IS YOUR INNER EYE YOUR INNER COMPASS?

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Visual Imagery & Spatial Memory: Behavioural & Pilot EEG Correlates of Cognitive Mapping

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Research Question

How does visual imagery vividness relate to spatial memory & theta oscillations?

Background

Spatial memory and visual imagery depend on the **hippocampus** and **parietal cortex**, key regions for navigation and cognitive mapping.

Individual differences in imagery vividness may influence navigational ability and spatial memory performance. These abilities are impaired in certain disorders.

Theta-band oscillations help in spatial navigation, the consolidation of memory and recall mechanisms.

Objectives

- Assess imagery vividness (VVIQ)
- Evaluate spatial sense (SBSOD)
- Correlate imagery & spatial memory.

Why This Study?

Need

Individual differences in imagery and their link to spatial cognition and theta oscillations remain poorly understood, despite relevance for navigation, memory, and neurological disorders like Alzheimer's and Epilepsy.

Novelty

This study uniquely combines VVIQ and SBSOD with reference to theta activity, a link under explored in healthy adults.

How Are We Approaching This?

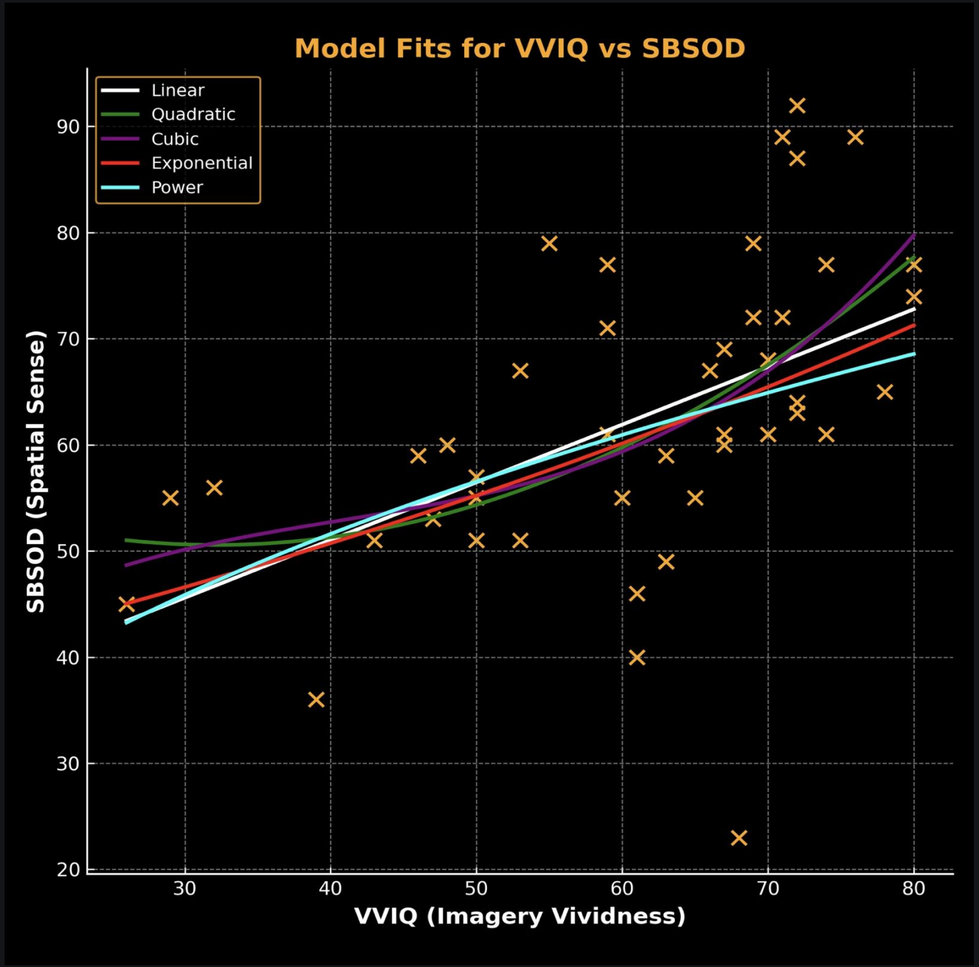
Participants
45 Healthy medical students (18-40 yrs.)

Behavioural Measures
Vividness of Visual Imagery and Santa Barbara Scale of Direction.

Data Analysis
Correlation and Regression analysis.

Spatial Task & EEG theta amplitude measures are planned.

Result & Takeaways



Result

- Linear model best fits the data ($\beta = 0.54$, $p < 0.0004$, Adjusted $R^2 = 0.24$).
- Other models did not improve prediction

Scan the QR code for viewing the collected data and analysis

What Does It Mean?

- Analyses showed that visual imagery vividness is **linearly** associated with spatial orientation ability in healthy adults, with **stronger imagery linked to better orientation**.
- While our data is behavioural, this relationship is consistent with prior evidence that hippocampal–parietal networks and theta oscillations may underlie both imagery and navigation.
- Future analyses will extend these findings by incorporating EEG measures of theta activity during imagery and navigation tasks.

What Are The Limits?

- **Modest sample size.**
- **Population isn't diverse.**
- **Self-report questionnaires only.**
- **Cross-sectional design limits causal inference.**

What's Next?

- ***Planned EEG studies.***
- ***Task-based measures that were planned.***
- ***Correlation and regression analysis of the parameters.***

How Can This Be Applied?

Clinical (Patient-focused)

- Early detection: EEG markers reveal subtle cognitive changes.
- Rehabilitation: Imagery-based training for Alzheimer's, Temporal Lobe Epilepsy, stroke.
- Network support: Boosts hippocampal–parietal connections (like motor imagery in stroke rehab.)

Societal / Technological (Tools & Accessibility)

- Navigation aids: Personalized apps (visual or verbal cues).
- Virtual & augmented reality training & educational platforms: Virtual mazes, route-finding.
- Educational platforms: Imagery-based exercises for schools or training programs .

Basic & Translational Research

- Investigate neural mechanisms: mental imagery ⇔ theta/alpha oscillations.
- Interventions: Test methods to enhance spatial memory.
- Biomarkers: Validate EEG for early cognitive decline.
- Populations: Apply tasks to larger, diverse groups.

Technological / Innovative Research

- Artificial intelligence: Uses data to predict imagery or spatial skills and tailor training.
- Brain–computer interfaces: Let mental images control devices or virtual tasks.
- Robotics: Robots that help people navigate or do cognitive exercises based on imagery research.

FROM THE BRAIN'S INNER COMPASS TO OUTER REALITY — GUIDING IMAGERY TODAY INTO TOMORROW'S CLINIC, CLASSROOM, AND TECHNOLOGY.

Scan the QR code for the key references.