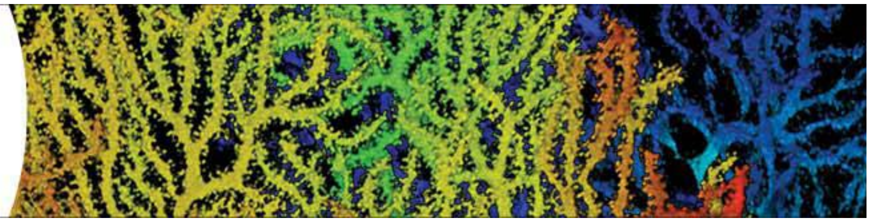
Neuroscience 2022



Print this Page for Your Records Close Window

Control/Tracking Number: 2022-S-6287-SfN
Activity: Scientific Abstract
Current Date/Time: 6/14/2022 10:22:34 PM

The effects of time horizon and guided choices on explore-exploit decisions in rodents

AUTHOR BLOCK: S. WANG[1], B. GERKEN[2], J. WIELAND[2], R. WILSON[2], ***J.-M. FELLOUS**[3];

[1]NIH, Natl. Inst. of Mental Hlth. (NIMH), North Bethesda, MD; [2]Psychology, [3]Psychology and Biomed. Engin., Univ. of Arizona, Tucson, AZ

Abstract:
Humans and animals have to balance the need for exploring new options with exploiting known options that yield good outcomes. This tradeoff is known as the explore-exploit dilemma. One key factor in explore-exploit decisions is the time horizon, i.e., the number of known future choices remaining which can be influenced by the current decision. Horizon adaptation is thought to be a hallmark of effective exploration. Recent studies showed that humans were able to adapt the extent of their directed and random exploration with the time horizon. Yet apart from one early study in birds, very little work has investigated how animals explore under different time horizons.
To better understand the neural mechanisms underlying how humans and animals address the explore-exploit dilemma, a good animal behavioral model is critical. Most previous rodent explore-exploit studies used ethologically unrealistic operant boxes and reversal learning paradigms in which the decision to abandon a bad option is confounded by the need for exploring a novel option for information collection, making it difficult to separate different drives and heuristics for exploration. In this study, we investigated how rodents make explore-exploit decisions using a spatial navigation Horizon Task adapted to rats to address the above limitations. In this task, rats were asked to choose between two options that gave out different number of drops of sugar water. The reward size from one of the two options is known to the rat, whereas the reward size of the other option is unknown. We assess how rats “explore” the unknown option as a function of time horizon, i.e., the number of choices they have in a game.
We compared the rats’ performance to that of humans using identical measures. We used hierarchical Bayesian analysis to quantify directed exploration and random exploration for both humans and rats. We showed that like humans, rats use prior information to effectively guide exploration. In addition, like humans, rats use information-driven directed exploration, but the extent to which they explore has the opposite dependence on time horizon than humans. Moreover, we found that free choices and guided choices have fundamentally different influences on future exploration in rodents, a finding that has not yet been tested in humans. This study reveals that the explore-exploit spatial behavior of rats is more complex than previously thought.

Author Disclosure Information:

S. Wang: None. **B. Gerken:** None. **J. Wieland:** None. **R. Wilson:** None. **J. Fellous:** None.
Presentation Preference (Complete): Poster Only
Linking Group (Complete): None selected
Theme and Topic (Complete): H.03.b. Prefrontal cortex ; H.03.a. Computational models
Nanosymposium Information (Complete):
Keyword (Complete): DECISION MAKING ; SPATIAL LEARNING ; EXPLORATION
Support (Complete):

Support: Yes
Grant/Other Support: : NIH Grant R01AG061888
Grant/Other Support: : NSF Grant IIS-1703340
Grant/Other Support: : Undergraduate Biology Research Program at the University of Arizona

Special Requests (Complete):
How do you plan to participate in Neuroscience 2022?: In-Person Only
Religious Conflict?: No Religious Conflict
Additional Conflict?: No
Is the presenting author of this abstract a high school or undergraduate student?: None

Status: Finalized

Feedback