

# Goal-directed tail use in Colombian spider monkeys is highly lateralized



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## Background and Aims

- Problem solving is a hallmark of human behavior, and is often studied through tool use paradigms.
- Little research has examined spider monkeys, which may be due to their unusual four-digit hand structure.
- The spider monkey has a very powerful prehensile tail, which has not been probed for problem solving.
- We previously observed that some monkeys use the tail spontaneously to manipulate objects.
- We hypothesized that experience manipulating objects with the tail would be linked to problem solving ability, and we predicted that monkeys who used the tail for manipulation would solve the experimental tail tasks.

## Data Collection Procedures and Data Analysis

- In a series of experiments, we probed the capacity of the spider monkey prehensile tail to solve a problem where a desired object was out of reach of the hands and feet (i.e., accessible only by the tail).
- A high-value food item was placed in one of the following five conditions:
  - Aerial: Inside a bowl suspended on a chain
  - Ground: On a hard surface at ground level
  - Elevated: On a bar placed on top of bookends
  - Container: Inside an angled transparent container
  - Water: Floating in a small pool of water
- Up to 10 data points per monkey per day were collected until 30 successful trials were obtained per task, or until the monkey had not attempted the task for three non-consecutive sessions (i.e., did not solve).
- A *Laterality Index* was calculated for each monkey on each measure using the formula  $LI = (R-L)/(R+L)$ , where R is the number of right tail responses and L is the number of left tail responses.

## Subjects

- 7 spider monkeys (*Ateles fusciceps rufiventris*) known to the experimenters to spontaneously use the tail for manipulation participated in the experiments.
- Focal subjects were drawn from a larger social group housed at Monkey Jungle wildlife park in Miami, FL.
- Testing occurred in the social group and all monkeys were exposed to the tasks, regardless of tail use status.
- Monkeys had access to food and water during testing.

## Results and Discussion

ID	SEX	AGE	AERIAL		GROUND		ELEVATED		CONTAINER		WATER	
			L/R	LI <sub>AERIAL</sub>	L/R	LI <sub>GROUND</sub>	L/R	LI <sub>ELEVATED</sub>	L/R	LI <sub>CONTAINER</sub>	L/R	LI <sub>WATER</sub>
Mints	F	27	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)
Sunday	M	10	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)
Mason	M	7	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)
Cleo	F	11	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)	DID NOT SOLVE		DID NOT SOLVE	
Jasper	M	3	30/0	-1.00 (L)	30/0	-1.00 (L)	30/0	-1.00 (L)	DID NOT SOLVE		DID NOT SOLVE	
Cary	F	4	3/27	0.80 (R)	DID NOT SOLVE		0/30	1.00 (R)	DID NOT SOLVE		DID NOT SOLVE	
Uva	M	6	0/30	1.00 (R)	0/30	1.00 (R)	0/30	1.00 (R)	DECEASED		DECEASED	

F = Female, M = Male, L = Left response, R = Right response. LI values > 0.20 = Right bias (R). LI values < -0.20 = Left bias (L). All other LI values = No preference (N).

- Results show that monkeys can solve each of these problems through goal-directed tail use. However, some tasks appear more difficult than others. Future work will quantify monkeys' performance from video coding.
- Notably, skilled tail use is highly lateralized regardless of direction of preference.

### References upon request

- We thank Monkey Jungle for their support, especially Sharon DuMond and Carlos Fernandez.
- Correspondence to: Eliza Nelson (elnelson@fiu.edu).