How Laterality Influences Problem-Solving in Monkeys and Humans

S. Albright, M. Soula & E.L. Nelson*
Department of Psychology, Florida International University

Background and Aims

- The ability to plan and execute a motor sequence efficiently is an important skill in primates.
- Poor planning can have negative consequences, such as the failure to obtain a valuable resource.
- Our aim was to compare how spider monkeys and human adults solve an out-of-reach problem.
- Monkeys used their tail to bring the object closer; humans used a simulated “tail” (i.e., gripper). Both could also use their hands in solving the task.

Methods

- **Subjects:** 5 spider monkeys (*A. f. rufiventris*). All were captive-born with a mean age of 17 ± 14 yrs.
- **Participants:** 12 undergraduate college students.
- **Handedness:** Baseline handedness was measured prior to the problem-solving task using standard measures for each species (monkeys: TUBE task; humans: Edinburgh Handedness Inventory).
- **Out-of-Reach Task:** A bowl with a grape (monkeys) or a small object (humans) was suspended on a chain out of reach, with the goal to get the item out. Humans were given identical instructions and placed the object in a container after retrieving it.

Results and Discussion

- **Handedness:** Most monkeys tested were left-handed (4:1), and most humans tested were right-handed (10:2).
- **Tail/Gripper Preferences:** All monkeys used the tail on the same side of the body midline as their preferred hand (4 left-tailed; 1 right-tailed). All humans used their preferred hand on the gripper (10 right “tailed”; 2 left “tailed”).
- **Problem-Solving Strategies:** All monkeys used an efficient strategy to solve the task (Fig. 1), whereas humans varied in their use of efficient versus inefficient strategies (Fig. 2). Strategy use is compared between species in Fig. 3.

Acknowledgments

We thank Monkey Jungle and the DuMond Conservancy for their support, especially Sharon DuMond, Carlos Fernandez, Jennifer Mathers, Hannah Patten, and Matt Rubenstein, as well as HANDS Lab members who helped collect data. Research was approved by the FIU IACUC or IRB as appropriate.

*Correspondence to: Eliza Nelson (elnelson@fiu.edu). References on request.

Fig. 1. Monkey utilizing an efficient strategy of tail pulls bowl (A) and hand removes the item (B). Inefficient strategies were not observed.

Fig. 2. Human efficient strategy of “tail” pulls bowl and hand removes the item (A) compared to inefficient strategies: maneuvering “tail” awkwardly (B) or “tail” overturns bowl and item falls to the table (C).

Fig. 3. Percentage of efficient and inefficient task strategies by handedness in monkeys and humans.

- Take-Home Point: 100% of monkeys but only 50% of humans used an efficient strategy to solve the out-of-reach task.
- For humans, the penalty of using an inefficient strategy may not have been as salient compared to the monkeys.
- In addition, monkeys had an advantage in extensive prior tail experience, compared to humans using the gripper “tail”.
- The failure by some humans to inhibit strong hand preferences (Fig. 2B) may have hindered efficient planning on this task.