

Emergence of hippocampal and striatal temporal cell properties in restrained mice

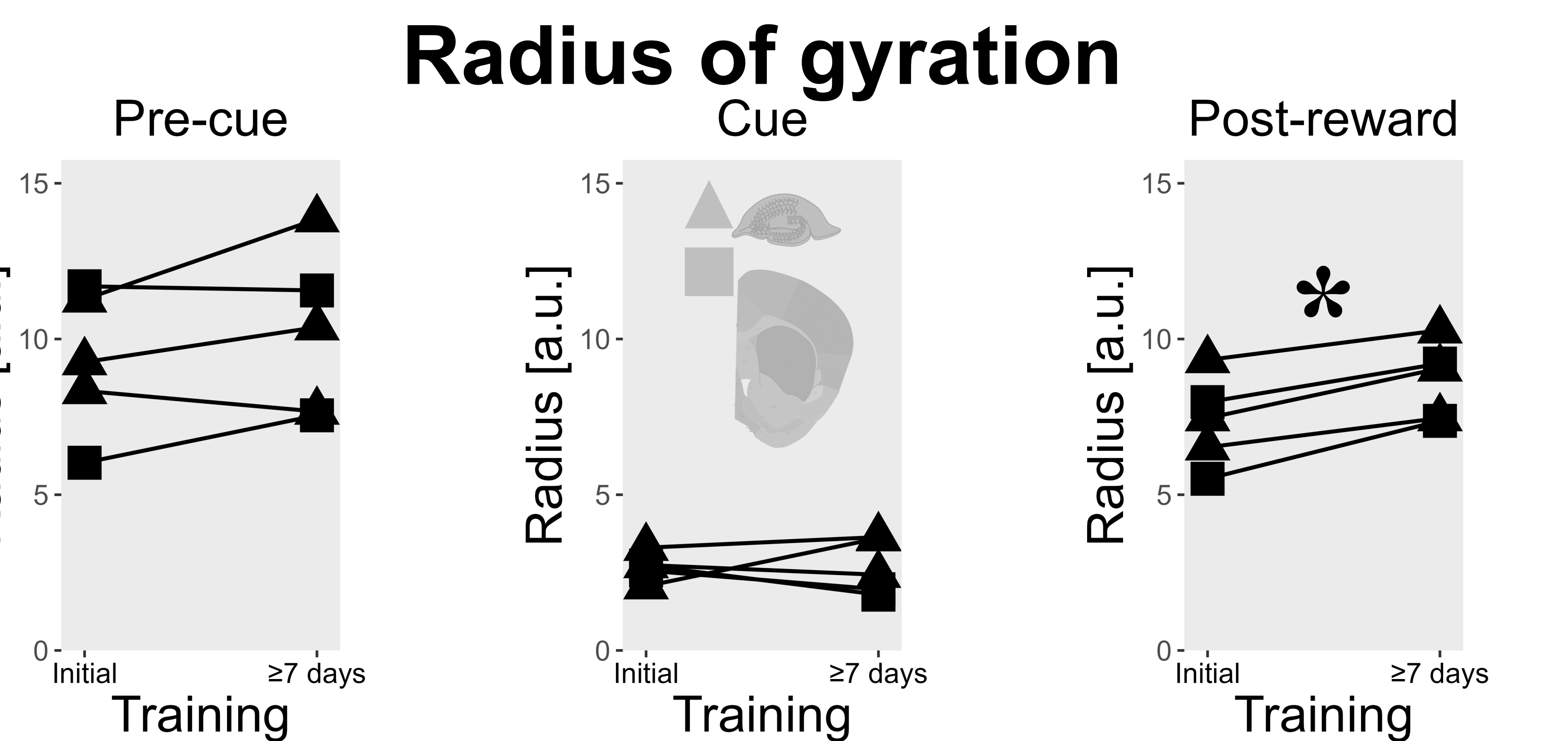
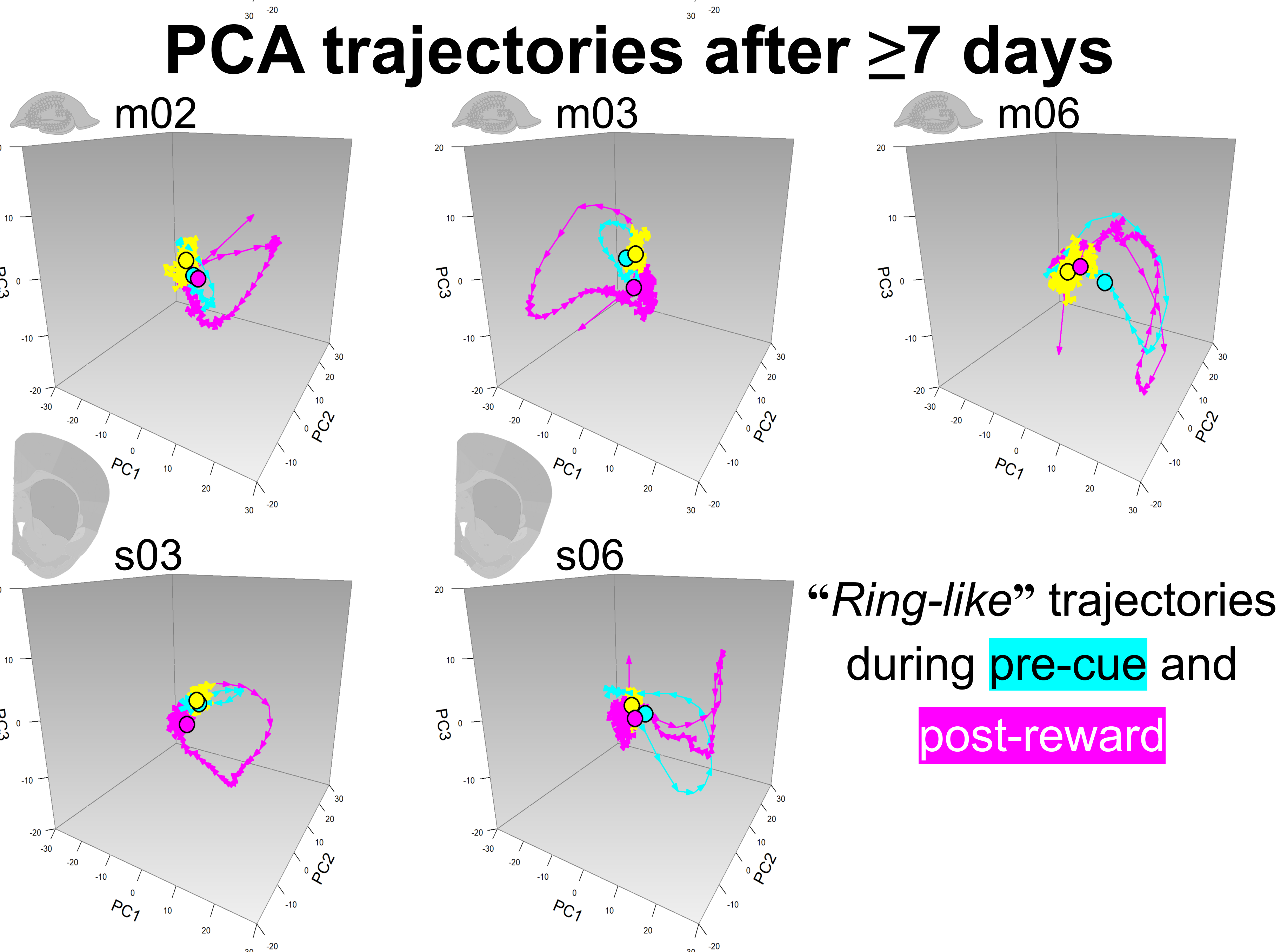
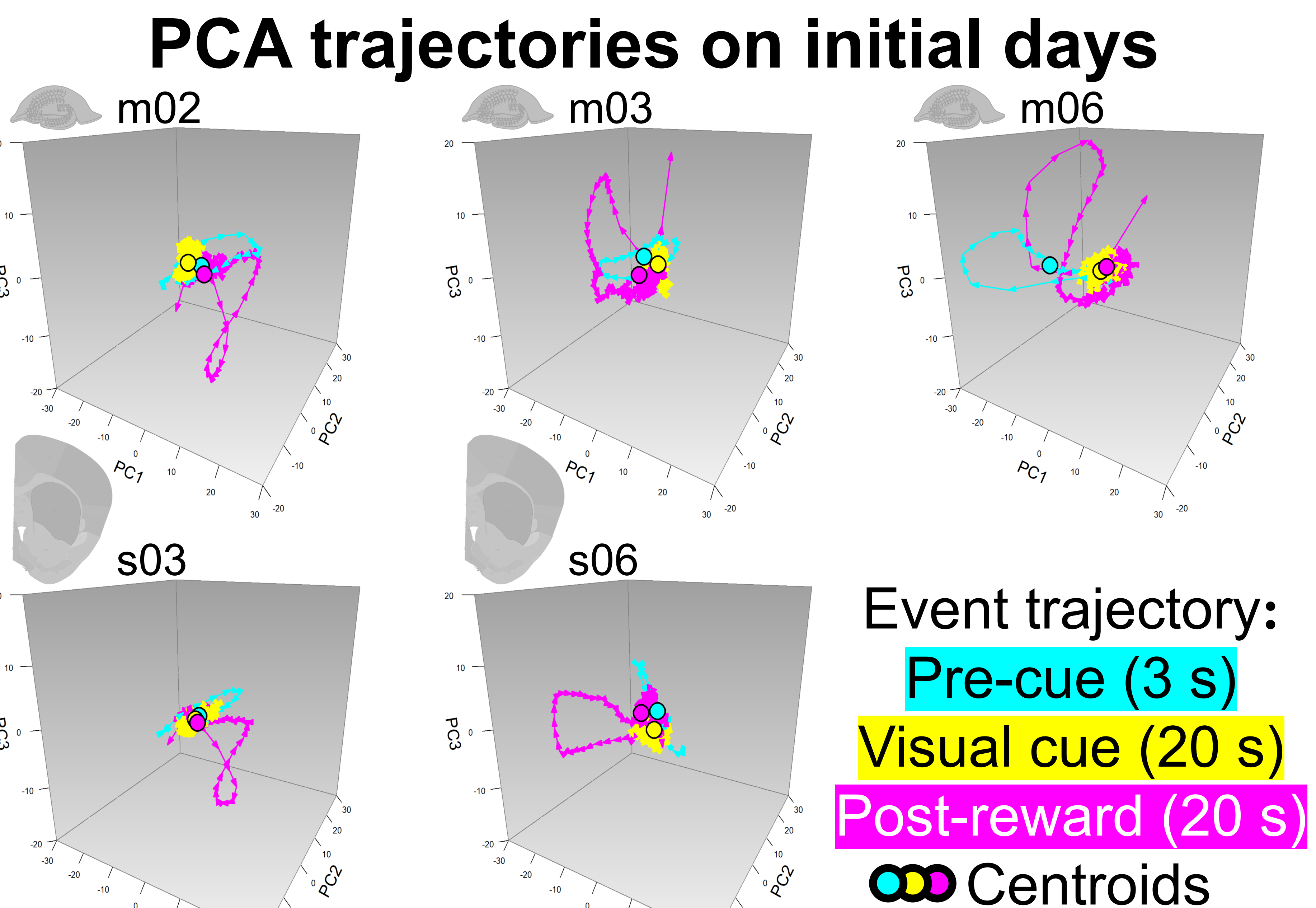
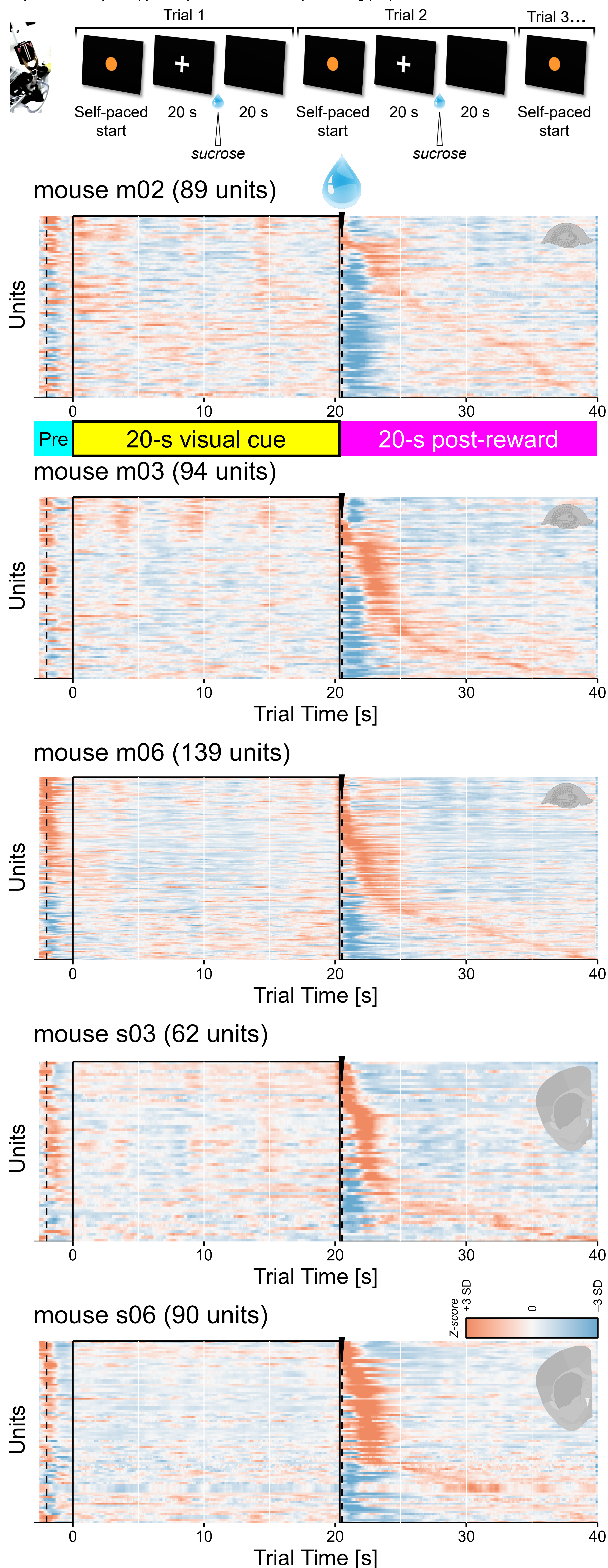
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Background and aim: The hippocampus encodes temporal context, enabling animals to bridge events separated in time; whereas the dorsal striatum supports interval timing, enabling animals to estimate elapsed durations and time their actions. While neurons with temporal receptive fields have been found in *both* regions, it remains unclear whether time-related firing properties are spontaneous or whether they emerge under a predictable task structure. It is also unclear whether locomotion or proprioceptive feedback is necessary for temporal firing properties to emerge, as previous studies have predominantly used rodents running on treadmills. To address these questions, we examine how experience shapes hippocampal and striatal temporal firing properties in restrained mice.

Results in left column: At the single-neuron level, hippocampal and dorsal striatal cells showed time-related firing patterns after ≥ 7 days of training. **Results in right column:** At the population level, temporal trajectories showed “ring-like” paths during **pre-cue** and **post-reward** windows. After training, **post-reward** temporal trajectories moved further away from centroids, indicating greater variation of population states. **Conclusion:** Learning affects the geometry of hippocampal and striatal population activity, suggesting the role of experience in shaping temporal representations.



Training increases the radius of gyration (i.e. how far the PCA trajectory is from its centroid) during the post-reward window