

**Project Title:**

The Human HexMaze Project: Investigating How Prior Knowledge Shapes Learning

**Project Description:**

Previous knowledge has been shown to facilitate the learning and consolidation of new, congruent information by updating existing knowledge networks (Tse et al., 2007, 2011). However, the precise mechanisms underlying how humans construct and update complex knowledge remain poorly understood, as participants usually bring considerable prior knowledge to experimental settings. To address this, we have developed a **novel and complex virtual navigation task**—a virtual adaptation of our rodent HexMaze paradigms—that enables the controlled study of the gradual build-up and updating of knowledge networks. By training participants in the **fMRI scanner**, we aim to capture the neural and behavioral dynamics of schema memory at the systems level. This includes observing shifts in activity across brain regions, the development of neural similarity patterns, and the spontaneous reactivation of these patterns during subsequent wakefulness. Additionally, we will assess the impact of **sleep**—specifically using daytime naps—on the formation and updating of these networks to understand how sleep contributes to knowledge consolidation and restructuring.

Finally, by linking our human data with parallel rodent studies, this project will address these research questions across multiple levels of analysis. The methods employed will range from molecular approaches and intracranial electrophysiological recordings to system-level investigations, enabling a comprehensive investigation of the development and updating of complex knowledge networks. This unique translational approach will offer valuable insights into the neural mechanisms underlying knowledge acquisition and plasticity.

**Period:**

The project will run from **2025 to 2027**.

**What We Offer:**

- Hands-on experience with **advanced MRI acquisition techniques**.
- Expertise in **sleep EEG recordings & scoring** during daytime naps.
- A unique opportunity to bridge **human and animal research**, providing insights into translational neuroscience.
- Integration into a **dynamic, social, and interdisciplinary lab** environment.

**Tasks:**

- Collect and analyze large behavioral, neuroimaging (MRI), and electrophysiological (EEG) datasets.

**Requirements:**

- Being highly motivated, autonomous, and rigorous.
- Strong work ethics and a commitment to ensuring high-quality data acquisition.

**Supervisors:**

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**Further Information:**

For more details, visit [The Genzel Lab: HexMaze Project](#).