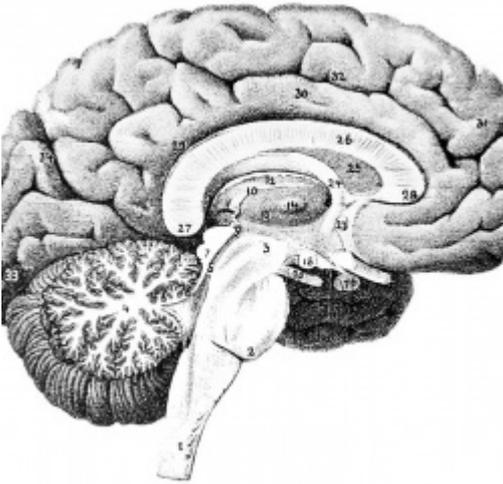


Our Brain Switches Between Habits and Choices. Here's How



By Julianna LeMieux — March 16, 2018



Brain

We all have habits. Some are useful automatic actions that we can do without thinking about, like pressing the start button on our coffee maker while still half asleep and bleary-eyed. Habitual behavior is routine and automatic, frequently initiated by a cue or change in a situation.

Sometimes, habits don't hold up, like the morning after you buy a new coffee maker with a new button, and have to think about where it is in order to press it. Starting the new coffee maker is a goal-directed action. Goal-directed actions, which are done to seek a reward, require decision making which takes time and energy.

The ability to flexibly switch between the two is an important response strategy, critical for behavior that adapts to situations.

The infralimbic prefrontal cortex (ifL-C) is the part of the brain involved in the regulation of flexible behavior. To demonstrate the role of the ifL-C in habitual and goal-directed actions, a group from the Medical University of South Carolina used adult male mice and asked them to change between the two types of behaviors while measuring their brain activity. In doing this experiment, the researchers could compare the changes in neural activity in the ifL-C during goal-directed actions and habitual behavior.

The mice were trained to self-administer 10% sucrose solution via two levers on both a habit-forming schedule and a goal-directed schedule. How individual neurons in the ifL-C were affected during the sucrose delivery in both conditions within a single session was examined. The firing rates and the proportion of cells that were modulated during the two schedules were analyzed to determine whether the same neurons are involved in determining goal-directed actions and/or

responses during habitual behavior.

The results reveal a critical role for the ifL-C in promoting habitual behavior. The information involved in this process is processed in the ifL-C during habitual behavior, mediating its expression. During goal-directed behavior, the ifL-C encodes information about outcome availability independent of reward consumption. Not only that, but the neural activity increases as the information about outcome becomes available. This encoding is absent or reduced during habitual behavior.

When flexibility in reward-seeking behavior is lost, the ability to stop negative behavior (even when there are adverse consequences) can go with it. This can lead to the pathological, inflexible behavior common in neuropsychiatric illness. This work is important to provide a greater understanding of the processes that connect outcomes to behavior. This may result in new treatments for disorders where the balance between habits and goal-directed actions is disrupted, such as obsessive-compulsive disorder.

Source: [1] Barker et al. Habitual Behavior Is Mediated by a Shift in Response-Outcome Encoding by Infralimbic Cortex eNeuro 26 December 2017, 4 (6) ENEURO.0337-17.2017; DOI: <https://doi.org/10.1523/ENEURO.0337-17.2017> [2]

COPYRIGHT © 1978-2016 BY THE AMERICAN COUNCIL ON SCIENCE AND HEALTH

Source URL: <https://www.acsh.org/news/2018/03/16/our-brain-switches-between-habits-and-choices-heres-how-12692>

Links

[1] <http://www.eneuro.org/content/4/6/ENEURO.0337-17.2017>

[2] <https://doi.org/10.1523/ENEURO.0337-17.2017>