Hippocampal contributions to approach-avoidance conflict

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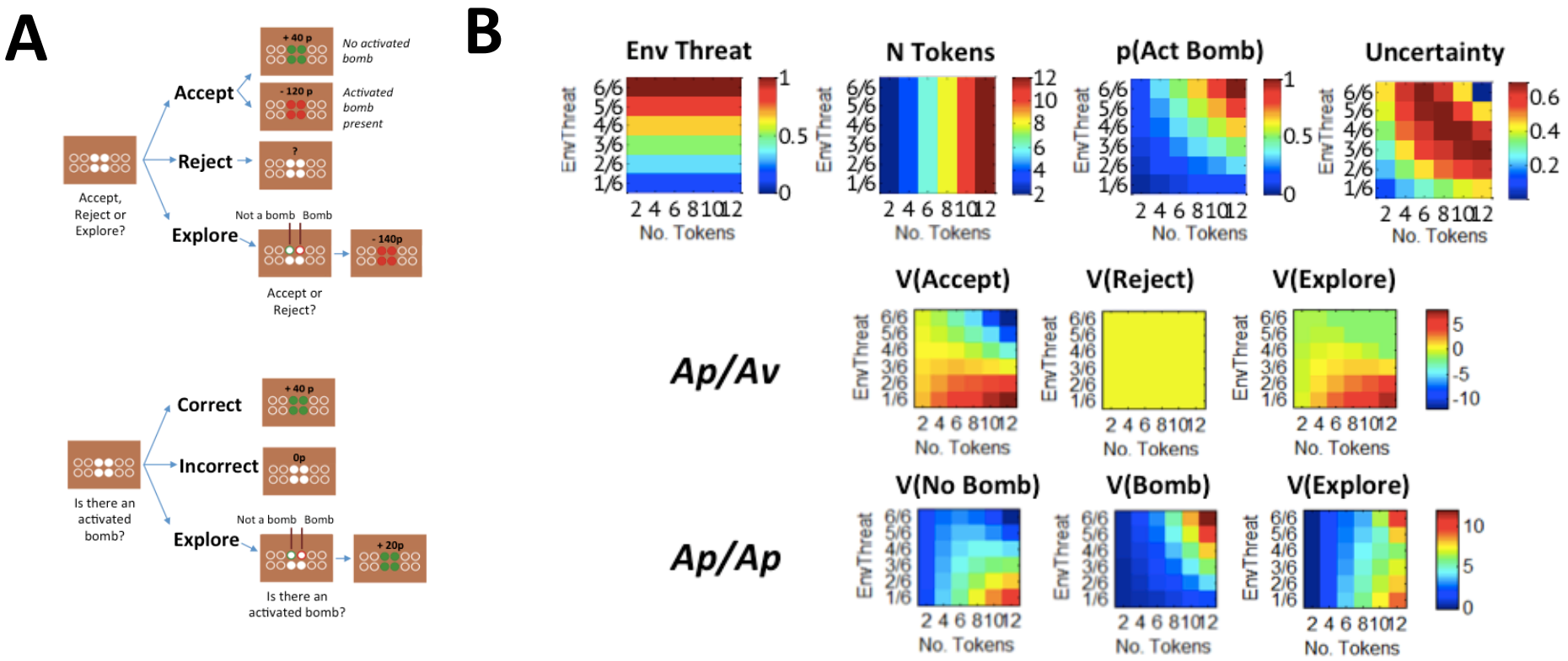
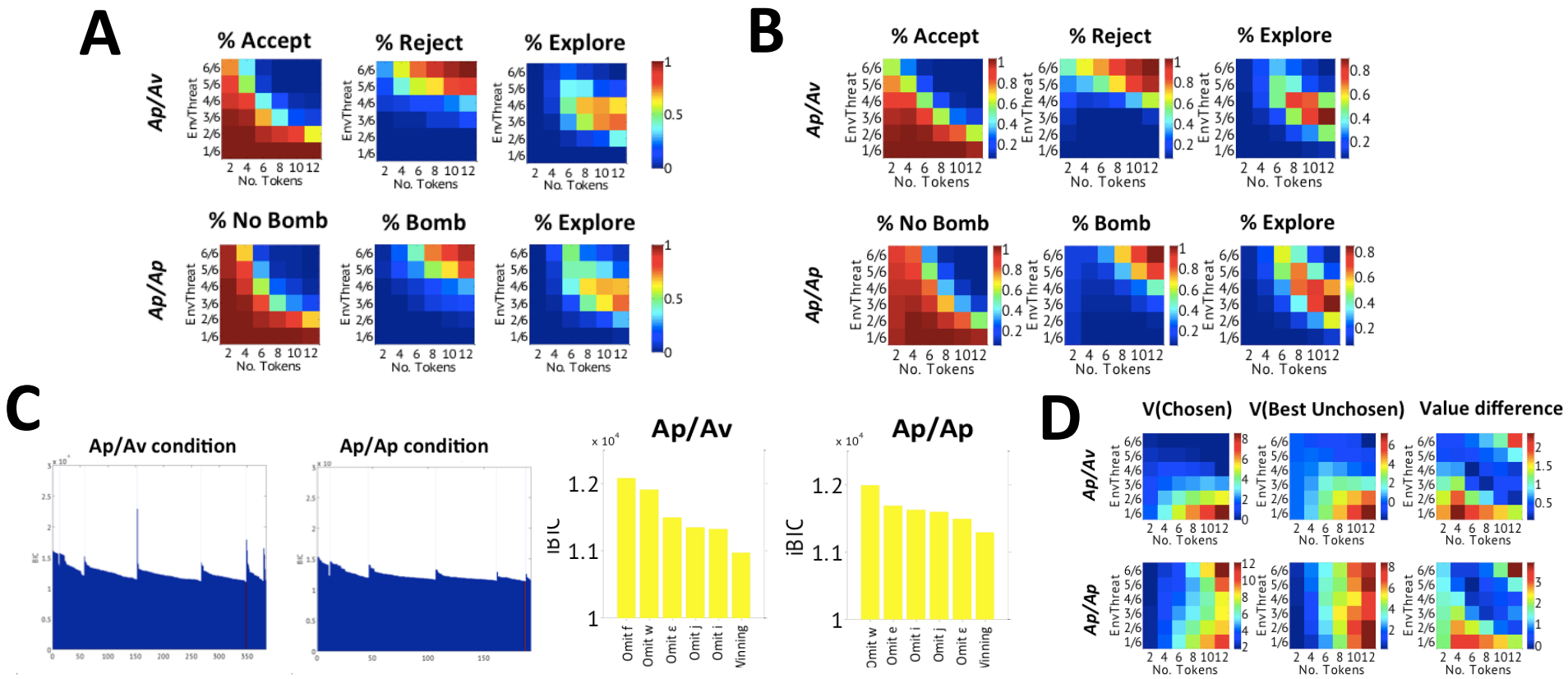
Accepted for publication at Cerebral Cortex (2016)

Experimental task and task space



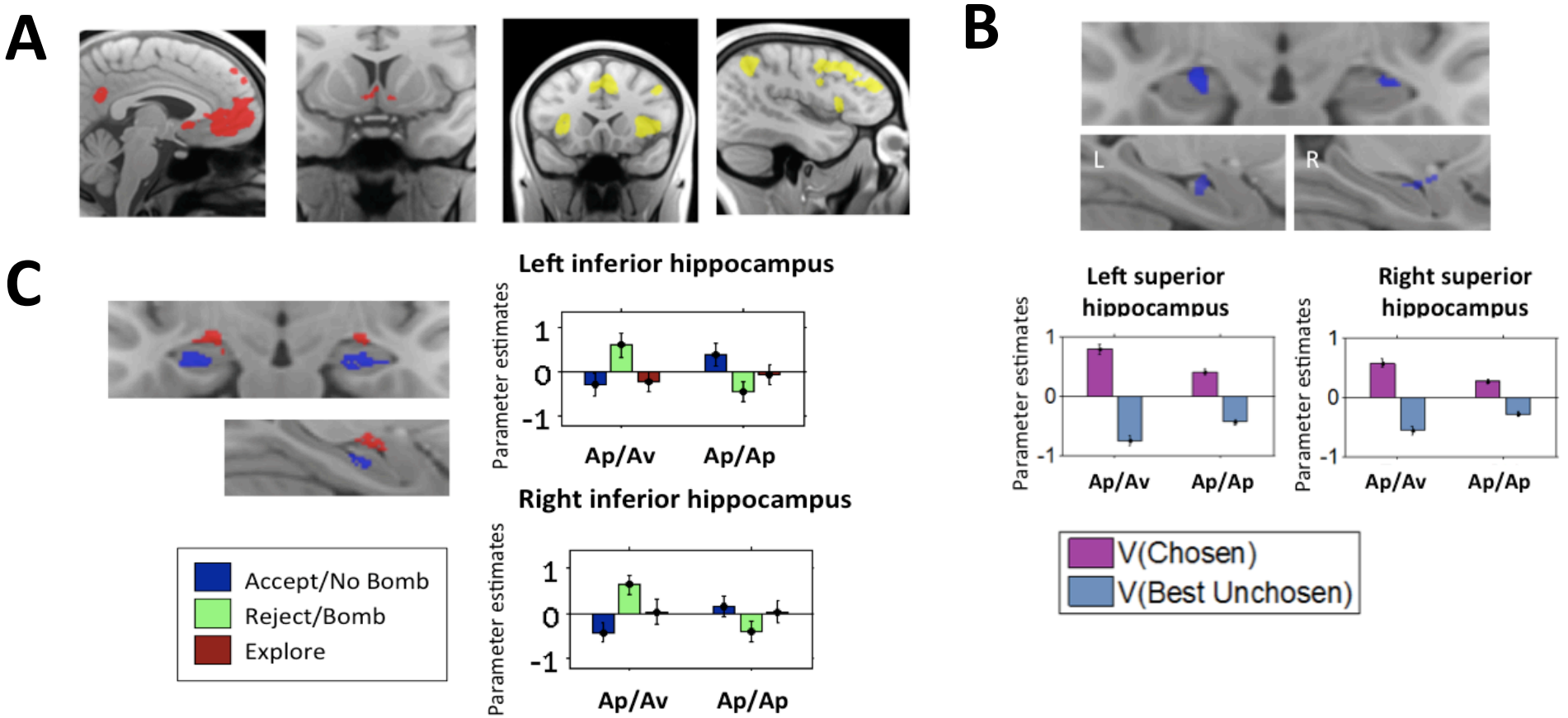
Subjects faced faced a series of different gambles that invoked either approach-avoidance (Ap/Av) or approach-approach (Ap/Ap) conflict (A, top and bottom respectively). Gambles were designed so as to vary several psychological quantities that are important in decision making (B, top). Values associated with each gamble in the task space are shown are calculated by combining expected gains and losses, which are probabilistically prescribed (B, bottom).

Behavioural modelling was used to calculate the subjective value signals that underlie choice



We fit a large space of models describing the computations that underlie choice. Overall patterns of choice (A) were well reproduced by the winning model (B). Figure (C) shows the iBIC scores for all models in the model space (left), as well as for the models adjacent to the winning models (right). The behavioural models allowed us to calculate the subjective values of the chosen and counterfactual (best unchosen) choice options, across the entire task space (D). As is typical in reinforcement learning, we assume that value differences are translated into categorical choice via the operation of a softmax transformation.

The hippocampal circuit translates value signals into categorical choice



Signals tracking the chosen and counterfactual choice options were seen in typical reward-tracking regions in the brain (A). Value signals in the superior hippocampus (potentially corresponding to CA3 subfield) were potentiated in the Ap/Av condition, relative to the Ap/Ap (B). Signals in the inferior hippocampus (potentially corresponding to downstream CA1) distinguished between rejecting aversive gambles in the Ap/Av condition, relative to facing the *same* gambles in the Ap/Ap condition (where subjects were immune to financial loss) (C).