




RESEARCH ARTICLE

# Revisiting the fourth dimension of tool use: how objects become tools for capuchin monkeys

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## Abstract

Culture allows humans to adapt to a diversity of contexts. Participatory experience in technical activities and activity with artefacts provide the basis for learning traditional technical skills. Some populations of non-human animals use tools. The ways in which artefacts influence the development of a traditional skill in non-human species can provide insight into essential supports for technical traditions in humans and shared learning processes across species. In wild bearded capuchins, nut cracking leaves edible pieces of nuts, nut shells and stones used as hammers at anvil sites. We addressed how mastery of cracking nuts by young monkeys is associated with interactions with these objects. We studied monkeys' reuse of nuts, hammers and anvils and the outcome of attempts to crack nuts, and from these data derived their behavioural variability and proficiency in nut cracking. Behavioural variability was the most robust predictor of whether a monkey collects pieces of nuts cracked by others or reuses stones and nuts, and was a stronger predictor of proficiency than age. Young monkeys were increasingly likely to reuse the stone used by another after the other monkey had left the anvil as they increasingly focused their behaviour on actions relevant to cracking nuts.

**Keywords:** animal traditions; practice; development; tool; artefact

**Social media summary:** The more focused on nutcracking activities wild capuchins are, the more they reuse their social mates' tools.

## Introduction

Culture allows humans to adapt to an extreme diversity of habitats and contexts. It involves the horizontal and vertical social transmission of technological improvements, facilitating the development of sophisticated tools (Legare, 2017). Learning technical skills is an essential outcome of human culture. Children grow up in environments modified by human activity, with objects that make up local traditions. Furniture, shelters, cutlery, clothes and tools of various types are ubiquitous. Children participate while adults use tools, eventually learning to use them on their own.

## Artefacts and traditions

In many cultures, parents actively organise space to guide children's learning to use objects in culturally appropriate ways, providing them with the opportunity to learn how to use objects even in the absence of a demonstration (Flynn et al., 2013). Even when adults do not actively organise space