From Homeostasis to behavior: Balanced Activity in an Exploration of Embodied Dynamic Environmental-Neural Interaction.

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Presentation Abstract Summary In recent years, there have been many computational simulations of spontaneous neural dynamics. Here, we describe a simple model of spontaneous neural dynamics that controls an agent moving in a simple virtual environment. These dynamics generate interesting brain-environment feedback interactions that rapidly destabilize neural and behavioral dynamics demonstrating the need for homeostatic mechanisms. We investigate roles for homeostatic plasticity both locally (local inhibition adjusting to balance excitatory input) as more globally (regional “task negative” activity that compensates for “task positive”, sensory input in another region) balancing neural activity and leading to more stable behavior (trajectories through the environment). Our results suggest complementary functional roles for both local and macroscale mechanisms in maintaining neural and behavioral dynamics and a novel functional role for macroscopic “task-negative” patterns of activity (e.g., the default mode network).

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