Influence of Basal Forebrain activation on memory formation

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Introduction

**The Basal Forebrain (BF)**

- Widespread projections to the neocortex
- Major cholinergic input to the neocortex
- Involved in Attention / Arousal / Awake
- Involvement in memory?

Modified from: Paul S, Interaction of basal forebrain cholinergic neurons with the glucocorticoid system in stress regulation and cognitive impairment. Frontiers in Aging Neuroscience. 2015 Apr
What is the impact of BF activation on memory?

- Novel Object Recognition with rats
- Bilateral implant of electrodes to the BF
- Electrical stimulation and Activity Recording
  - In freely moving, awake animals

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  with rats

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Novel Object Recognition

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Novel Object Recognition

Experimental

Stimulation in the BF, parameters
- 20Hz stimulation
for 500ms every 10s
BF Stimulation increases Novelty preference

Exploration Duration

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BF Stimulation increases Novelty preference

Exploration Duration
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BF Stimulation increases Novelty preference

![Exploration Duration Chart]
BF Stimulation increases Novelty preference

Exploration Duration

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BF Stimulation increases Novelty preference

![Bar chart showing exploration duration during different training sessions and test, with stimulation increasing Novelty preference over Familiarity preference.](chart.png)
BF stimulation increases Gamma activity

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Right BF Activity

Stimulation on

Time

Frequency

Amplitude

Arena
No stimulation

Arena
with stimulation
BF stimulation increases Gamma activity

Gamma activity is linked to **Self Directed Internally Driven behaviors** (e.g. Quiet wakefulness)
BF stimulation increases Gamma activity

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BF stimulation increases Self directed behaviors

Duration of Grooming and Quiet behavior

Control group

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BF stimulation increases Self directed behaviors

Duration of Grooming and Quiet behavior

Control group

Experimental group

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Conclusions

- BF stimulation increases Novelty preference
- BF stimulation does not increase exploration duration
- BF stimulation evokes activity in the Gamma range
- Duration of Self directed internally driven behaviors increases during BF stimulation
  - **Consolidation** process
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The Visual Cognition Lab Members

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