Motor planning in Colombian spider monkeys





BACKGROUND:

- Second-order planning is selecting a grasp based on what the individual intends to do with an object.
- The morphological constraint hypothesis proposes species with *less* dexterity use second-order planning *more* consistently (i.e., more radial grips).
- If motor planning is related to dexterity, spider monkeys should show high rates of radial grip use because they have a **low digital dexterity rating**.

METHODS:

- Tested 8 Colombian spider monkeys housed at a local wildlife park using an **elevated dowel task**.
- Data were collected across 7 session until monkeys had completed 10 left and 10 right baited trials.



The image shows a spider monkey participating in the elevated dowel task and the progression through one trial. (A) Dowel is placed on the apparatus. (B) The door to the testing area is opened. (C) Spider monkey participates.

Spider monkeys defied expectations about second-order planning.



Cross-species comparisons challenged our hypothesis. Spider

monkeys differed from cotton-top tamarins rather than capuchins.



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Dashed line denotes chance level.

p = .026

Cotton-top Tamarins = 4

DATA ANALYSIS: • Hand use was coded as left or right and grip use was coded as radial, ulnar, under, or goal-end.

The illustration shows a right spider monkey hand and three grasps used to bring the left end of the dowel to the mouth: a radial grasp (top) where the radial bone faced the baited end; an ulnar grasp (middle) where the ulnar bone faced the baited end; and a goal-end grip (bottom) where the hand directly grasped the baited end. Under grasp not shown.

RESULTS:

DISCUSSION:





• The percentage of radial grips relative to all other grips was used as the dependent variable to compare with prior studies in platyrrhine species.

 The percentage of radial grips used varied from 50% to 100% with a mean of 73.38 ± 18.91%. • A one-sample t-test found that the radial grip was the group strategy, t(7) = 3.497, p = .010. • Binomial tests revealed some individual monkeys

were not consistent in radial grip use (5 of 8).

• Findings challenge the morphological constraint hypothesis, suggesting dexterity should not solely be defined by the ability to execute a precision grip. • Despite the lack of a thumb, the ability to separate one digit from the rest of the hand has important implications for motor planning in spider monkeys.

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