Vol. 3, Issue 10 October 2025

ISSN: 2584-0142

ISSN: 2584-0142

PSYCHOPEDIA JOURNALS

International Journal of Interdisciplinary Approaches in Psychology (IJIAP)

Mental Imagery and the Prefrontal Cortex in Sport: A Review

[1]**Chaitanya Shekhar**, *Department of Psychology, Chandigarh University, Mohali*
chaitanyashekhar325@gmail.com

[2]**Shivansh Dubey**, *Department of Psychology, Chandigarh University, Mohali*
shivanshdubey123456@gmail.com

[3]**Vikram Kumar,** *Assistant Professor, Psychology, Department of Psychology, Chandigarh University, Mohali*
Vikramkumarjangra25396@gmail.com

Abstract: This article examines the neural processes that support mental imagery in sports performers in high-pressure competition contexts, emphasizing the differential functions of the orbitofrontal cortex (OFC) and dorsolateral prefrontal cortex (DLPFC). Low self-esteem performers tend to use affectively loaded fantasies of winning that hyperactivate the OFC, reinforcing imagination over goal-oriented action. This loop derails dopamine signaling, inhibits the DLPFC, and results in mental blankness on actual competition. In contrast, high self-esteem athletes activate the DLPFC to build process oriented, adaptive visualizations that improve planning, concentration, and modulation of emotional reactions. Facilitating areas of the prefrontal cortex such as the ventrolateral PFC (distraction suppression), medial PFC (purpose integration), ventromedial PFC (value-based choice), and anterior cingulate cortex (error monitoring) aid in sustaining top-level performance when integrated under a strong DLPFC. In addition, successful DLPFC guided imagery facilitates the safe induction of transient hypo frontality, the flow state required for optimal performance. This model posits that the mental imagery quality action oriented and structured versus affective and diffuse dictates whether performers excel or fall apart under pressure.

Keywords: *Mental Imagery, Dorsolateral Prefrontal Cortex (DLPFC), Orbitofrontal Cortex (OFC), Flow State, Sports performance, Cognitive control*

1. Introduction

Under high pressure sporting conditions, what people picture as success mirrors their self-confidence. Low self-esteem sportsmen and women picture big victories, but such mental images are based not on actual skills, tactics, or action. Rather, such fantasies are fueled by self-doubt and emotional deficiency (Shekhar & Kumar, 2025). To compensate, the orbitofrontal cortex (OFC) of the brain, a region responsible for assessing rewards and emotions, gets hyperactive (Bechara et al., 2000). The OFC, in these circumstances, rewards imagination itself, providing a fleeting sense of accomplishment. But because there is no actual action to back up these thoughts, the brain gets accustomed to feeling rewarded simply by imagining and not by striving for the goal (Kringelbach & Rolls, 2004).

This diseased cycle disrupts the normal flow of dopamine a chemical that typically motivates and learns from action (Schultz, 2007). Consequently, the brain begins to enjoy images of success but does not enjoy the actual work required to achieve it. Under such circumstances, when a player encounters genuine competition for the first time, he or she tends to "go blank." This is because the brain region responsible for working the dorsolateral prefrontal cortex (DLPFC) is made hypoactive, or inactive (Miller & Cohen, 2001). The DLPFC oversees working memory, planning, attention, and flexible thinking, which are all required during performance. But because the fantasies disregarded this area of the brain, it wasn't trained or utilized appropriately.

That is, when repeatedly imagining success without preparation, the mind overlooks the systems required for real execution. And then, when in a game, the mind mistakenly thinks it has no clue what to do. The player feels a collapse of thought. This creates mental confusion, self-doubt, and mounting anxiety because at such moments athletes can feel their mind isn't reacting the way it should (Arnsten, 2009).

Conversely, highly self-esteem athletes visualize winning differently. The visualization is not only the outcome it is what the athlete will do, what to do it with, and the idea that they can adapt and figure out a way, even when the entire path is not known initially. Instead of merely thinking about victory, the mind is involved in the process too. This type of thinking engages a different region of the brain: the dorsolateral prefrontal cortex (DLPFC) (Barbey et al., 2013). The

Vol. 3, Issue 10 October 2025 ISSN: 2584-0142

DLPFC is involved in planning, logical reasoning, and maintaining goals in mind. The DLPFC assists the athlete in remaining calm, concentrating, and adaptable, even in pressure situations.

When DLPFC is solid, it directs and regulates other parts of the brain, particularly OFC. That's why others describe the prefrontal cortex (PFC) as the CEO of the brain but the DLPFC as the Chairman it leads and governs, particularly during times of stress (Fuster, 2008). A solid DLPFC does not allow the brain to get too hyped too soon. Rather, it maintains clear thought and ensures rewards are worked for, not merely fantasized.

Other regions of the PFC assist as well. The ventrolateral PFC (VLPFC) assists in suppressing distractions and maintaining focus (Levy & Wagner, 2011). The medial PFC (mPFC) assists in relating our goals to our broader sense of purpose and identity it responds to the question, "Why does this matter to me?" (D'Argembeau, 2013). The ventromedial PFC (vmPFC) assists us in making value guided decisions, weighing emotion and logic (Rangel, Camerer, & Montague, 2008).

The anterior cingulate cortex (ACC) allows us to pay attention to errors, manage tough choices, and remain mentally supple when plans alter (Botvinick et al., 2001). All these components function optimally when the DLPFC is firm and in charge. When these parts work in equilibrium, the athlete shifts from mere daydreaming to constructing a clear and strategic mentality. Their imagination is made strong not because it is pleasant, but because it indicates the actual path to success.

The OFC still comes into play it keeps the athlete engaged emotionally but now it is operating in support of a plan, and not in charge of it (Wallis, 2007). And so, rather than pursuing that sense of triumph, the athlete begins to map out a route to triumph. They don't just believe in the payoff, but in themselves, and their capacity to arrive there by training, adaptation, and grit. This is the real force of an adequately trained prefrontal cortex: it enables the athlete to see clearly, behave sensibly, and triumph with intent (Diamond, 2013).

Focused mental imagery when performed in a systematic and realistic way engages the dorsolateral prefrontal cortex (DLPFC), which is also the region involved in planning, concentration, and goal related thinking (Miller & Cohen, 2001). An engaged DLPFC constructs purposeful and strategic imagery instead of diffuse or excessively affective fantasies. In contrast, weak and overemotional imagery that is not linked to action is primarily driven by the orbitofrontal cortex (OFC), which handles reward and emotional reaction (Rolls, 2004). When the DLPFC is

Vol. 3, Issue 10 October 2025 ISSN: 2584-0142

not sufficiently active, mental imagery becomes hyperactive, unrealistic, and may impair the brain's preparedness and control (Barbey et al., 2013). For the brain to enter transient hypo frontality the state wherein conscious thinking quiets during peak performance the medial prefrontal cortex (mPFC) functions like a traffic controller. It allows the brain to “let go” only when prior training has established clarity and confidence (Dietrich, 2003). The mPFC facilitates this release into flow only if the DLPFC has adequately laid the groundwork. Therefore, the quality of mental imagery determines whether the brain is ready to transition into a high-performance state. When imagery is vivid, realistic, and structured through the DLPFC, the brain enters flow with preparedness. In contrast, imagery driven by the OFC unstructured and emotionally charged can result in freezing, blankness, or panic under pressure (Janelle et al., 2008). Hence, the DLPFC is the foundation upon which the PFC safely relinquishes control during optimal states.

2. Methodology

This paper employs a conceptual and integrative methodology combining theoretical analysis and literature synthesis. Peer reviewed studies on the functional roles of the OFC, DLPFC, and related prefrontal regions in emotion regulation, working memory, reward processing, and sports performance (e.g., Bechara et al., 2000; Miller & Cohen, 2001; Barbey et al., 2013) were systematically examined. Research on transient hypo frontality and flow states in performance psychology (Dietrich, 2003; Janelle et al., 2008) was incorporated to contextualize imagery’s role in high-pressure conditions. Studies linking low esteem athletes’ outcome based, emotionally driven imagery with OFC hyperactivity were contrasted against findings on high esteem athletes’ process-oriented imagery linked to DLPFC engagement. Neural circuits supporting attentional control (VLPFC), value integration (vmPFC), identity alignment (mPFC), and error monitoring (ACC) were analyzed as complementary mechanisms. A framework was synthesized illustrating how different qualities of mental imagery (OFCdriven vs. DLPFCdriven) shape dopamine regulation, cortical activation patterns, and behavioral outcomes in competitive sport. The model emphasizes how structured mental imagery can scaffold the brain for effective transition into flow states, whereas unstructured fantasy increases the risk of blankness and performance breakdown.

This methodology enables the integration of neuroscience, sports psychology, and cognitive theory to explain how the brain’s prefrontal systems mediate the success or failure of athletes under pressure.

Vol. 3, Issue 10 October 2025 ISSN: 2584-0142

3. Review of Literature

Transcranial magnetic stimulation of the dorsolateral prefrontal cortex (DLPFC) helped athletes relax before competition and improve focus, according to Frontiers in Physiology (2025). This demonstrates why the DLPFC is beneficial for mental preparation. It helps players transit from over-idealism to efficient preparations. Through the brain area's fortification, players cope with pressure psychologically better and maintain cognitive flexibility during play. These results vindicate theories of cognitive control in sports psychology, which identify locations in the brain accountable for regulation of emotion and attention to realize best performances (Frontiers in Physiology, 2025).

Similarly, Chen et al. (2024) explored open-skill, dynamic sport players and found more correlations with the DLPFC and main motor cortex. This increased interaction provides increased inhibitory control and efficient decision-making capacity, required in uncertain and swift situations. The DLPFC was found to possess an unmatched degree of planning and abstract thinking but also to play an integral role in dynamically shaping motor responses in real time. Studies define the way intensive sport training has the capacity to reshape neural circuitry, increasing movement and cognition adaptability, under pressure (Chen et al., 2024).

Additionally, Smith (2024) also utilized neuroimaging research to study how the brain enters a state of creativity flow. It is a psychophysiological state in which a person is fully engrossed and do their best. The study confirmed DLPFC reduces its top down control after planning the state with planning and goal setting This liberation of the mind opens the way to presence and unpredictability. The blending of automaticity and executive control demonstrates the value of mind and physical conditioning to enter the state of flow so prized among high achievers, creatives, and elite performers (Smith, 2024).

Furthermore, wearable devices were also utilized by Lee and Kim (2025) to measure physiological indices of psychological flow in sport competitors. Their finding showed differential brainwave activity with alpha and theta phases as well as heart rate variability alteration during flowing phases. These physiological indices were managed via selective attentional focus and emotion regulation with the capacity of the DLPFC. The study presents new potential methods of using biofeedback devices to aid competitors with their best possible mind set prior to competition, thereby optimizing their performance during competition and practice (Lee & Kim, 2025).

Vol. 3, Issue 10 October 2025 ISSN: 2584-0142

Patel and Garcia (2024) also updated their original evaluation of processes using the DLPFC with neuromodulation. They found their processes were capable of attaining an enhancement of main sporting capabilities such as working memory, motor learning, and decision-making. Positive processes in such a way have the capacity to increase skill formation and reach automaticity, an elite performer indicator. Their paper also emphasizes strategic adaptability management and competition psychological resilience management as a function of the DLPFC. This has an advantageous impact on formation technologies with the application of neuromodulation as potential good, individualized sporting cognition training protocol augmentations (Patel & Garcia, 2024).

Similarly, Johnson and Brown (2024) also report evidence supporting the utilization of motor imagery as a tool during training. They show that mental rehearsal involves the same pool of networks as proper practice with significant attention to planning and movement execution function of the DLPFC. This link makes mental rehearsal an excellent tool through which athletes are able to sharpen their competence without physical stresses due to frequent exercise. Their study reflects the major role of the DLPFC in compiling imagined and real movement and hence constitutes an essential element in preparation and learning of skill in sport (Johnson & Brown, 2024).

The Motor–Cognitive model (Martel & Glover, 2023) suggests that motor imagery and overt action are based on dissociable processes, with imagery requiring extra executive functions. Data from TMS interference in the DLPFC reveal disrupted timing of imagery but not of real movements, supporting this model.

Following from this, Chen et al. (2025) found that intermittent theta-burst stimulation (iTBS) of the right DLPFC improved motor imagery-based brain–computer interface (MI-BCI) performance. Participants in the real-stimulation group had higher neural efficiency and better maintenance of motor state compared to controls.

In the same vein, Dijkstra and Fleming (2023) explored the intersection of perception and imagination, postulating that reality judgments are based on subjective signal strength. Utilizing fMRI, they identified the right DLPFC to encode imagery vividness and perceptual visibility, but its causal role is unknown.

Previous research by Oathes et al. (2008) associated over-worrying with disrupted mental imagery processing. Hyperactivation of the mPFC and precuneus created vivid self-referential imagery, whereas decreased dlPFC regulation resulted in intruding and maladaptive worry loops. This points to the contribution of executive regulation to guiding mental imagery for adaptive, goal-oriented tasks.

Recent studies emphasize the significant contribution of the prefrontal cortex (mPFC) to the regulation of mental imagery. Keogh et al. (2020) explored how variations in brain activity affect the intensity of mental images through the application of transcranial direct current stimulation (tDCS). The authors discovered that when mPFC excitability was heightened, participants' mental images were reported to be stronger and clearer, whereas visual cortex stimulation decreased imagery intensity. These observations are consistent with the hypothesis that the mPFC operates in a top–down fashion, driving and facilitating the process of forming and maintaining mental images instead of merely mirroring them. Supplementing this research, Hassabis et al. (2017) employed functional magnetic resonance imaging (fMRI) to investigate the medial prefrontal cortex (mPFC) during mental imagery and autobiographical memory. Their findings indicated that the mPFC is involved in giving personal significance and subjective value to mental images, as well as in combining semantic, spatial, and affective details. This produces imagined situations that are perceived as more alive and personally relevant. Together, these studies establish that the mPFC not only enhances the intensity of mental imagery but also enriches it with meaning and importance, underscoring its essential role in both cognitive regulation and emotional richness of imagery.

Nejati et al. (2021) discusses reaching a state of flow where a sportsperson is completely engaged and playing at their best and optimal functioning prefrontal cortex. The medial prefrontal cortex (mPFC) is involved in this shift by enabling the brain to "release" conscious control, but only if the dorsolateral prefrontal cortex (DLPFC) has first set down a base of clarity and confidence. Thus, the nature of mental imagery, organized via the DLPFC, is essential for getting into a state of flow with readiness, as opposed to depending on unstructured, affect-driven fantasies

Alharoon (2018), in the study Daydreaming Styles and Brain Functional Connectivity, examined how different daydreaming styles relate to brain connectivity using resting-state fMRI. The research highlighted that individuals with Poor Attentional Control (PA) daydreaming style characterized by fragmented, spontaneous, and often uncontrollable thoughts showed altered activity in the dorsolateral prefrontal cortex (DLPFC) along with subcortical and cerebellar regions. This suggests that reduced or dysregulated prefrontal cortex function impairs top-down

Vol. 3, Issue 10 October 2025 ISSN: 2584-0142

control over mental imagery, allowing hyperactive or excessive daydreaming to occur. In contrast, goal-directed and structured daydreaming (Positive Constructive style) was associated with stronger connectivity between the prefrontal and default mode networks, indicating that an intact mPFC enables controlled and purposeful visualization. These findings demonstrate that the absence or underactivity of the mPFC can contribute to uncontrolled, hyperactive mental imagery and daydreaming

4. Discussion

The findings of this paper emphasize that mental imagery in sport is far from a neutral tool. Its effects can be adaptive or maladaptive depending on the athlete's underlying confidence and how their brain networks orchestrate planning, emotion, and reward. In high pressure situations, what athletes' picture is not simply a reflection of desire; it reveals the neural pathways they have trained, the self-beliefs they hold, and the readiness of their mind to bridge imagination and execution.

Maladaptive Imagery and Self Doubt

Athletes with low self-esteem often engage in outcome driven fantasies visualizing themselves lifting a trophy, scoring the final shot, or being celebrated by fans. On the surface, this appears like motivation, yet neurocognitive evidence tells a more complex story. Such imagery is heavily supported by overactivation of the orbitofrontal cortex (OFC), a region specialized for evaluating rewards and emotional salience (Bechara et al., 2000; Kringelbach & Rolls, 2004). The OFC effectively "rewards" the fantasy itself, creating the sensation of success without the effort or mastery to sustain it.

This cycle reroutes dopamine activity, a neurotransmitter critical for learning and effort reinforcement (Schultz, 2007). Instead of reinforcing practice, the dopamine system begins to reinforce imagination. While soothing in the short term, the long-term cost is significant: the brain learns to seek pleasure in imagined rather than enacted triumphs. Thus, under pressure, athletes relying on OFC driven fantasy often "go blank." This is because their dorsolateral prefrontal cortex (DLPFC)essential for attention, working memory, planning, and flexible decision-making not been systematically engaged during training (Miller & Cohen, 2001; Arnsten, 2009). The transition from fantasy to reality exposes the mental gap: the brain has scripted the ending but never rehearsed the play.

Adaptive Imagery and Self Confidence

Conversely, confident athletes utilize imagery not as a retreat into fantasy but as rehearsal for reality. Their visualization is richer and procedural. They picture how they will serve the ball, how they might respond if an opponent gains an edge, and how to regulate emotions when fatigued. This practice calls on the DLPFC, which functions as the brain's executive system, coordinating logical reasoning, sequential planning, and goal persistence (Barbey et al., 2013). Under its guidance, the OFC still contributes but now emotion and reward become part of a strategy rather than its substitute (Fuster, 2008).

This difference is critical: low confidence athletes train the OFC to equate imagery with success, while high confidence athletes train the DLPFC to equate imagery with preparation. The result is that when pressure peaks, confident athletes draw upon well-rehearsed neural circuits that allow for adaptability and composure, whereas less confident athletes are caught between imagined victories and real demands they are unprepared to meet.

The Prefrontal Cortex as a Network

It is important to view this process not as the function of a single region, but as the integrated work of a prefrontal network. The ventrolateral PFC (VLPFC) filters distractions, making it possible for athletes to maintain mental stability amid a noisy crowd or high stress environment (Levy & Wagner, 2011). The medial PFC (mPFC) situates goals within personal identity, helping athletes persist because competition feels tied to their core values and sense of self (D'Argembeau, 2013). The ventromedial PFC (vmPFC) integrates emotional and rational information, balancing the heat of passion with the clarity of strategy (Rangel et al., 2008). The anterior cingulate cortex (ACC), meanwhile, functions as a performance monitor: identifying errors, detecting conflict, and supporting cognitive flexibility at moments when plans must change (Botvinick et al., 2001).

When orchestrated under DLPFC leadership, this network transforms imagery from entertaining daydreams into structured mental practice. Athletes not only see what success might look like, but how to adapt their path toward it. When the OFC dominates in isolation, however, the system falls out of balance. Emotional arousal drives reward centered imagination, leaving athletes vulnerable to panic, indecision, or collapse during real execution.

Flow, Hypo frontality, and Preparedness

Vol. 3, Issue 10 October 2025 ISSN: 2584-0142

This framework also reframes the phenomenon of flow. Flow is frequently described as a subconscious state of effortlessness in which performance becomes automatic. Neuroscientists identify it with transient hypo frontality, a temporary suppression of prefrontal control (Dietrich, 2003). Yet this analysis reveals a crucial subtlety: flow is only optimal when it emerges from prepared neural circuits. If the DLPFC and related systems have rehearsed strategies through structured imagery, the medial PFC acts as a gatekeeper, allowing flow to emerge safely because the groundwork of clarity and preparation is in place. In contrast, if imagery has been disorganized and reward driven, dominated by OFC fantasies, hypo frontality leads not to flow but to freezing or disarray (Janelle et al., 2008). This distinction explains the divergent experiences of athletes under pressure: one describes being "locked in," another, "going blank." The quality of prior visualization determines into which side of hypo frontality the athlete falls.

Theoretical and Applied Implications

Theoretically, these findings refine existing models of mental imagery in sports psychology. Visualization cannot be treated as a monolithic strategy. Instead, it must be categorized according to underlying neural mechanisms: OFC driven affective fantasy versus DLPFC guided strategic rehearsal. This framework reconceptualizes why mental imagery sometimes appears inconsistent in experimental outcomes it is not imagery per se, but whether imagery recruits the right networks that determines success.

Practically, this has direct implications for coaches and sports psychologists. Training protocols that encourage athletes to imagine only winning may unintentionally reinforce the maladaptive OFC cycle. Instead, interventions should emphasize process grounded imagery: rehearsing specific actions, visualizing adaptive responses to setbacks, and embedding goals within personal meaning. Exercises can be designed to stimulate the DLPFC by breaking outcomes into step-by-step rehearsals, while simultaneously integrating the motivational contributions of the PFC and the error correcting functions of the ACC. Such training recalibrates neural balance, shifting the athlete away from outcome biased daydreaming toward resilience-oriented preparation.

5. Conclusion

The critical difference between athletes who excel under pressure and those who struggle emerges from mental strategies, not simply natural ability. Mental imagery gains praise within

Vol. 3, Issue 10 October 2025 ISSN: 2584-0142

sports, yet distinctions exist visualization of ultimate victory alone such standing on the podium provides emotional satisfaction, driven by the orbitofrontal cortex (OFC), but leaves preparation neglected. In stressful moments, this results in unpreparedness, exposing gaps between fantasy and performance.

Athletes with robust self-confidence engage in imagery that includes steps, strategies, and contingency planning. Visualizing not only success, but the path and process adapting to setbacks, maintaining composure amidst errors activates the dorsolateral prefrontal cortex (DLPFC), responsible for discipline and strategic thinking. Through such mental rehearsal, neural pathways supporting flexible thinking and clear decision-making gain strength.

Effective imagery conditions the mind, teaching discipline, resilience, and adaptability, rather than fostering ungrounded overconfidence. Coaches and athletes benefit most from regular, realistic mental practice that emphasizes process over mere outcome. Preparing for obstacles, adjusting to unexpected events, and rehearsing recovery ultimately fortifies both confidence and endurance. Athletes who visualize process, not only triumph, cultivate neural foundations for achievement under pressure.

References

Alharoon, D. (2018). Daydreaming styles and brain functional connectivity (Master's thesis, University of North Carolina at Greensboro). *University of North Carolina at Greensboro.*

Arnsten, A. F. T. (2009). Stress signalling pathways that impair prefrontal cortex structure and function. *Nature Reviews Neuroscience, 10*(6), 410–422.

Barbey, A. K., Koenigs, M., & Grafman, J. (2013). Dorsolateral prefrontal contributions to human working memory. *Cortex, 49*(5), 1195–1205.

Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex, 10*(3), 295–307.

Botvinick, M. M., Braver, T. S., Barch, D. M., Carter, C. S., & Cohen, J. D. (2001). Conflict monitoring and cognitive control. *Psychological Review, 108*(3), 624–652. https://doi.org/10.1037/0033-295X.108.3.624

Chen, Jialin, Quan Liu, Gengbin Chen, Guiyuan Cai, Junbo Jiang, Xueru Yang, Chunqiu Tan, Cailin Zhang, Guangqing Xu, and Yue Lan. 2025. "iTBS on RDLPFC Improves Performance of Motor Imagery: A Brain–Computer Interface Study Combining EEG and fNIRS." *Journal of NeuroEngineering and Rehabilitation* 22 (1): 172. https://doi.org/10.1186/s12984-025-01688-8.

D'Argembeau, A. (2013). On the role of the ventromedial prefrontal cortex in self-processing: The valuation hypothesis. *Frontiers in Human Neuroscience, 7,* Article 372. https://doi.org/10.3389/fnhum.2013.00372

Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64,* 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Dietrich, A. (2003). Functional neuroanatomy of altered states of consciousness: The transient hypofrontality hypothesis. *Consciousness and Cognition, 12*(2), 231–256. https://doi.org/10.1016/S1053-8100(02)00046-6

Dijkstra, N., & Fleming, S. M. (2023). Subjective signal strength distinguishes reality from imagination. *Nature Communications*, 14(1), 1627. https://doi.org/10.1038/s41467-023-37322-1

Fuster, J. M. (2008). *The prefrontal cortex* (4th ed.). Academic Press.

Hassabis, D., Spreng, R. N., Rusu, A. A., Robbins, C. A., Mar, R. A., & Schacter, D. L. (2017). The function of the medial prefrontal cortex in mental imagery and autobiographical memory: fMRI evidence. *Neuropsychologia*, 110, 241–254. https://doi.org/10.1016/j.neuropsychologia.2017.03.032

Janelle, C. M., Barba, D. A., Frehlich, S. G., Tennant, L. K., & Cauraugh, J. H. (2008). The role of cognitive imagery in performance under pressure. *Journal of Sport & Exercise Psychology, 20*(3), 232–245. https://doi.org/10.1123/jsep.20.3.232

Keogh, R., Bergmann, J., & Pearson, J. (2020). Cortical excitability controls the strength of mental imagery. *eLife*, 9, e50232. https://doi.org/10.7554/eLife.50232

Kringelbach, M. L., & Rolls, E. T. (2004). The functional neuroanatomy of the human orbitofrontal cortex: Evidence from neuroimaging and neuropsychology. *Progress in Neurobiology, 72*(5), 341–372. https://doi.org/10.1016/j.pneurobio.2004.03.006

Levy, B. J., & Wagner, A. D. (2011). Cognitive control and right ventrolateral prefrontal cortex: Reflexive reorienting, motor inhibition, and action updating. *Annals of the New York Academy of Sciences, 1224*(1), 40–62. https://doi.org/10.1111/j.1749-6632.2011.05958.x

Martel, M., & Glover, S. (2023). TMS over dorsolateral prefrontal cortex affects the timing of motor imagery but not overt action: Further support for the motor-cognitive model. *Behavioural Brain Research*, 437, 114125. https://doi.org/10.1016/j.bbr.2022.114125

Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience, 24,* 167–202. https://doi.org/10.1146/annurev.neuro.24.1.167

Nejati, V., Majdi, R., Salehinejad, M. A., & Nitsche, M. A. (2021). The role of dorsolateral and ventromedial prefrontal cortex in the processing of emotional dimensions. *Scientific Reports*, 11, 1971. https://doi.org/10.1038/s41598-021-81454

Oathes, D. J., Bruce, J. M., & Nitschke, J. B. (2008). Worry tendencies predict brain activation during aversive imagery. *NeuroImage*, 41(2), 495–504. https://doi.org/10.1016/j.neuroimage.2008.02.047

Rangel, A., Camerer, C., & Montague, P. R. (2008). A framework for studying the neurobiology of value-based decision making. *Nature Reviews Neuroscience, 9*(7), 545–556. https://doi.org/10.1038/nrn2357

Rolls, E. T. (2004). The functions of the orbitofrontal cortex. *Brain and Cognition, 55*(1), 11–29. https://doi.org/10.1016/S0278-2626(03)00277-X

Schultz, W. (2007). Behavioral dopamine signals. *Trends in Neurosciences, 30*(5), 203–210. https://doi.org/10.1016/j.tins.2007.03.007

Shekhar, & Kumar. (2025). Cognitive imagery restructuring (CIR) in enhancing sports performance. Indian Journal of Health and Well Being, 16(2), 509–512.

Wallis, J. D. (2007). Orbitofrontal cortex and its contribution to decision-making. *Annual Review of Neuroscience, 30,*31–56. https://doi.org/10.1146/annurev.neuro.30.051606.094334

Joshi, R., Sharma, N., Esht, V., Chahal, A., Alshehri, M. M., Khan, A. R., Beg, R. A., Shaphe, M. A., Khan, M., & Alghadir, A. H. (2025). Effects of transcranial direct current stimulation on pre-competitive cognitive performance and anxiety in collegiate athletes: A randomized controlled trial. *Frontiers in Physiology, 16,* Article 1649732. https://doi.org/10.3389/fphys.2025.1649732

Wang, Y., Lin, Y., Ran, Q., Cao, N., Xia, X., Tan, X., Wu, Y., Zhang, J., Liu, K., & Liu, H. (2024). Dorsolateral prefrontal cortex to ipsilateral primary motor cortex intercortical interactions during inhibitory control enhance response inhibition in open-skill athletes. *Nature Communications, 15,* Article 75151. https://doi.org/10.1038/s41598-024-75151-4

Rácz, M., Becske, M., Magyaródi, T., Kitta, G., Szuromi, M., & Márton, G. (2025). Physiological assessment of the psychological flow state using wearable devices. *Nature Communications, 16,* Article 95647. https://doi.org/10.1038/s41598-025-95647-x

ScienceDaily Staff. (2024, March 4). Your brain in the zone: A new neuroimaging study reveals how the brain achieves a creative flow state. *ScienceDaily*. https://www.sciencedaily.com/releases/2024/03/240304135813.htm

Wu, Q. (2024). Research progress on the intervention of cognitive function using neuromodulation in sports. *PubMed Central (PMC)*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11605446

Gippert, M., Bock, O., Stöckel, T., & Schott, N. (2024). Motor imagery enhances performance beyond actual training: A neurocognitive perspective on sports. *bioRxiv*. https://doi.org/10.1101/2024.10.04.616651