# Substrate choice in nut-cracking behavior of semi-wild tufted capuchin monkeys (*Cebus apella*)

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Tufted capuchin monkeys at the Tietê Ecological Park, São Paulo, crack open *Syagrus* palm nuts placed on the hard substrate with hammer stones (Ottoni & Mannu, 2001).

## Question

Do capuchin monkeys know substrate conditions necessary for successful nut-cracking with hammers?

## Background

The monkeys at this park are selective of the hammers (Falótico & Ottoni, 2005).

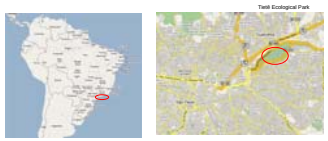
Captive tufted capuchins at the Monkey Valley Zoo, France, prefer to use hard substrate when they crack nuts on the surface by directly pounding them (Pouydebat, et al, 2006).

This species show understanding of causality in the tool-choice task (Fujita, et al., 2003), even with obstacles and traps (Sato et al, submitted).

## Method

### Experimental Site

Tietê Ecological Park, São Paulo, Brasil



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### Subjects

Opportunistically selected crackers.

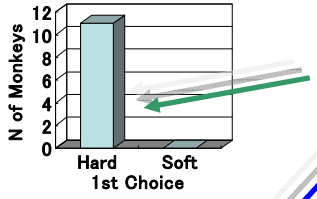
### Procedure

We placed 2 types of artificial anvils (25x62.5 cm) and a familiar hammer stone (14x13 cm, 1.42 kg) and dozens of nuts between the anvils, and ..... waited.

Hard anvil: connected 5 cement blocks
Soft anvil: wooden board covered with sponge and rubber

Position of the anvils counterbalanced across subjects.

Recorded which anvil the monkeys used in their first cracking attempt.




| 1st Workers | | Age | L/R |
|---|---|---|---|
| Suspeito | M | >9 | H/S |
| David | M | >10 | H/S |
| Cisca | F | >8 | S/H |
| Filó | F | 5 | S/H |
| Angélica | F | 3 | H/S |
| Químico | F | >7 | H/S |
| Vavá | F | >9 | S/H |
| **2nd & Later Workers** | | | |
| Joaquim | M | >10 | H/S |
| Física | F | >10 | H/S |
| Medeiros | M | >10 | H/S |
| Ana | F | >9 | S/H |

## Results

11 monkeys worked on the experimental site (Table).

All Monkeys chose the hard anvil in their 1st attempt ($p<0.001$). (Figure)

7 monkeys who worked in the original setting (w hammer placed middle) used the hard one ($p<0.02$).

4 monkeys worked after another, when the hammer was on the hard anvil.

They immediately recognized the appropriate anvil by mostly visual inspection before trial-and-error.

## Discussion

The monkeys seem to understand that the anvil surface must be hard for the success of this tool using behavior.

Capuchins not only understand spatial relationships among elements required for successful tool use (Fujita, et al, 2003; Sato, et al., submitted) but also quality (i.e., hardness of the surface) of the elements involved in it .

However, starting cracking immediately after visual inspection may mean that the monkeys simply used the surface that was similar to the one they often use (cement floor). Thus stronger neophobia against the soft anvil may partly account for the results.

## Future Directions

Need replication with anvils of the same appearance.

## Abstract

Semi-wild tufted capuchin monkeys (*Cebus apella*) at the Tietê Ecological Park, São Paulo, Brazil, are known to crack open small *Syagrus* palm nuts placed on the hard substrate by hammer stones. We tested whether the monkeys knew substrate conditions necessary for successful nut-cracking. Specifically we placed side by side two types of artificial substrates, one made of cement blocks and the other made of soft rubber, on the ground of an open lot where the monkeys frequently use for this feast. A natural hammer, which they routinely use, and dozens of palm nuts were located between the anvils. The experimental observation was conducted opportunistically. During the observation period, 4 males and 7 females attempted to crack open nuts at the experimental site. All were more or less skilled crackers. All of the individuals observed chose the hard substrate from their first attempt with the novel substrates. Thus the monkeys seem to appreciate the hardness of the substrate as an important condition for success.

## References

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