Cognition in black-handed spider monkeys (*Ateles geoffroyi*): A battery of behavioral tests

Author: Tiffany Bosshard Supervisor: Matthias Laska

Background & Aims

Cognition allows animals to acquire, process, and store sensory information from the environment and use it to adapt to their surroundings. A battery of behavioral tests was used to assess the cognitive abilities of black-handed spider monkeys.

Methods

WHAT?

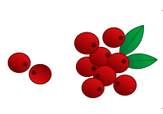
1 Object permanence
2 Associative learning
3 Long-term memory

4 Relative quantity discrimination

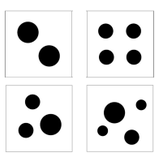
5 Discrete number discrimination
- a Homogeneous stimuli
- b Contrasting stimuli

HOW?

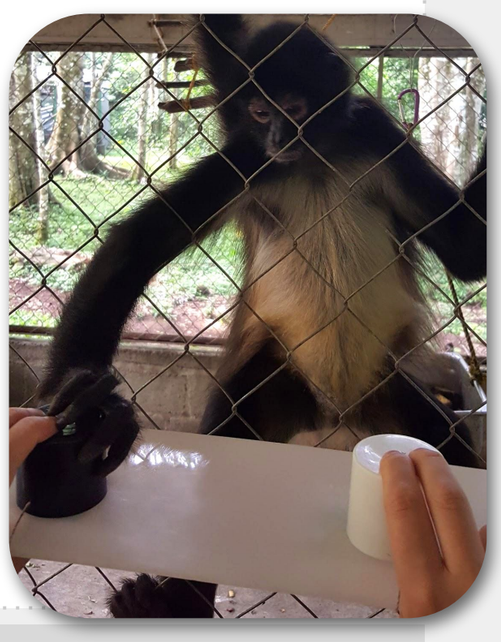
Showing under which cup the reward was placed
Concealing where the reward was placed
Repeating the second task after a 4-month break



Presenting two quantities of food

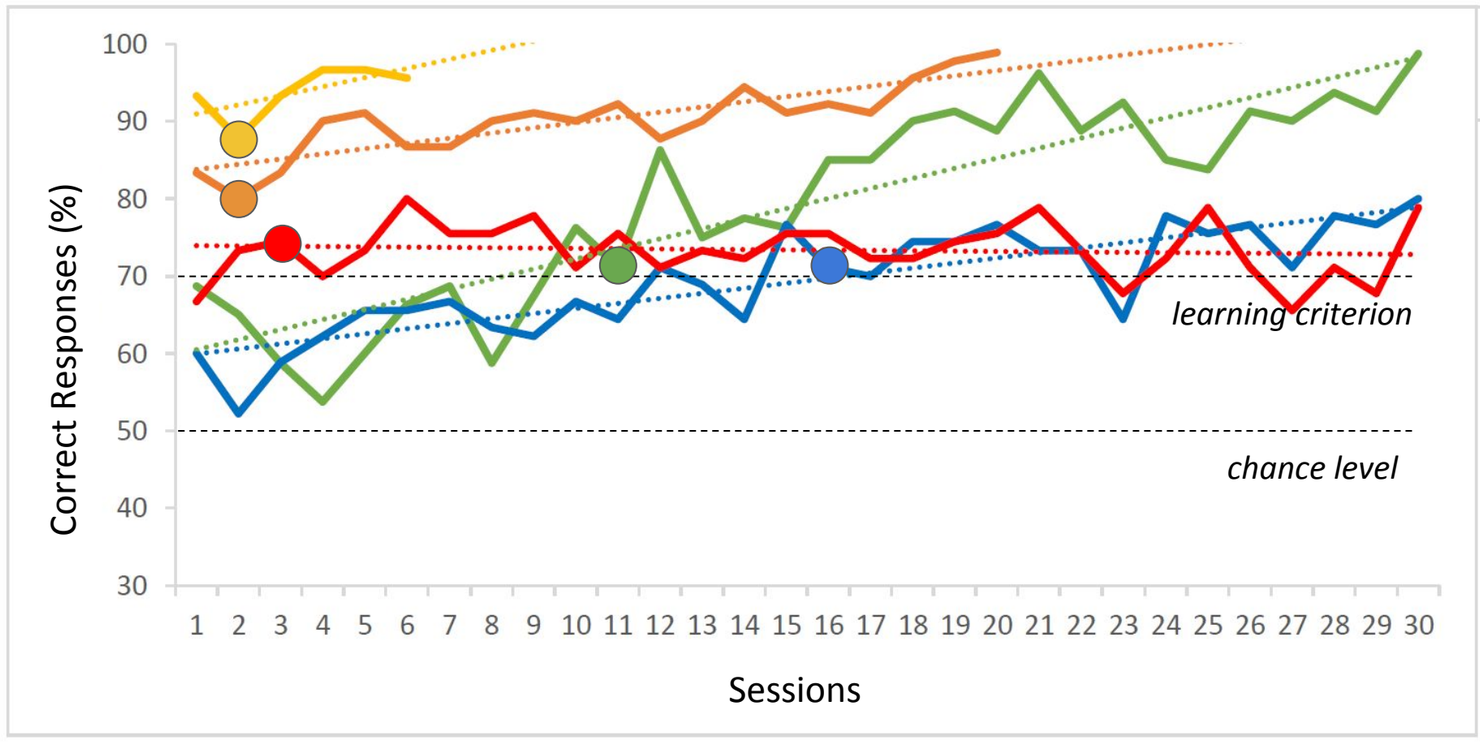


Presenting two boxes fitted with dotted cards:
Cards with same-sized dots
Cards with various-sized dots



9 monkeys, correct response for selecting: right cup color, larger quantity, higher numbered card
10 trials per session - learning criterion: 70% correct responses over two consecutive sessions

Results



Mean group performance: object permanence, associative learning, quantity discrimination, number discrimination with same-sized dots and various-sized dots. **Colored points:** the learning criterion is reached.

Long-term memory task, mean group performance: 98.8% correct responses in last associative learning session before the break and 84.4% in first session after the break

CONCLUSION:

Despite variation in individual performance and in group performance across tasks, the animals succeeded in all cognitive tests

Discussion

1. This ability requires visual representation of objects and working memory, which serves to keep track of a kin, mate, or predator through structured environments.

2. Forming positive and negative associations with various stimuli allows animals to adapt to biologically significant events, like gaining information on the edibility and nutrition value of certain foods, and learning to avoid unpalatable or toxic ones.

3. Long-term memory requires the identification and recognition of a stimulus and judgement of its prior occurrence, which allows animals to store acquired information, namely how to reproduce a past behavior for a positive outcome.

4. To evaluate quantities allows for numerical judgements by mentally representing the approximate number of items in a set, such as the denser of two food patches, and ultimately maximising food intake.

5.a. Abstract stimuli may be manipulated to create variations of the same numerical contrast and thus prevent the animals to base their responses on patterns instead of numerical properties.

5.b. The animals' prompt high score in the numerosity task with various-sized dots supports the notion that they acknowledged the task for its numerical properties as opposed to size or pattern of the dots.

Cognitive abilities are shaped by the ecological and social environments of a species.

Contact:
tifbo967@student.liu.se

LINKÖPING UNIVERSITY
Universidad Veracruzana
Instituto de neuroetología