Comparative Study of Visual Learning in Three Mammalian Species

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Introduction

- Rodents and Primates are two of the most highly utilized animal models for human visual processing.

- Research on cognitive processes in animal models is normally comprised of training on a particular behavioral task.

- Few studies have directly compared behavioral performance between species on identical behavioral tasks.

- Purpose: to understand the learning-related behavioral characteristics of different animal species and how they compare to each other during the acquisition and performance of a visual learning task.
Methodology

$n = 2$ (Monkeys)
$n = 6$ (Tree Shrews)
$n = 4$ (Rats)

Procedure

Correct

Incorrect

Equiluminant

Low Contrast

High Contrast

REWARD

ITI (2s)

ITI (6s)

BEEP

Cognition Day, October 5th 2016
Results

Average Performance

- All species managed to learn the task in high contrast condition.
- Rats learned the task at a slower rate and had a lower peak performance compared to Monkeys and Tree Shrews.
- Rats failed to acquire the task under the lower contrast conditions.
Results

Peak Performance

Contrast Conditions

Performance (% correct)

Monkeys
Tree Shrews
Rats

Contrast Conditions

Transferring

Performance (% correct)

H-L
L-E

*H = High contrast, M = Moderate contrast, L = Low contrast, E = Equiluminance
Results

• Rats failed to transfer between conditions.

• Monkeys and Tree Shrews showed a similar overall performance, with monkeys exhibiting a higher max performance compared to Tree Shrews and Rats.
Spatial Bias

- Each species possesses unique pattern of spatial bias
- The Rats showed a pronounced center avoidance
- Monkeys and Tree Shrews exhibit center preferences though with reversed time lines.
Learning strategy doesn’t have an effect on the probability of win-stay vs. lose-stay at the central position for the monkeys or tree shrews.

The rats initially showed higher tendency of staying in the central position following a reward (win-stay strategy) and this shifted to a generalized avoidance of the central position during the more difficult conditions.
Conclusion

- Rats learned more slowly than the other two species.

- Tree shrews showed a relatively similar performance to Monkeys, with slightly lower peak performance.

- Each species exhibited a unique spatial learning strategy, with a pronounced central avoidance in rats versus central preference in Monkeys and Tree Shrews.

- Our data also suggest that tree shrews provide a better animal model in cognitive visual research then the rats, since the behavioral learning characteristic of the Tree Shrews closely resembles that of the Monkeys.

Thank You