Event boundaries shape memory formation: evidence from single neuron recordings in humans

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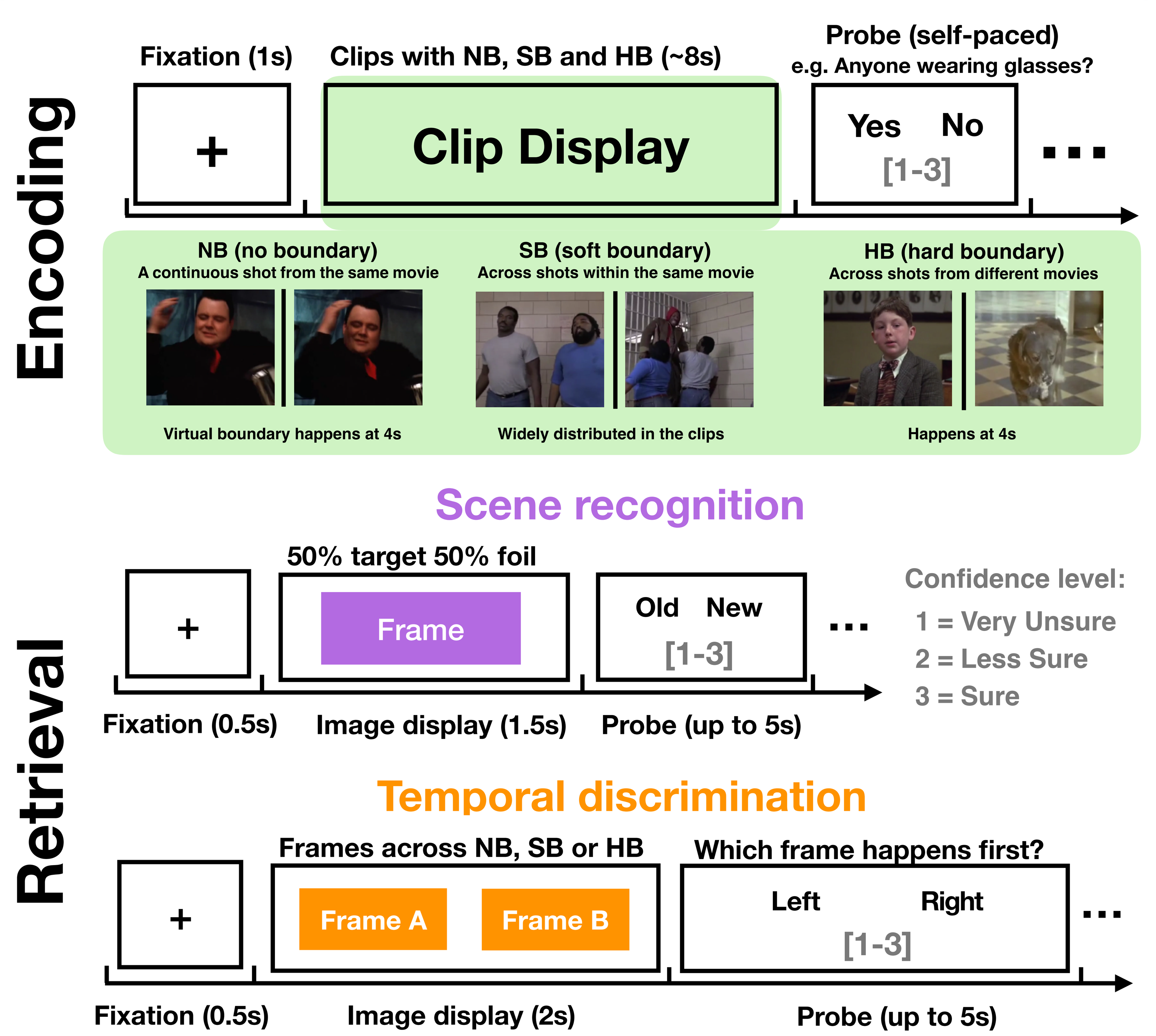
INTRODUCTION

Life memories are carved as discrete events ("episodes")[1].

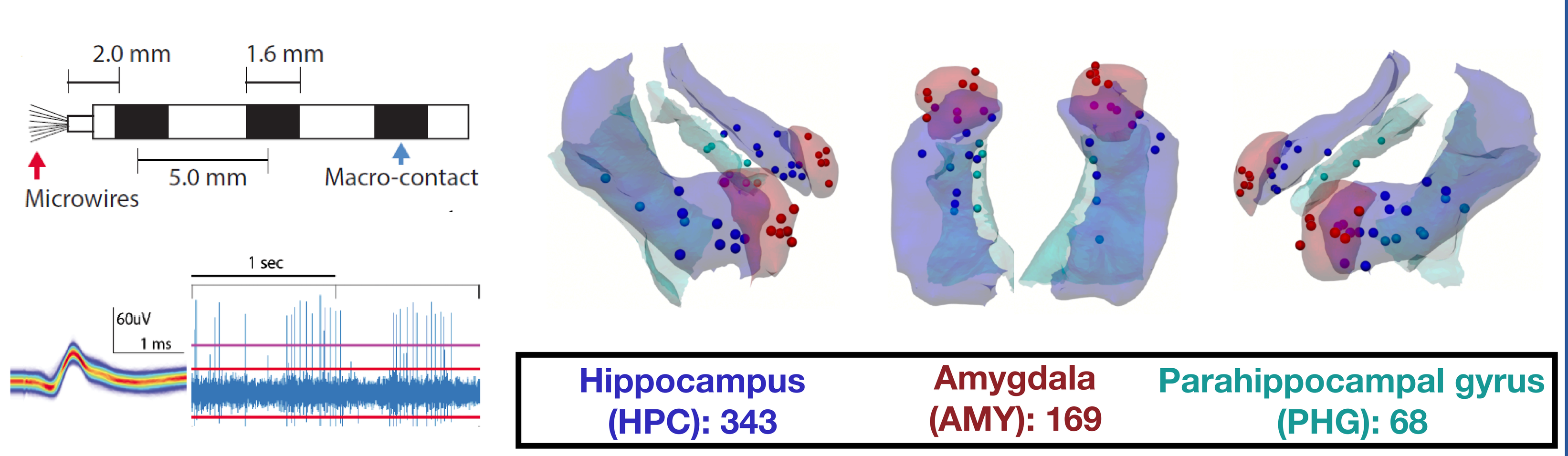
What is the very definition of "episode"? Specifically, what dictates the onset and offset of an event stored in memory remains elusive[2].

Building upon previous studies[3], we investigated the neuronal mechanisms that demarcate events by using behavioral measurements and single neuron recordings in humans.

EXPERIMENTAL SETUP

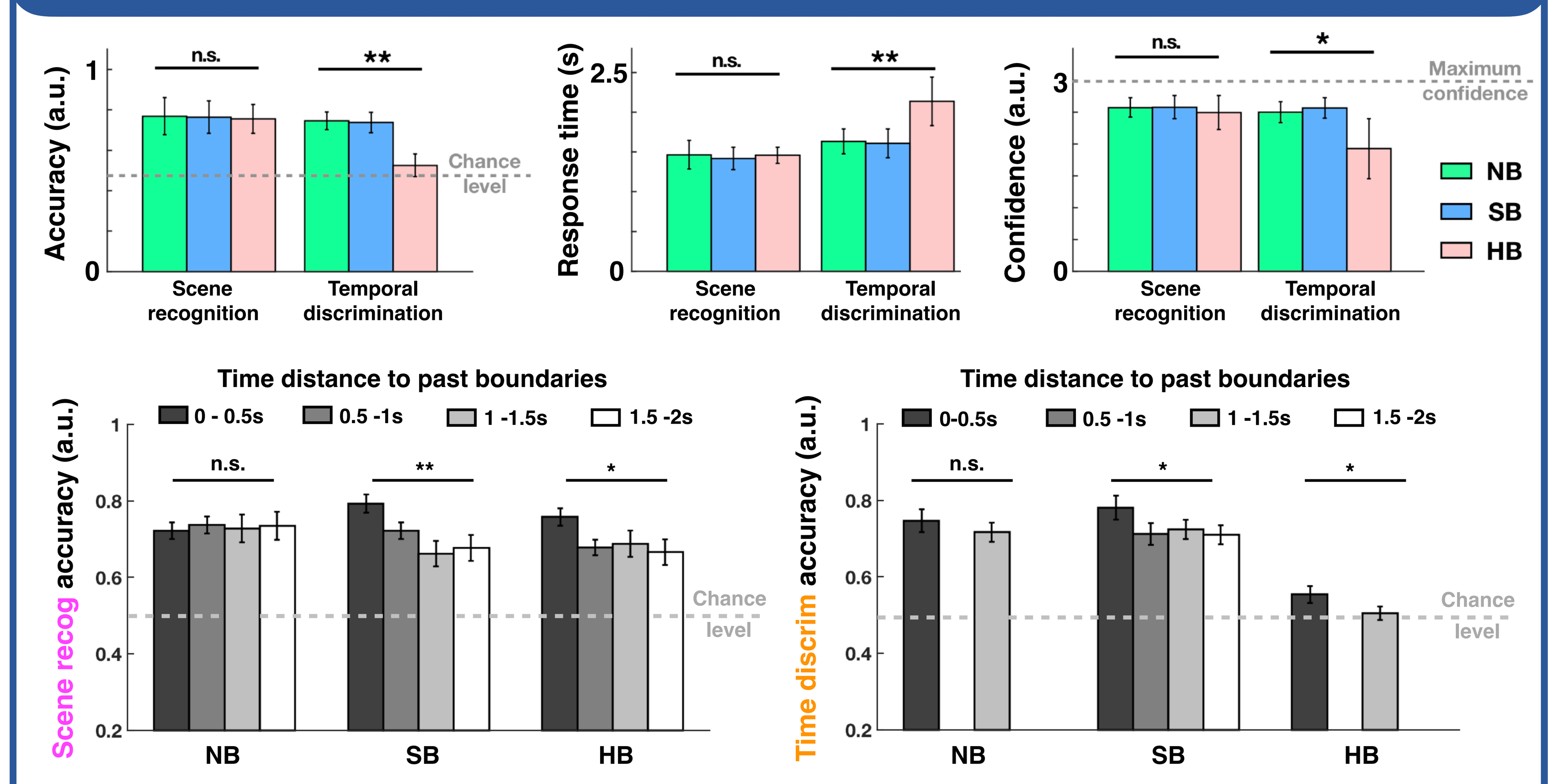


Single neuron recordings from 20 subjects with drug-resistant epilepsy

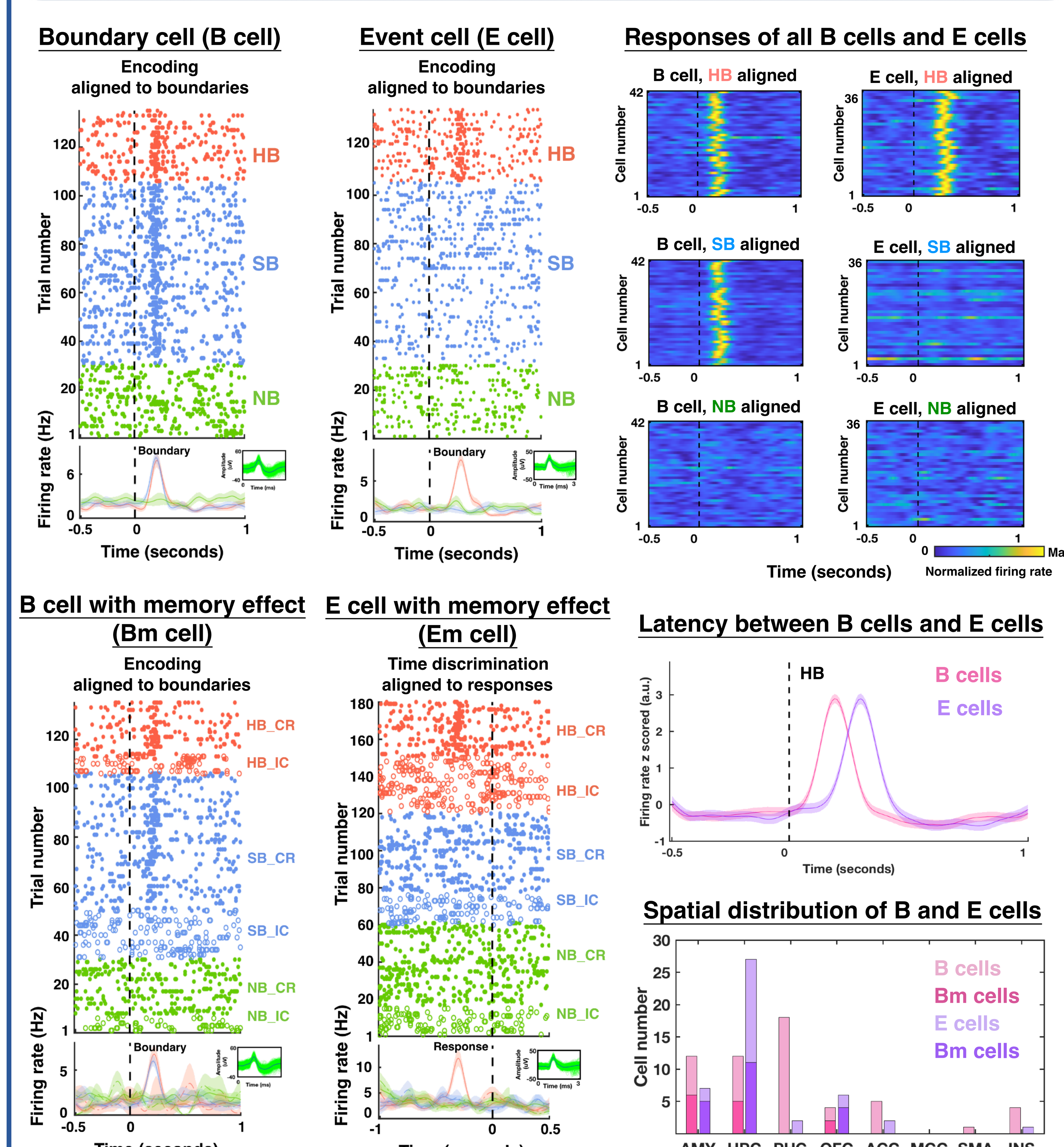


Medial temporal lobe (MTL)

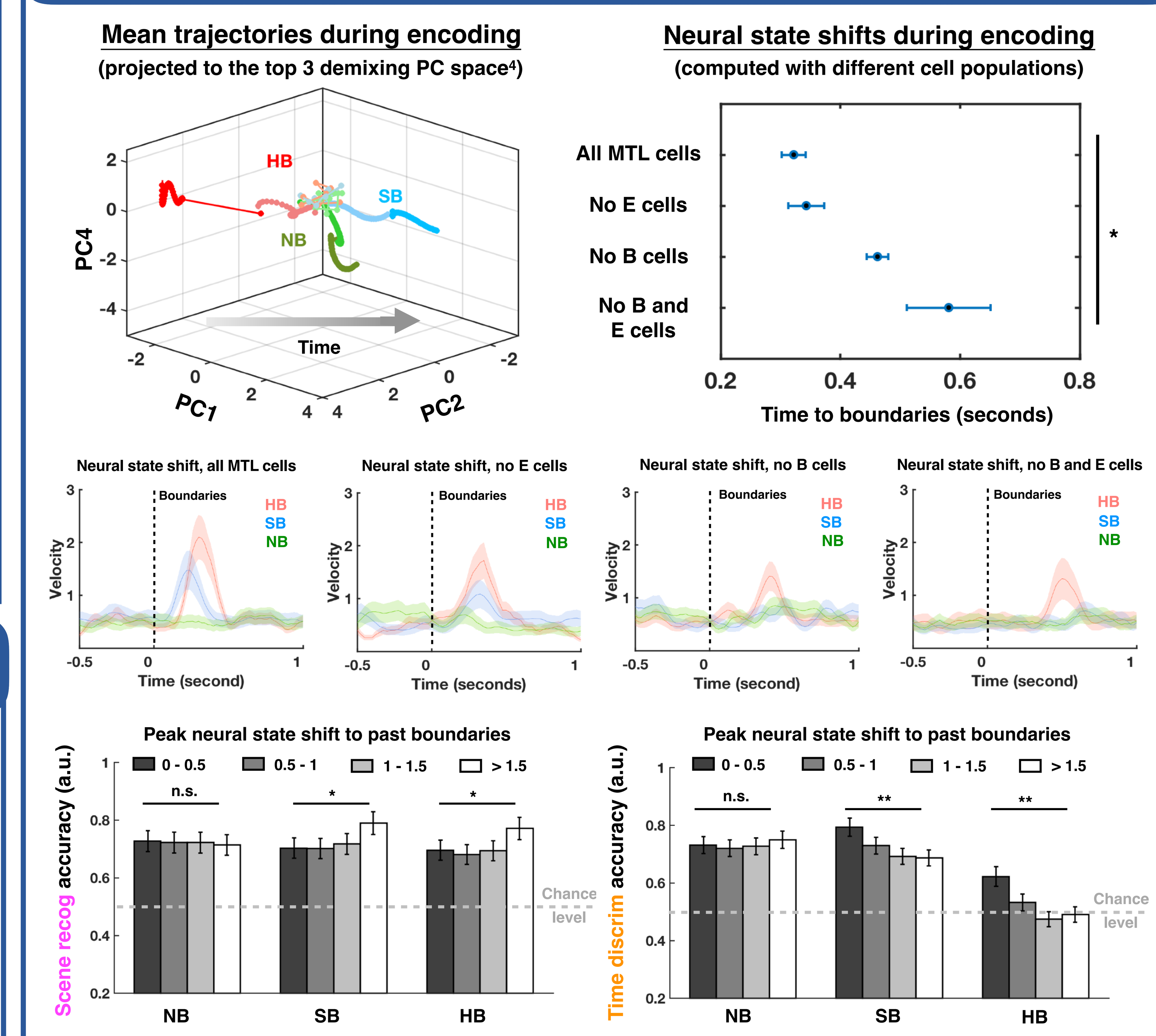
BOUNDARY EFFECTS ON MEMORY



NEURONS SIGNALING DIFFERENT BOUNDARIES



NEURAL STATE SHIFTS ACROSS BOUNDARIES



CONCLUSIONS

Behaviorally, boundaries enhance the scene recognition while HB impairs the recollection of the temporal order

78/580 putative neurons signaling boundaries in the MTL (B cells: n = 42, both SB and HB; E cells: n = 36, only HB)

Response strengths of Bm cells (n = 11) and Em cells (n = 16) correlate with subjects' memory performance in the scene recognition and the temporal discrimination, respectively

Neural state shifts present when crossing boundaries, coordinated by different neural populations (HB: all MTL cells; SB: mainly B cells)

Significant latency of neural state shifts exist among different neural populations when crossing HB, suggesting a hierarchical structure for event segmentation (B cells -> E cell -> unassigned MTL cells)

Neural state shifts introduce a memory "trade-off": with large neural state shifts enhance scene recognition but harm temporal discrimination

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