

Dynamic Representation of Taste-Related Decisions in the Gustatory Insular Cortex of Mice

Roberto Vincis,^{1,3,4,*} Ke Chen,^{1,2,4,*} Lindsey Czarnecki,¹ John Chen,^{1,2} and Alfredo Fontanini^{1,2,5,*}

¹Department of Neurobiology and Behavior, Stony Brook University, Stony Brook, NY 11794, USA

²Graduate Program in Neuroscience, Stony Brook University, Stony Brook, NY 11794, USA

³Department of Biological Science and Program in Neuroscience, Florida State University, Tallahassee, FL 32306, USA

⁴These authors contributed equally

⁵Lead Contact

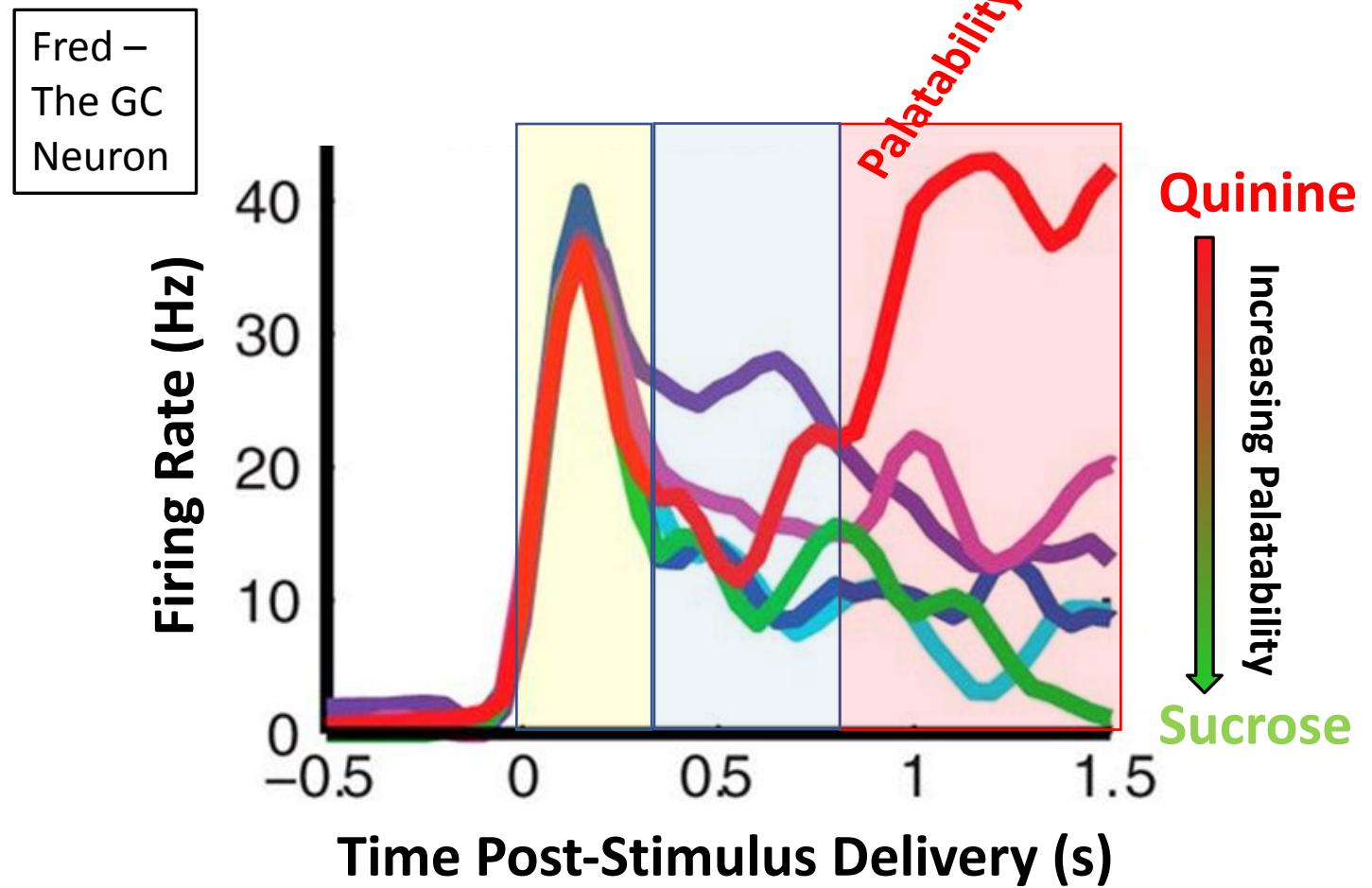
*Correspondence: rvincis@fsu.edu (R.V.), ke.chen@stonybrook.edu (K.C.), alfredo.fontanini@stonybrook.edu (A.F.)

<https://doi.org/10.1016/j.cub.2020.03.012>

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NBIO JOURNAL CLUB 4/26/2021

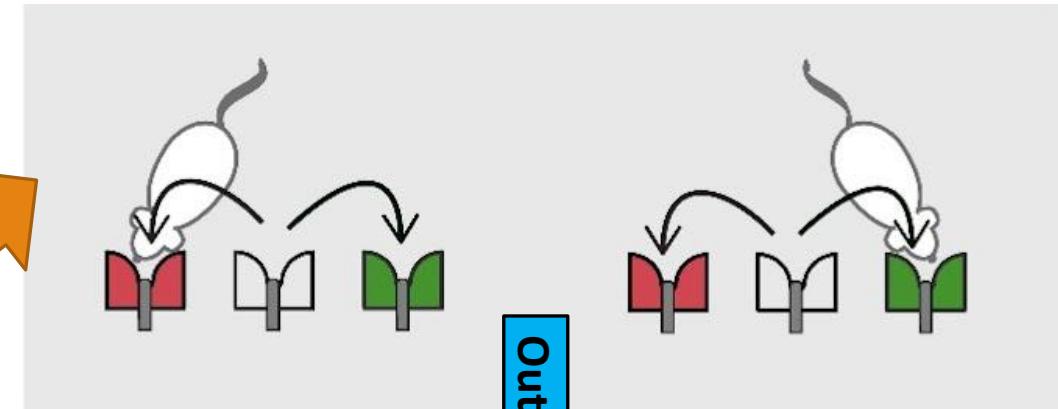
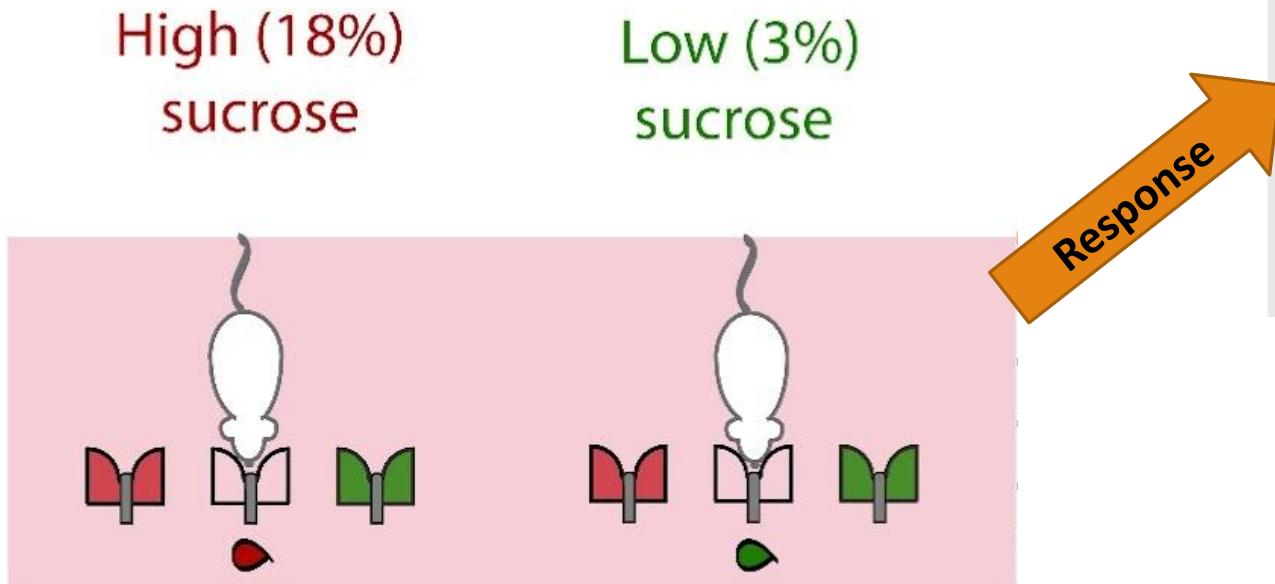
Taste discriminatory and Hedonic information in GC



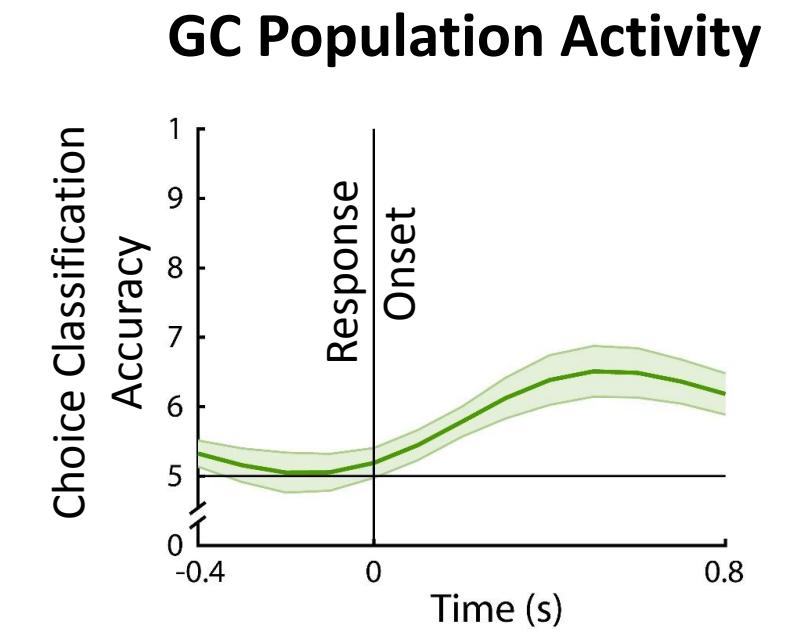
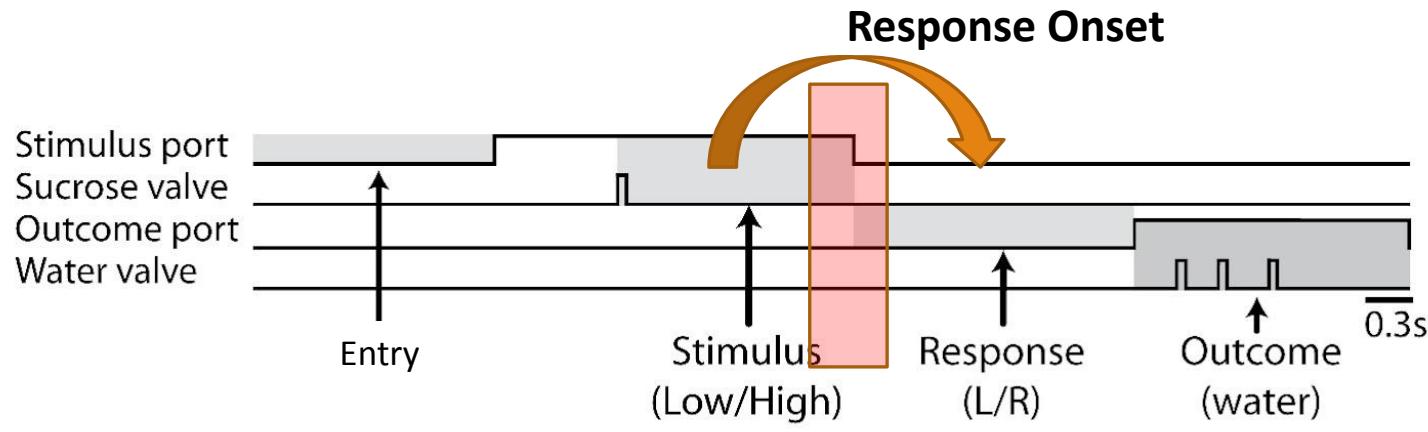
GC perturbation delays consumption-related behavior (gaping)



GC shows task-related activity in perceptual decision making (2-AFC)



GC shows task-related activity in perceptual decision making

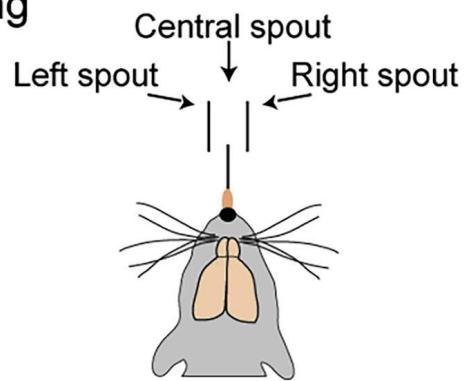


Motivation

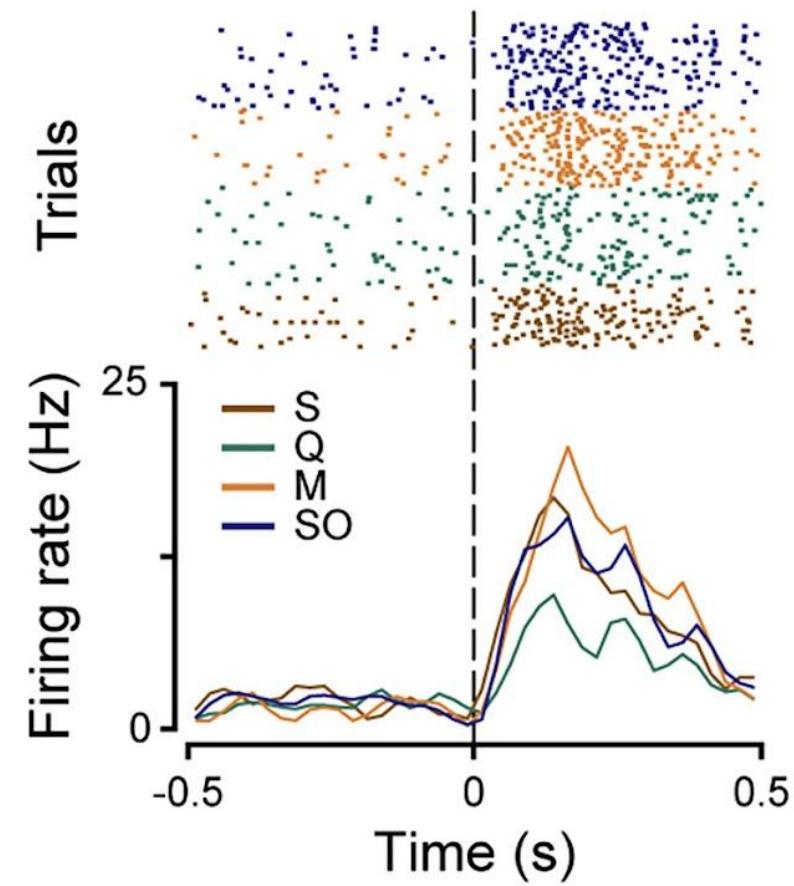
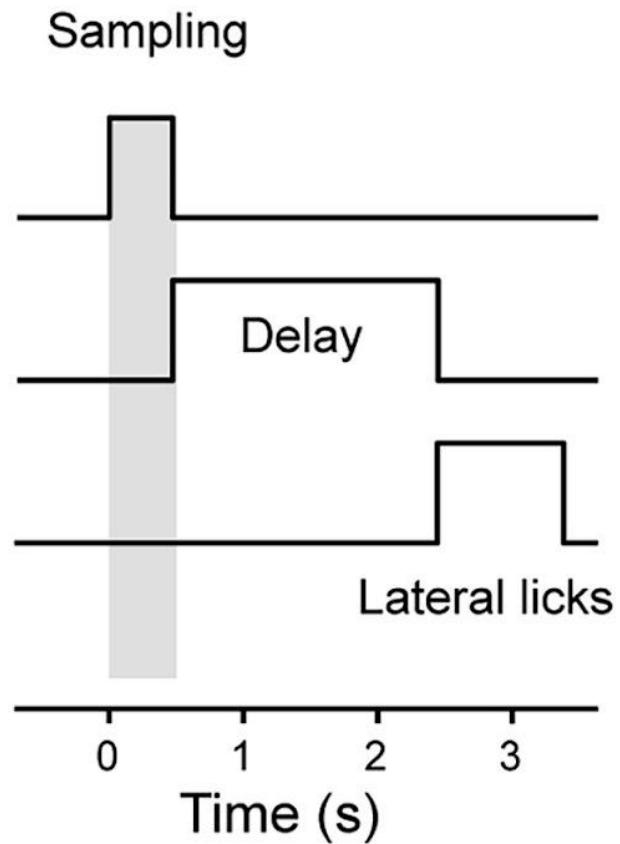
- “The extent to which GC activity contributes to **driving reward-directed choices** in 2-AFC task is currently unknown”
- “It is not established whether GC contributes to decision making by exclusively representing **chemosensory information** or encoding other cognitive variables such as **planning for specific behavioral choices and actions**”
- “The task has a **delay period** specifically to better resolve activity-anticipating decisions and actions”

2-AFC with counterbalanced hedonic stimuli

Sampling

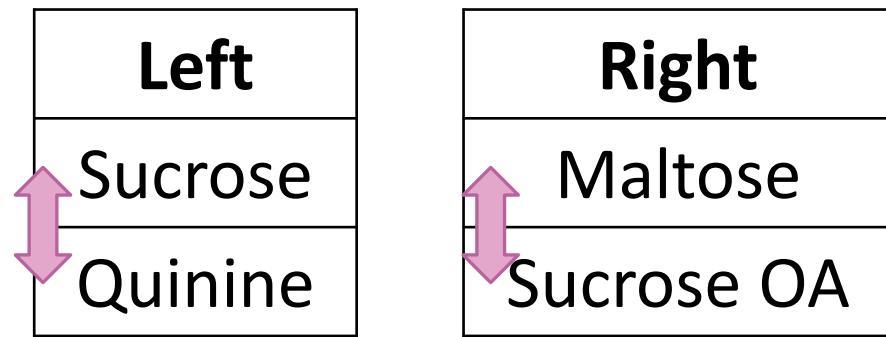


Taste Discriminatory Activity in GC

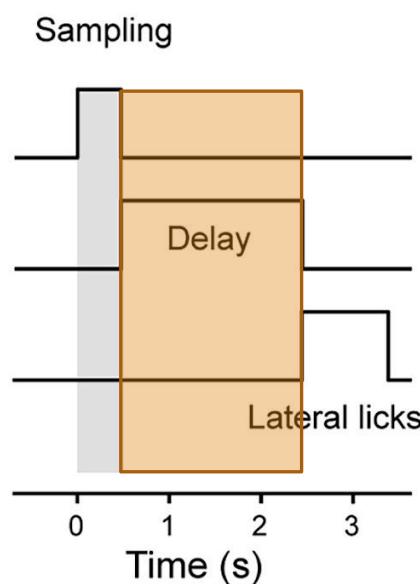
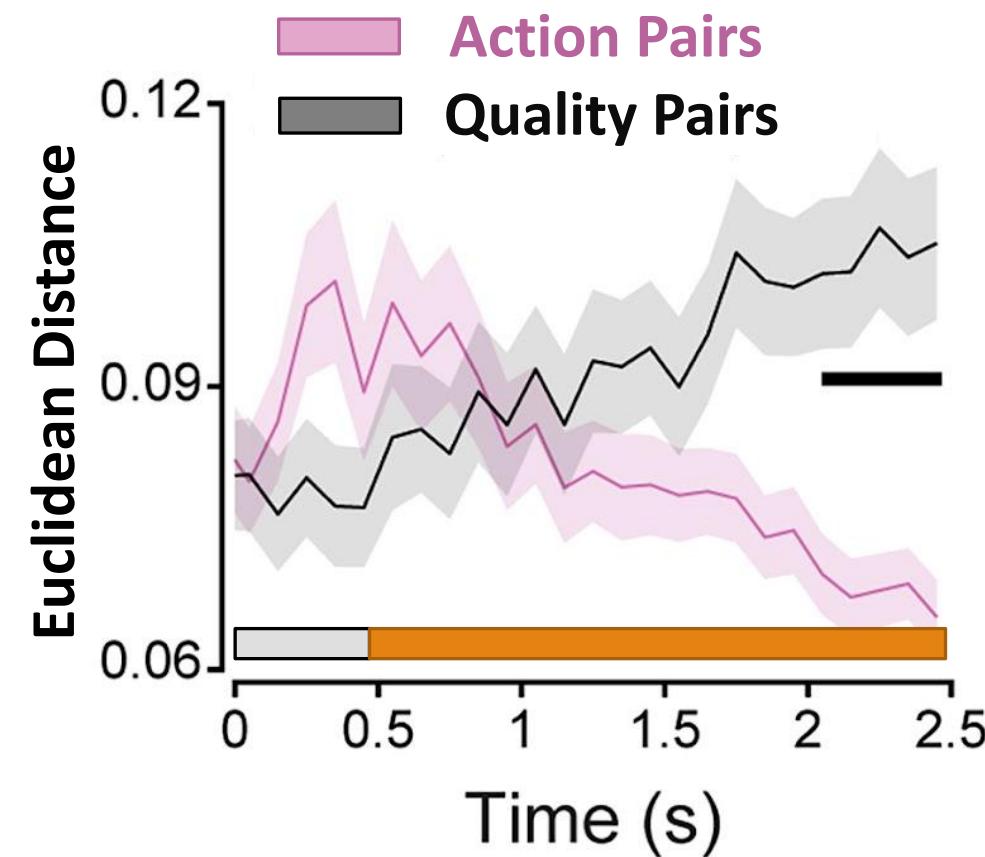
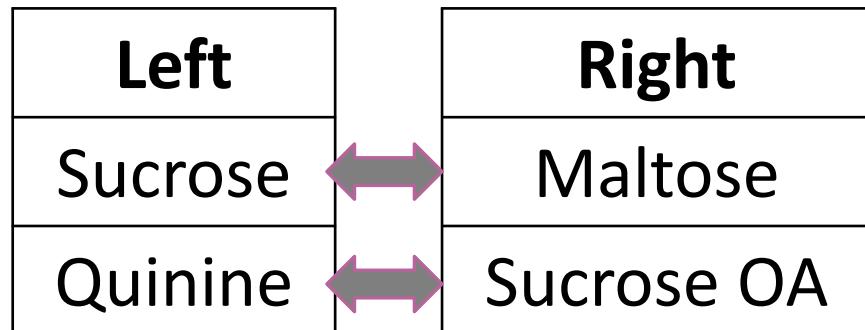


GC Activity transitions from chemosensory to task-related information

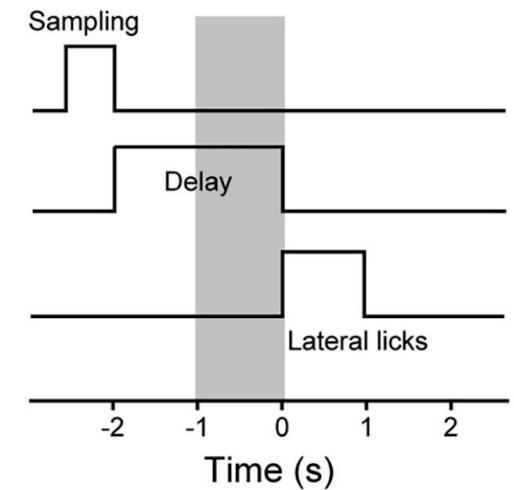
Action Pairs



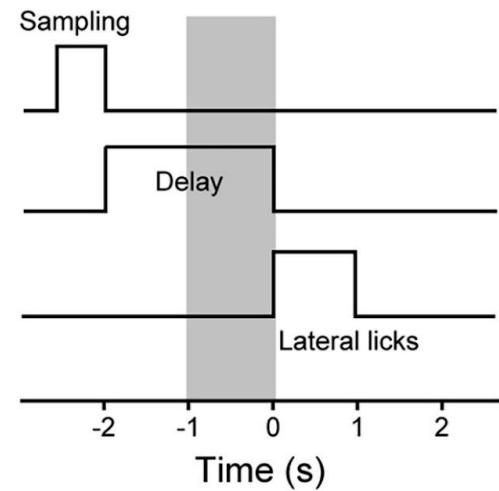
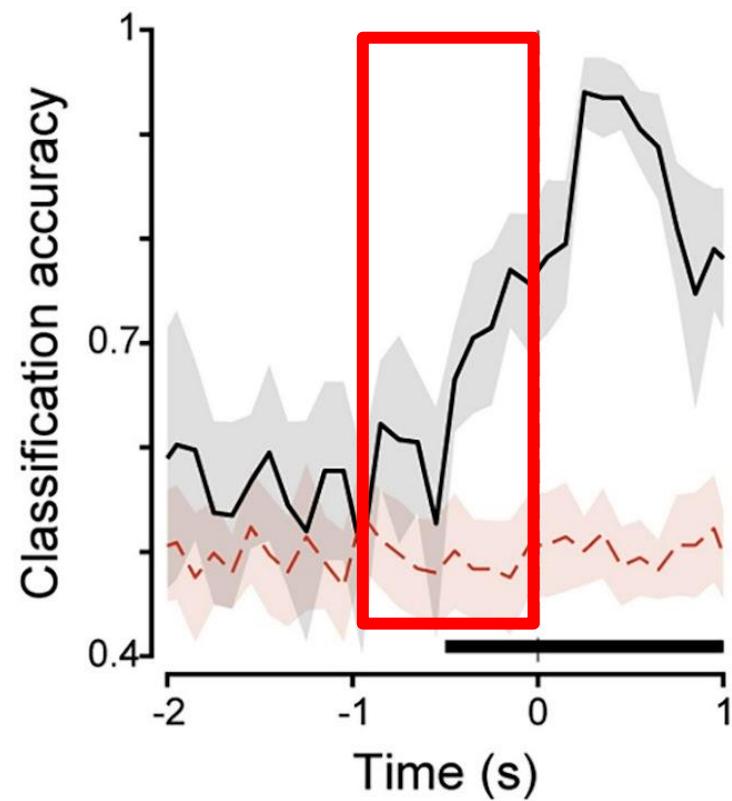
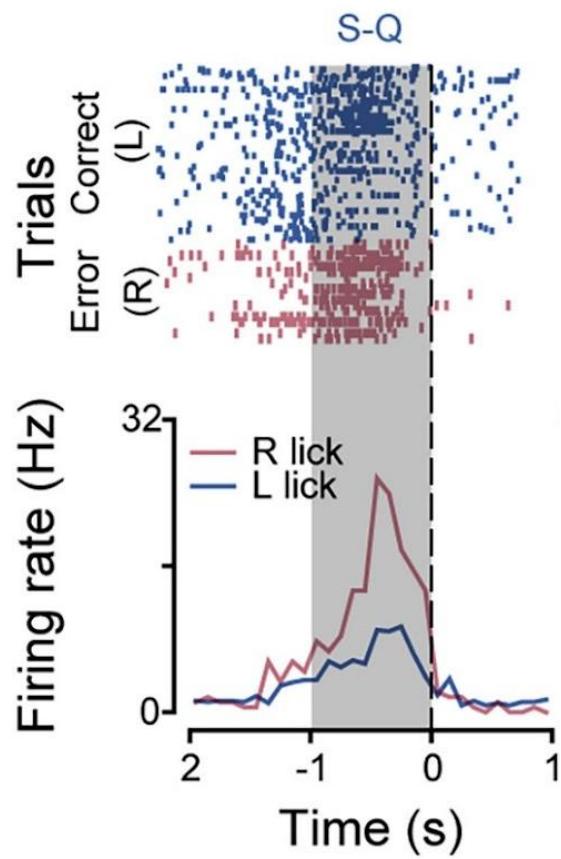
Quality Pairs



GC activity shows “planning” related modulation



GC activity shows “planning” related modulation

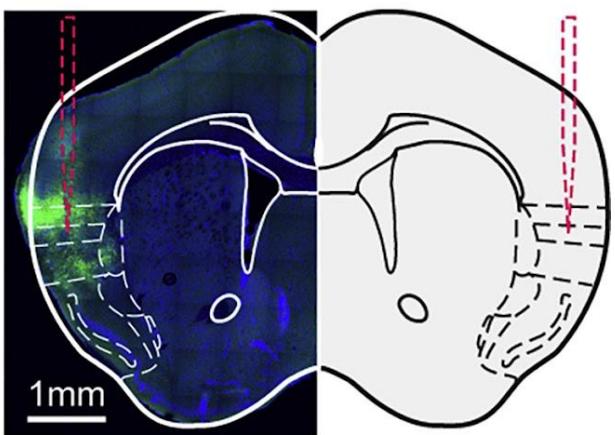


Chemogenetic perturbation of GC diminishes task performance

1. Can't say whether taste sensation is being perturbed, or decision making
2. Using a task with specific temporal structure; cannot parse timing of GC involvement with this perturbation

Timing of perturbation differentially impacts task performance

PV-Cre mice with
AAV5-EF1 α -DIO-ChR2-EYFP or
AAV5-EF1 α -DIO-EYFP

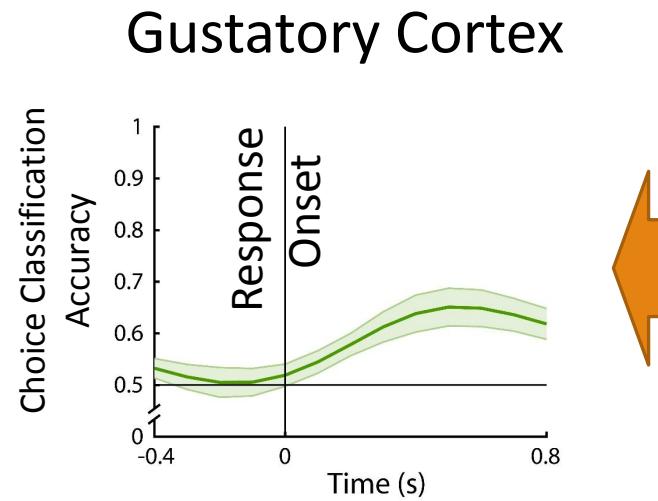


Conclusion

- Investigate whether GC contributes to decision making by exclusively representing **chemosensory information** or encoding other **cognitive variables** such as planning for specific behavioral choices and actions
 - GC shows activity related to both chemosensory information and cognitive variables
- Investigate the extent to which GC activity contributes to **driving reward-directed choices** in 2-AFC task
 - GC activity during the delay period appears important for task performance

Is GC “really” driving decision-making?

- GC reciprocally connected to OFC
 - 1. GC perturbation actually affects OFC
 - 2. Can't say GC by itself plays a driving role in this task
- OFC involved in this task
(Fonseca 2018)
 - 1. Nothing to say that GC planning activity we see is still not coming from OFC



What more could they have done?

1. If there is “bleedthrough” of the perturbation to OFC, then GC might not be “driving” the planning
2. Block OFC → GC projection and investigate neural activity in GC

Was this a good motivation?

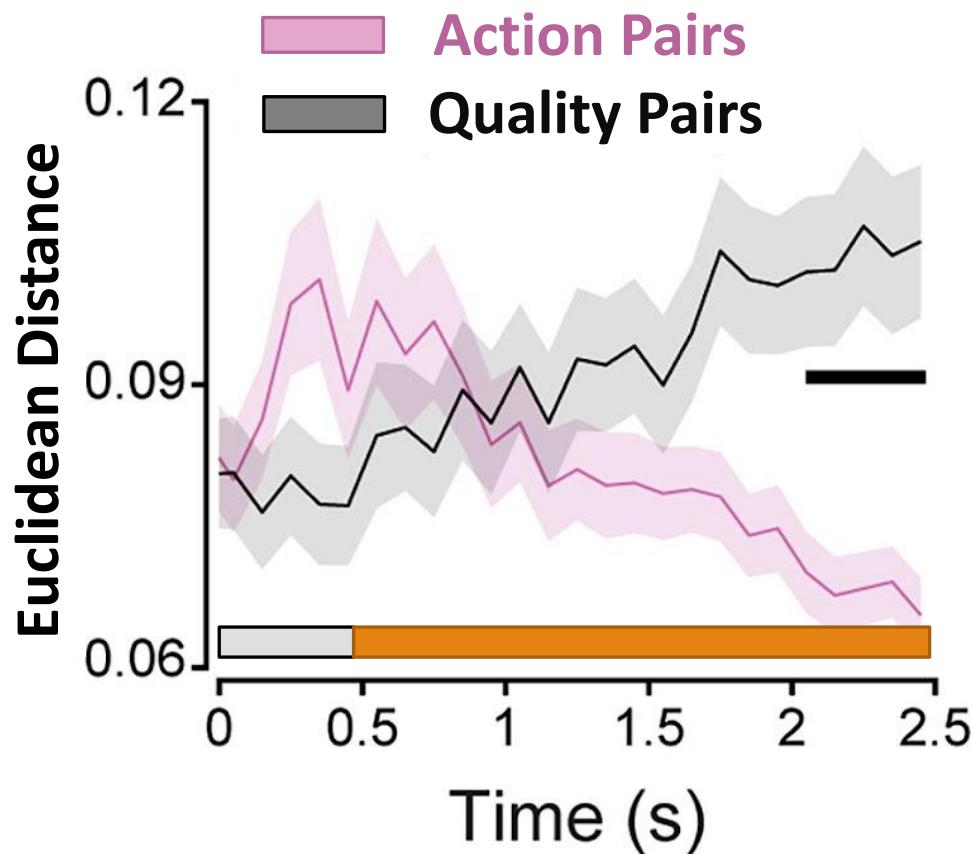
- Sure, but...
- No particular prediction for what knowing about GC's role in planning will tell them about decision making at-large
- State any future directions for what they plan on doing with this information
- Curiosity/Exploratory work

Palatability as a task-parameter?

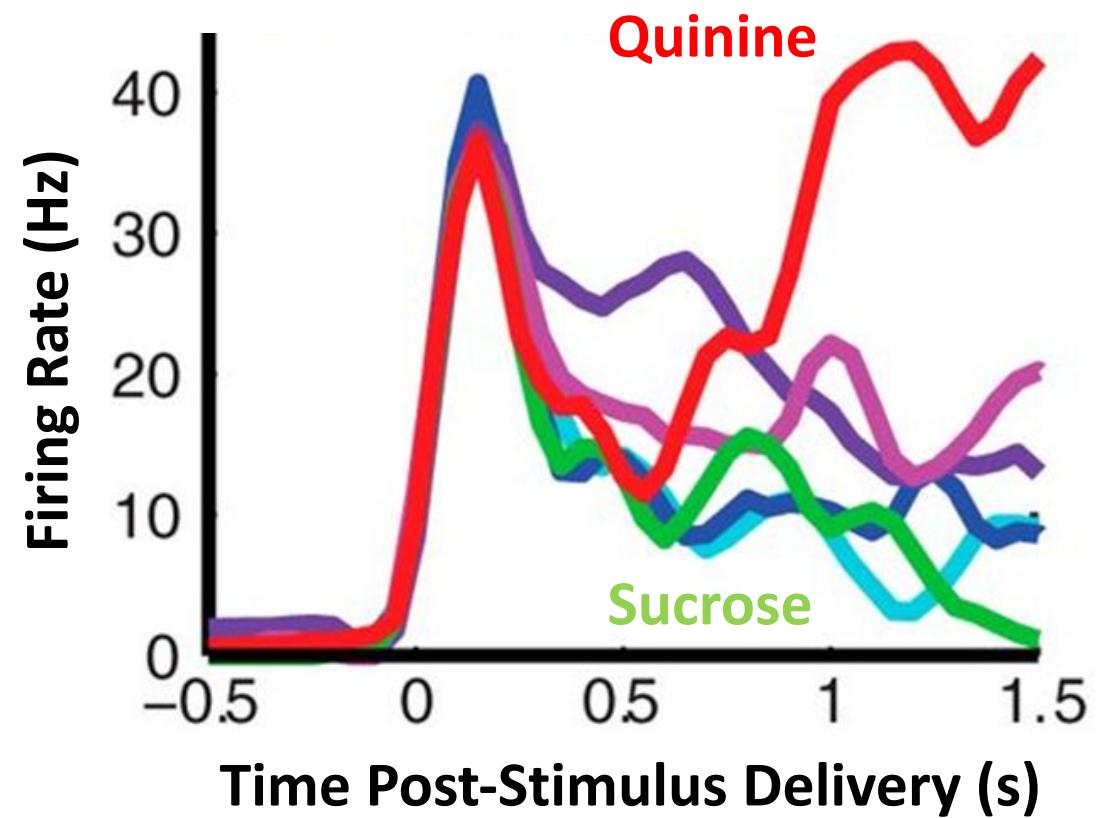
- Vincis 2020 □ Response to hedonically similar tastants becomes less similar with time
- Katz □ Response to hedonically similar tastants becomes more similar with time
- Consumption related decision making □ Palatability
- Taste-related perceptual task □ Task-related decision signal
- Is palatability an “inherent” part of taste processing?
- Use more tastants (NaCl, Sucrose, Citric Acid, Quinine), in the same counterbalanced fashion

Questions?

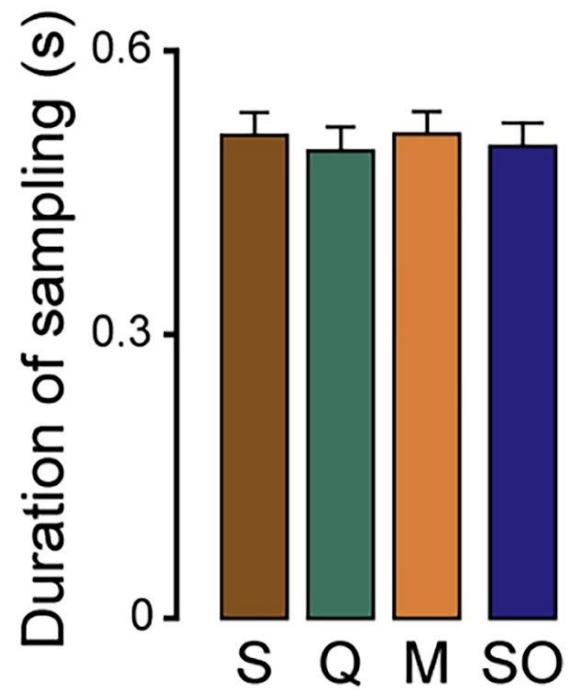
Taste-related perceptual decision



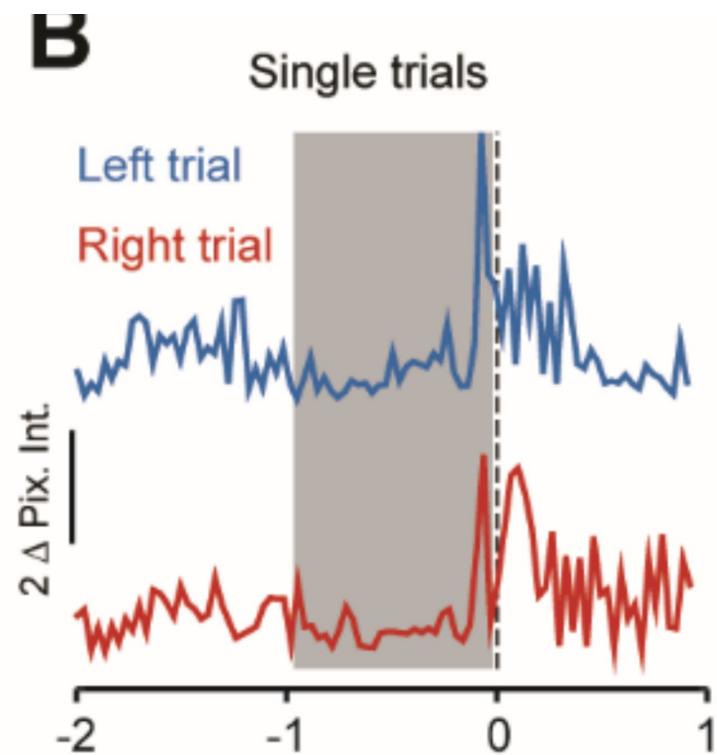
Consumption Decision



No differences coming next are due to
oro-motor activity



Video recorded oromotor movements



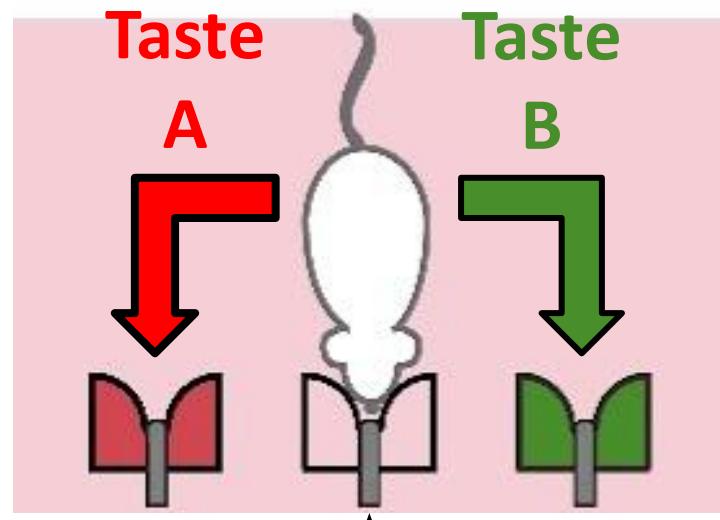
Consumption related decision-making vs Taste-related Perceptual Decision

Taste Solution



Ingest
Or
Egest

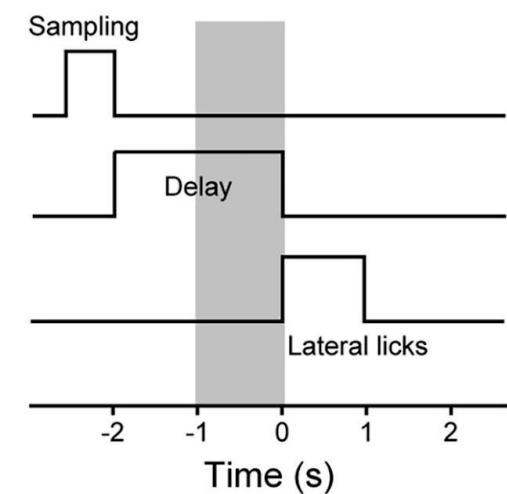
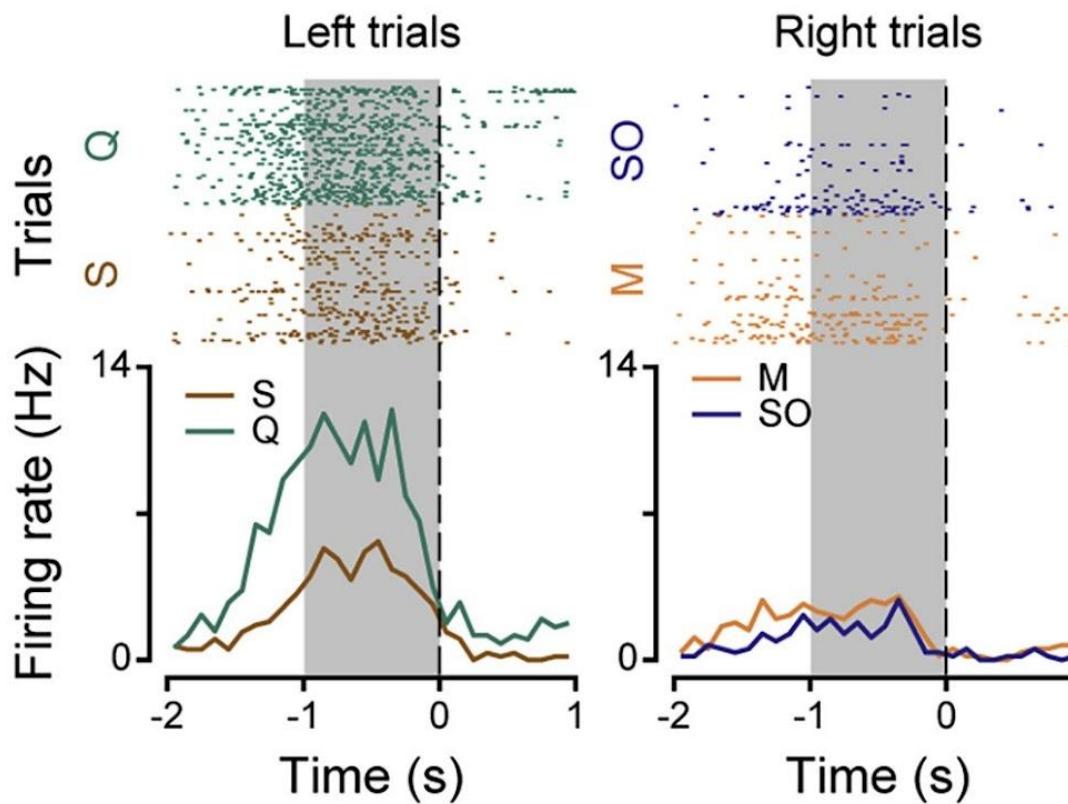
Passive Taste Delivery



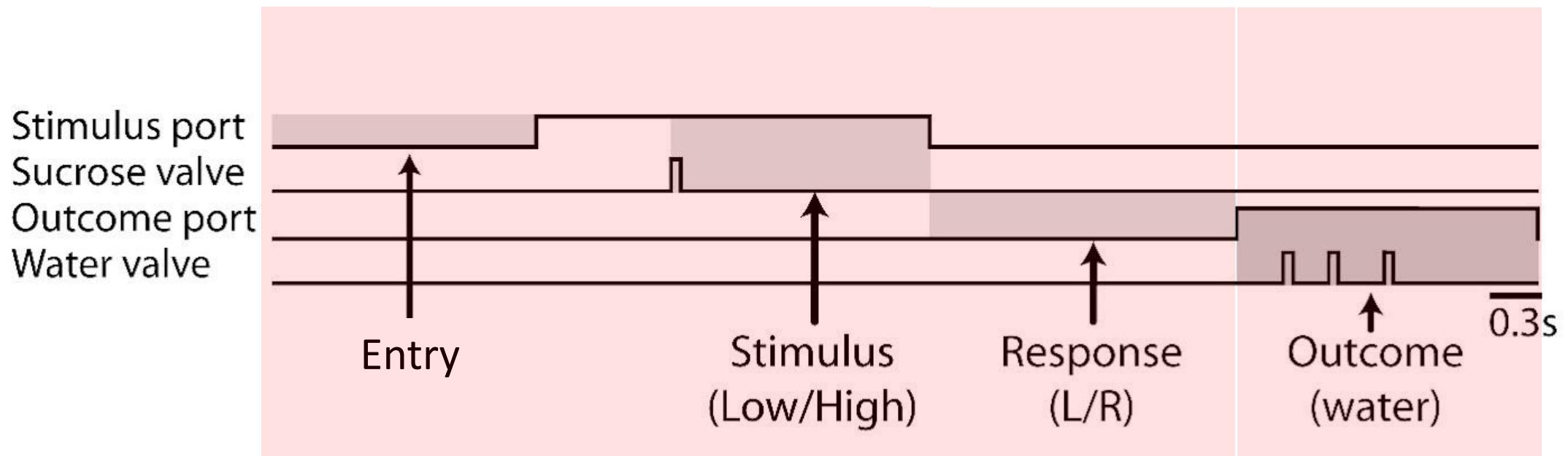
Taste Solution

2 Alternative Forced Choice

GC neurons multiplex chemosensory and task-related information



GC shows task-related activity in perceptual decision making



Timing of perturbation differentially impacts task performance

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