

Dysregulated Dopamine and Reality Monitoring Errors

Ibadullayeva Arzu & Masimov Mahammad

Cognitive Science Departament, Nicolaus Copernicus University, Torun

Introduction

Dysregulations in dopamine secretion can lead impairments in Reality Monitoring.

Reality monitoring is vital cognitive function which allows people to distinguish between internally generated ideas and real-life events that occurs in external world[1]. A healthy reality monitoring system allows us to analyse new details with existing memories in a way that preserves coherence and helps us respond appropriately within our real environment.

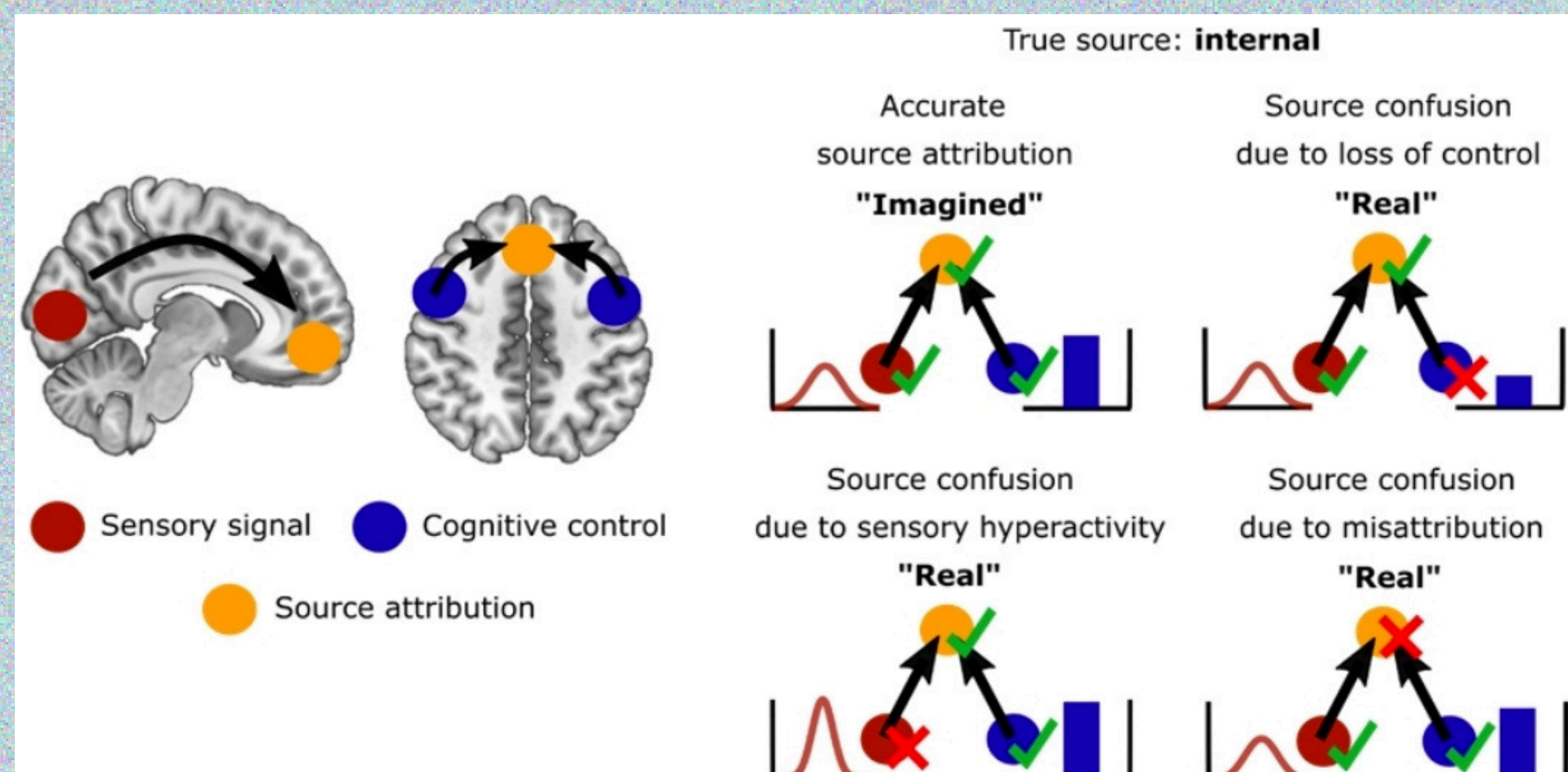


Figure 1. This diagram explains how the brain decides whether something is real or imagined. The anterior medial prefrontal cortex (amPFC) (yellow circle) helps evaluate sensory signals (red) and cognitive control (blue) to figure out if a thought or perception is real or generated by the mind.

Optimal dopamine levels ensure cognitive flexibility, regulating motivation, facilitating learning, processing rewards, and managing prediction errors. Errors in perception of reality generated from unbalanced dopamine level can lead to decision-making biases, cognitive biases, emotional instability, and social withdrawal, delusions and hallucinations[2].

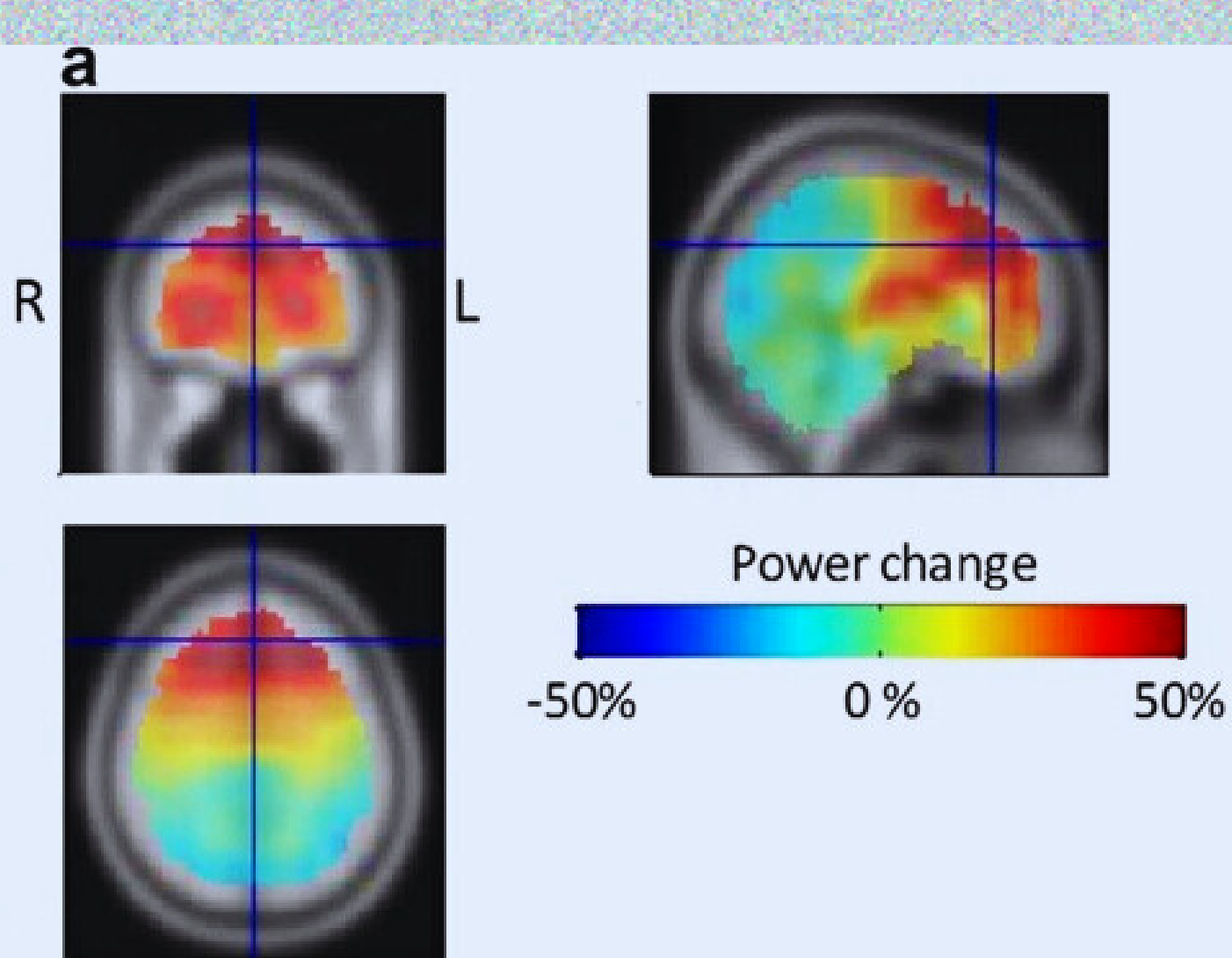


Figure 2. This figure shows how hyperdopaminergic state affects self-awareness and reality monitoring by increasing activity in the medial prefrontal cortex (mPFC). Left side of the image: Shows brain activity changes caused by dopamine. The coloured areas (red, yellow, blue) represent changes in brain, with higher activity (red/yellow) indicating increased function in the medial prefrontal cortex (mPFC).

Methods

This study critically examines the existing literature on dopamine's role in reality monitoring.

We analysed:

Dopaminergic activity in the medial prefrontal cortex (mPFC).

Effects of hyperdopaminergic and hypodopaminergic states on cognitive functions.

Behavioural and psychological effects linked to reality monitoring deficits.

Results

Hyperdopaminergic State disrupts prediction error signalling, a vital component of reality monitoring[3]. In hyperdopaminergic state this system gets overactive, causing the person to exaggerate significance of irrelevant internal stimuli[3]. For instance, a random sound might feel deeply significant., a neutral facial expression might seem threatening, an internal thoughts might be confused as external voices. This misattributions leads to hallucinations and delusions[2], as self-generated thoughts are misperceived as external events. Such impairments followed by disrupted cognitive flexibility, causing rigid, distorted belief systems.



Figure 3. Data from a PET study suggests that the the greater the increase in abnormal dopamine activity in the striatum (green), which is associated with hallucinations, delusions, and cognitive deficits in schizophrenia, the less the frontal lobes are activated (red) during a working memory task

Hypodopaminergic state

Affected Brain areas:
1. Medial Prefrontal Cortex
2. Anterior Cingulate Cortex[4]
3. Basal Ganglia[5]

Effects:

- Weakens cognitive control and working memory, increasing confusion between real and imagined experiences[6].
- Contributes to blunted emotional responses and social withdrawal.
- Reduces motivation and adaptability, leading to impaired decision-making and behavioural rigidity[5].

Conclusion & Discussion

Understanding effects of dysregulated dopamine and reality monitoring errors is crucial. Distorted reality monitoring caused by imbalanced dopamine levels contribute to psychotic symptoms and paranoia, disorganized thinking in clinical disorders including Schizophrenia[3]. In Bipolar Disorder fluctuating dopamine levels, be factor in manic and depressive episodes by shifting reality and causing delusional thinking and amplified emotions and behaviours[7]. Also in Major Depressive Disorder insufficient dopamine weakens cognitive control and memory accuracy, increasing confusion about one's perception of themselves and causing depressive rumination, cognitive inflexibility, and impaired decision-making[8]. Beyond these even in non-clinical cases individuals can experience heightened anxiety, impulsivity, emotional blunting, and social withdrawal.

To improve overall life quality of individuals suffering from such dysregulations, balancing dopaminergic activity with pharmacological interventions, and targeting reality monitoring impairments with cognitive-behavioural therapies can help to restore dopaminergic balance and improve reality perception.

References

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