

# A Computational Model of Executive Function in a Food Preference Task

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## TL;DR

We developed a computational model for executive function and cognitive inhibition, demonstrated by a food preference task in which the presence of a dieting goal biases food choice (🍔 / 🥦). The model demonstrates:

- A **computational personality model\*** as basis
- A **higher-order goal** in biasing **decision-making**
- A **higher-order goal** in biasing the **reward value**, and subsequent **reinforcement learning**

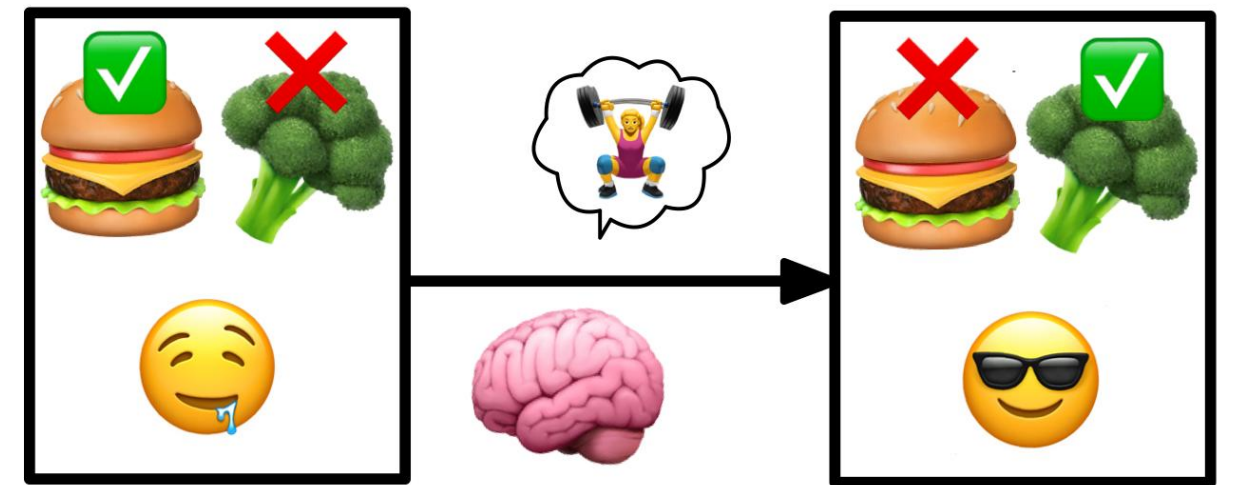


Fig 1. The food preference task: the food choice is biased by a higher-order goal (💪)

## MODEL DESIGN

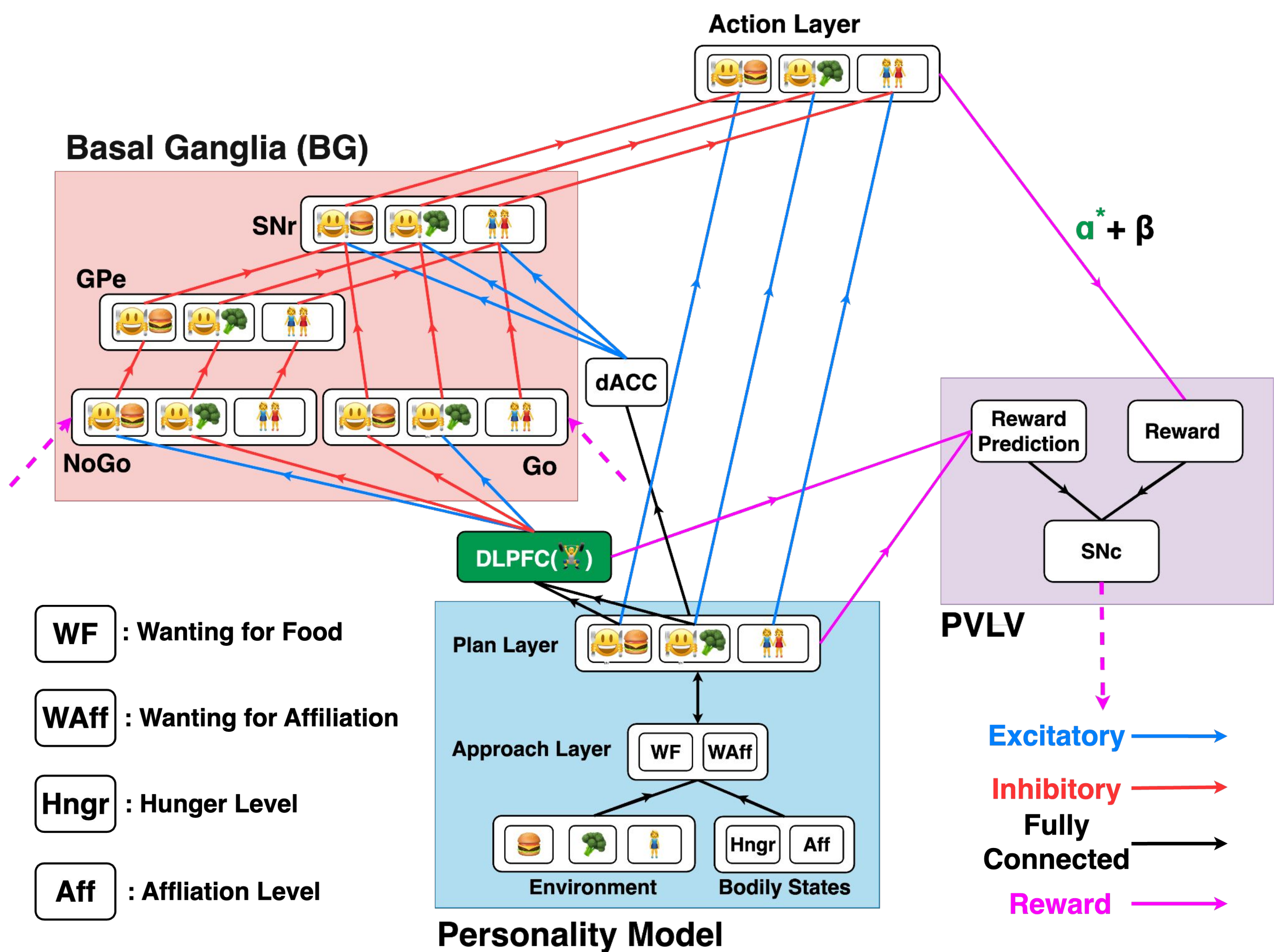


Fig 2. Visualization of the computational model with a higher-order goal biasing in DLPFC

## MODEL DETAILS

- **Personality model:** proposes action plan
- **BG:** gates plans based on predicted reward
- **DLPFC:** maintains dieting goal that biases gating
- **PVLV:** learns from cognitive reward ( $\alpha^*$ ) and sensory reward ( $\beta$ ) from action, updates BG

## RESULTS

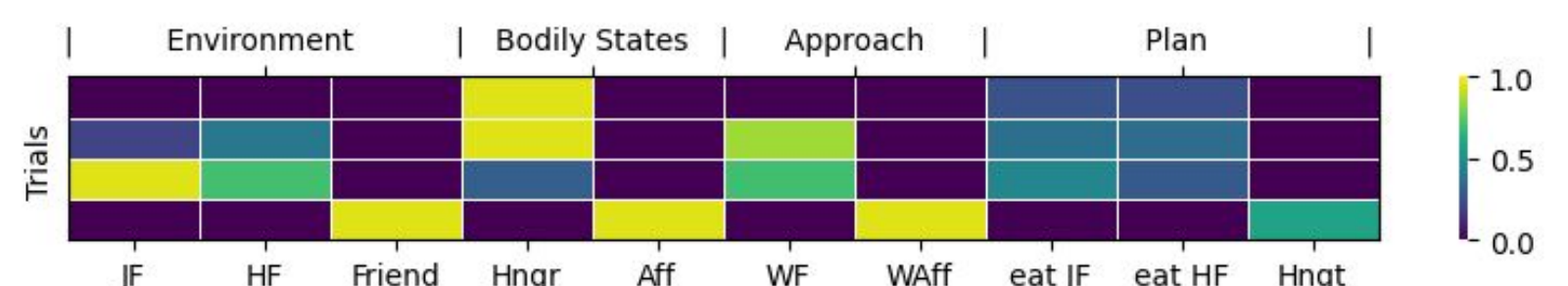


Fig 3. Neuron Activations for the Motivational Model

\* Read, Stephen J, and Lynn C Miller. "A Neural Network Model of Motivated Decision-Making in Everyday Social Behavior." *Social-Behavioral Modeling for Complex Systems*, by Paul K. Davis et al., 29 Mar. 2019.