Review of: "Fornix and Uncinate Fasciculus Support Metacognition-Driven Cognitive Offloading"

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Potential competing interests: No potential competing interests to declare.

This research is very interesting. The study used fractional anisotropy (FA) as a biomarker for white matter integrity, analyzing its correlation with cognitive processes and biases in memory strategy choices. This provides insights into the neural basis of metacognitive monitoring and control, exploring how these processes interact at both local and global levels in four features, including the fornix, Uncinate Fasciculus (UF), superior longitudinal fasciculus (SLF), and cingulum bundle (CB). As well, the study employed various statistical methods in diffusion tensor imaging (DTI), including bootstrapping resampling and Bayesian analysis, to ensure robust and reliable results, which help in understanding the strength of evidence and variability in the limited data or relatively modest sample size of participants.

Nevertheless, there are still some issues for the authors to consider.

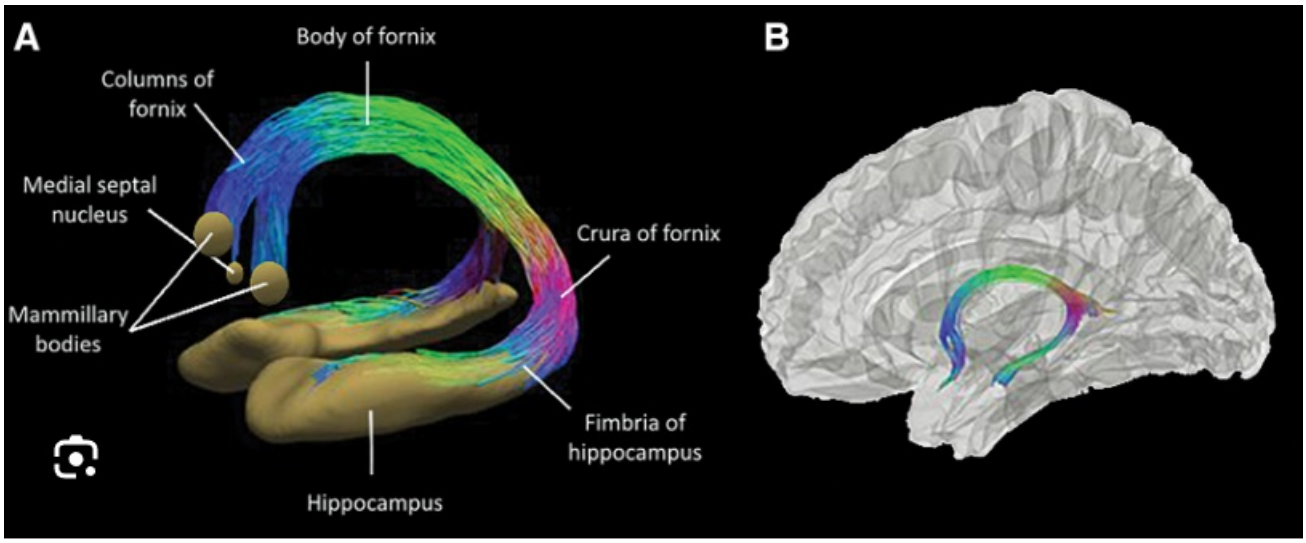
Q1. You should clarify the "**metacognitive control process**" or modify this to **"state"**. In the Abstract, you said "the neural mechanisms underlying this **metacognitive control process** remain unclear", but the results are that "Behaviorally,…. At the brain level, FA of the fornix positively correlated….. the FA of the left uncinate fasciculus negatively correlated….. FA of the superior longitudinal fasciculus…..", which is not a "control process", and does not vividly show the flows.

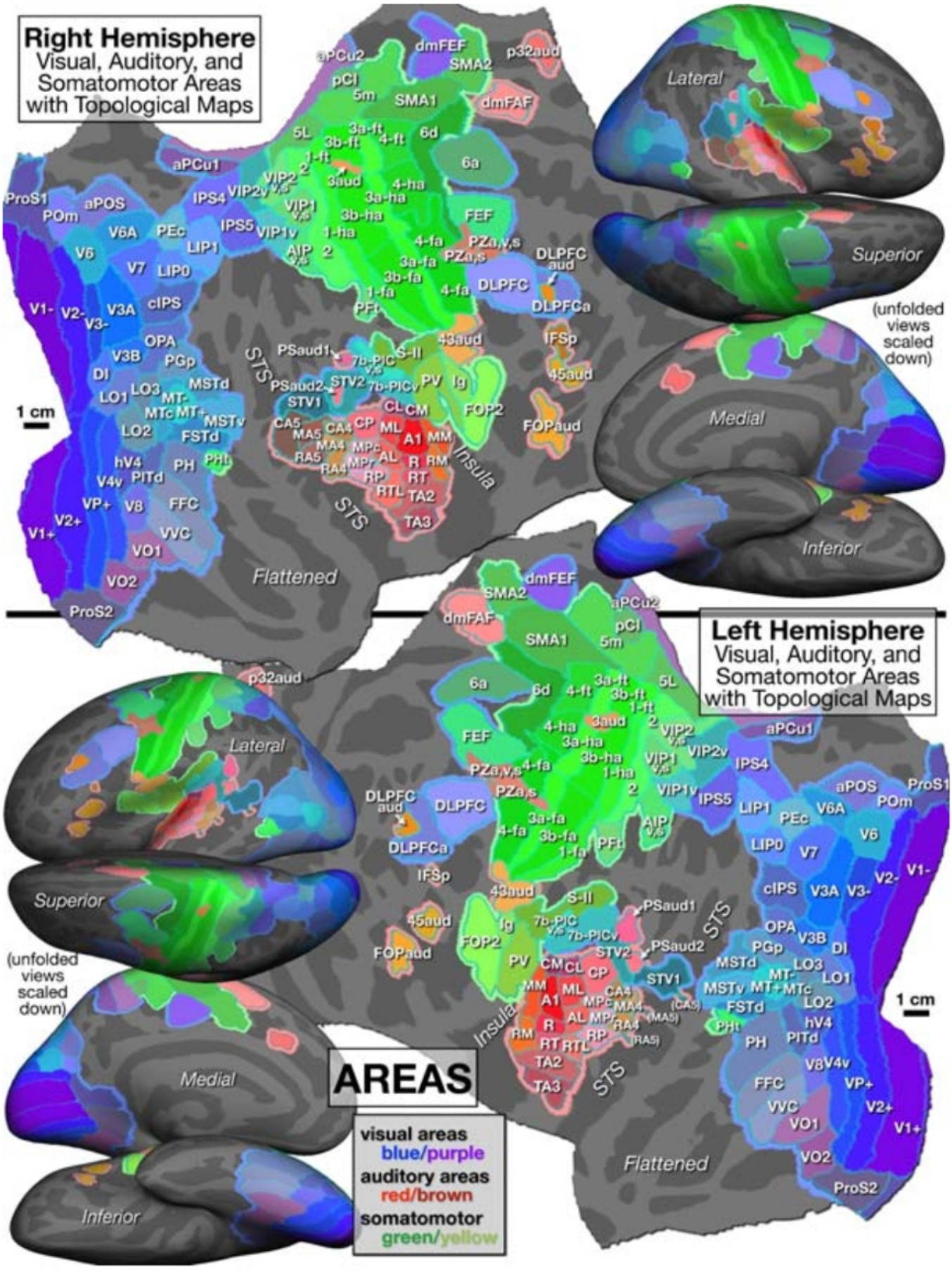
Q2. In the Abstract, you said "findings reveal a**temporal-frontal neural circuit** underlying metacognition-driven cognitive offloading". You should clarify the flows in the context, not only in the introduction but also in the results.

Q3. In the Introduction, about your proposed study, you said "we focused on the following white matter fiber tracts: 1) the **fornix** which links the hippocampal formation and subcortical structures including the thalamus, and supports episodic memory retrieval[31][32][33][34]; 2) the **uncinate fasciculus (UF)** which links the temporal lobe including the hippocampus to the rPFC, and supports error monitoring in memory retrieval[35][36]; 3) the **superior longitudinal fasciculus (SLF)** which links the inferior parietal lobe to the lPFC, a critical region for both metacognitive monitoring and control[29][37][38]; and 4) the **cingulum bundle (CB)** that links the metamemory-related region precuneus (e.g.[30]) to the cognitive control-related region dACC[39][40]."

It is suggested to clearly mark these focus areas in the figure and point out the connection relationship between the fornix,

UF, SLF, IPFC, and CB surrounding areas and related areas, to facilitate the understanding of the image of the flows. For example, reference these: “Brodmann areas of the cerebral cortex / Lobes of the brain: Structure and function / Neuroanatomy https://www.youtube.com/watch?v=AvcB9cXI1Yk ”, “Phase-encoded fMRI tracks down brainstorms of natural language processing with subsecond precision”(RS Huang, 2024), and focus on marking the connection relationships of the areas you care about.




Right Hemisphere
Visual, Auditory, and Somatomotor Areas with Topological Maps
Lateral
Superior
Medial
Inferior
Flattened
(unfolded views scaled down)
1 cm
Left Hemisphere
Visual, Auditory, and Somatomotor Areas with Topological Maps
AREAS
visual areas
blue/purple
auditory areas
red/brown
somatomotor
green/yellow
Insula
STS

Q4. Please clarify **why setting the optimal indifference point (OIP)**, and the unbiased 0.6 ACCFI.

I thought that “The Optimal Indifference Point (OIP) is a behavioral index used to determine the value at which a participant should be indifferent between using internal memory or external reminders to maximize rewards.” Is that right? I believe this is simpler to understand. OIP serves as a benchmark to evaluate whether participants are making optimal decisions in choosing between internal and external memory strategies based on reward maximization. By comparing the OIP with the Actual Indifference Point (AIP), researchers can assess biases in participants' strategy choices, such as a tendency to over-rely on external reminders even when it is not optimal.

Q5. Why does the **FA of the right superior longitudinal fasciculus** moderate the relationship between participants’ under-confidence in their ability? Why not **the FA of the left superior**?

You said, “Since the FA of the right SLF was previously reported to correlate with metacognitive monitoring ability,” Why not cite the reference? Why not compare the **FA of the right SLF** and **the left SLF** to improve the integrity of the province and the reliability of the data?

Additionally, there are stars between confidence prediction and**superior longitudinal fasciculus (Left) and between** confidence prediction and **superior longitudinal fasciculus (Right). Is this namely to the same correlation (importance)?**

Q6. Please directly **describe the FA in the Introduction**, or in the section of “DTI Tractography and relationship with behavioral indices” and cite the reference in “the relationship between the structural integrity of white matter (WM) tracts (indexed by fractional anisotropy; FA) and participants’ behavior”. As well, why did the paper evaluate the FA?

Suggested Description: for example, FA is a quantitative biomarker used to assess the 'integrity' of white matter in the brain. It measures the degree of directionality of water diffusion in brain tissue, which reflects the density and organization of white matter tracts.

The paper evaluated FA to investigate the neural basis of metacognition-driven cognitive offloading. By examining the FA of specific white matter tracts, the study aimed to understand how structural brain differences relate to the use of external reminders and internal memory processes.

Q7. **Please clearly clarify the motivation of the study in the Introduction** I noticed that what you're trying to explain is the brain structure and the neural mechanism behind the behavior that comes with confidence, that is, looking for the reason behind a cognitive-behavioral problem. Is that right? For example, cognitive offloading is a common strategy used to manage prospective memory tasks, especially when individuals are under-confident about their memory abilities. This strategy can lead to poorer memory for offloaded items if reminders are unexpectedly removed. But the neural basis behind it is unclear. So you made these findings?

Q8. **Please directly show lower structural integrity or higher structural integrity with FA characters**, rather than only lower or higher. Do the people with lower structural integrity refer to low FA?

What are participants with lower structural integrity or higher structural integrity? Whether participants with lower structural integrity may be somewhat disordered?

For example, you can add that structural integrity refers to the condition and organization of white matter tracts in the brain. Higher structural integrity indicates well-organized and dense white matter, which is associated with efficient neural communication. Lower structural integrity suggests less organized white matter, which can affect cognitive functions.

Q9. You said the global and local confidence and metacognitive relationship,**required to clarify what is global confidence and local confidence?** So what is a local metacognitive signal and a global metacognitive signal? And why do people with better metacognitive monitoring ability weigh local metacognitive signals more heavily than global ones when guiding decisions?

Q10. **For figure 2, it is recommended to map the brain more clearly**(reference to these: “Brodmann areas of the cerebral cortex / Lobes of the brain: Structure and function / Neuroanatomy https://www.youtube.com/watch?v=AvcB9cXI1Yk ”, “Phase-encoded fMRI tracks down brainstorms of natural language processing with subsecond precision” (RS Huang, 2024)) and explain clearly what the X-axis represents.

Best Wishes!

Thank you!