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Learning how to use a tool: Mutually exclusive tool–function mappings are selectively acquired from linguistic in-group models

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ABSTRACT

The current study investigated whether 4-year-olds used language as a cue to social group membership to infer whether the tool-use behavior of a model needed to be encoded as indicative of the tool's function. We built on children's tendency to treat functions as mutually exclusive, that is, their propensity to refrain from using the same tool for more than one function. We hypothesized that children would form mutually exclusive tool–function mappings only if the source of the function information was a linguistic in-group person (native) as opposed to an out-group (foreign) person. In Experiment 1, participants ($N = 39$) were presented with four tool–function pairs by a model who had previously spoken either in their native language or in a foreign language. During the test phase, children encountered new purposes for which they could either use the demonstrated tools' color variant or use another equally suitable, as yet unseen, alternative tool. In line with our predictions, children preferred to use the alternative tool for the new function only in the native language condition (native: 63.3%; foreign: 42.7%). Experiment 2 replicated the initial finding using another foreign language and demonstrated that the lack of mutually exclusive tool choice in the foreign condition did not originate from children's failure to encode the demonstration. These findings suggest that children restrict learning artifact functions from linguistic in-group models. The mutual exclusivity

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principle in the domain of function learning is used more flexibly than previously proposed.

Introduction

Humans' physical environment consists, in great part, of objects that were designed, planned, and manufactured by fellow humans. Thus, children are surrounded by man-made artifacts or tools from the earliest of ages. Although there are several different purposes for which any given tool can be used, all tools have functions defined by social norms, and the vast majority of them have *a single* function. Social norms *prescribe* how certain tools should be used, creating a context in which tool-use behavior may be considered correct or incorrect. The great challenge in function learning is to be able to acquire information by social observation rapidly (often in the absence of comprehensive causal understanding) and, at the same time, to be sensitive to cues that provide guidance regarding the social validity of the observed information. Specifically, the model's (lack of) access to the in-group's shared knowledge base should not be ignored. The study we present sheds light on how 4-year-old children cope with this challenge.

Due to their different experiences (some of which depend on personal choices and others on sociocultural factors), different people know different things and, thus, are differently reliable sources of information. There is evidence that infants monitor various cues of individual knowledgeability and show reservations to use information conveyed by previously unreliable sources (e.g., Poulin-Dubois, Brooker, & Polonia, 2011). This is especially so if the cue to knowledgeability and the to-be-learned information belong to the same domain; for example, 3-year-old children prefer to learn novel object labels and functions from an informant who previously named well-known objects and stated artifact functions correctly (Birch, Vauthier, & Bloom, 2008; Brooker & Poulin-Dubois, 2013). If aided by a cue to the model's certainty in his or her own knowledgeability (confidence), even 14-month-old infants show selectivity in learning (Zmyj, Buttelmann, Carpenter, & Daum, 2010). Moreover, during their preschool period (3–4 years), children show evidence of understanding that an individual's expertise may be limited to certain domains and avoid overgeneralizing expertise to unrelated fields of knowledge (Kushnir, Vredenburgh, & Schneider, 2013).

Although observational evidence of an individual's behavior conveys the most direct proof of knowledgeability, this route is rather slow and demanding. Because social group memberships can largely influence what kinds of knowledge certain individuals have access to, using others' social categories to create expectations about what those people know may serve as a heuristic to determine expertise, increasing the efficiency of social learning. Wood, Kendall, and Flynn (2013) argued that the bias to learn from models who share the learner's features (e.g., age, sex, culture) is beneficent because familiarity signals a shared environment where the same behaviors are relevant. In fact, some have proposed that the primary aim of social categorization is to identify the borders of shared knowledge and to guide observational learning (Esseily, Somogyi, & Guellai, 2016; Oláh, Elekes, Bródy, & Király, 2014; Soley & Spelke, 2016). Accordingly, there is evidence that those social categories that indicate a relevant set of shared knowledge, such as the model's age (Seehagen & Herbert, 2010; VanderBorght & Jaswal, 2009; Zmyj, Daum, Prinz, Nielsen, & Aschersleben, 2012) or gender (Perloff, 1982; Taylor, 2013) but not race (Krieger, Möller, Zmyj, & Aschersleben, 2016), influence children's propensity to learn.

When it comes to learning about artifact functions, learners need to consider the context that provides a large-scale organized system of knowledge—culture.[2] Although artifacts are designed to serve a given function, all of them can be used for an array of other purposes as well. What limits a tool's use to

[2] We define *culture* in a minimal sense, referring to those groups in which the members accumulate, share, and pass on knowledge to others, creating a stable shared representational space.