

# The Privileged Status of Category Representations in Early Development

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**ABSTRACT**—*The ability to carve the world into broad categories (e.g., DOG) made up of distinct individuals (e.g., Lassie and Toto) is essential for adaptive behavior and has been the focus of extensive research in cognitive and developmental psychology. Classic work on the development of category representations has revealed that they emerge early: Even infants can conceive of distinct objects as equivalent members of the same category. However, more recently, research on conceptual development has begun to suggest a stronger conclusion, namely that mental representations of categories are privileged by our cognitive systems relative to representations of similar, but noncategorical, entities. According to this research, which I review in this article, our minds may be structured to facilitate the acquisition, retention, and manipulation of category-level information. This conclusion goes beyond current theories of conceptual development.*

**KEYWORDS**—*categories; concepts; conceptual development; generic language*

Category representations are a powerful tool in the service of adaptive behavior. Rather than thinking about every object we encounter as a unique item, our minds treat many of them as interchangeable tokens of broader types. Viewing the world

through this categorical lens has at least two benefits: it reduces the informational load posed by our environments, because fewer types (i.e., categories) exist than tokens (i.e., individuals), and it enables effective prediction and action. By placing unfamiliar objects into familiar categories, we can predict their likely properties and tailor our behavior toward them accordingly. Given that category representations enable many of our smartest behaviors, questions about the development of these representations have informed much research in developmental and cognitive psychology. In this article, I defend a new claim about this aspect of development, namely that category representations are not just *available* to young children (as previous work has suggested), but actually *privileged* relative to representations of other, noncategory entities. As I will explain, this claim is suggested by findings that cannot be accommodated by current theories of conceptual development.

Categorization starts early: Under the right circumstances, even infants can form and use category representations (1, 2). For instance, infants as young as 3 months conceive of novel objects that are accompanied by the same verbal label (e.g., “Look at the *toma!*”) as members of the same category (3, 4; see also 5–7). Not only can infants group distinct objects into the same category, but they also use the shared category membership of these objects to draw additional inferences about them. For example, 13-month-olds expect two novel objects that share the same category label to share further properties (e.g., making a sound when shaken), even when they look dissimilar (1; see also 8–10).

Because of findings such as these, it is now accepted that category representations are available in the early stages of cognitive development. However, category representations may be more than merely available; this conclusion understates the role of categories in children’s thinking. In light of the findings I will describe, a more apt description may be that category-level information is privileged by the developing cognitive system. Because the meaning of the word *privileged* is broad, it is important to be clear about its semantic content in this context. I use this term to indicate, roughly, that category representations are

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assigned more weight by children's cognitive systems relative to other, noncategorical representations of similar complexity and content. This additional weight affects category representations at several stages, from their inception (e.g., children may be particularly curious about information at this level) to their storage in memory and, ultimately, to their use (e.g., category-level information may be manipulated with particular efficiency). More precisely, category representations may be privileged on at least four dimensions as follows:

- 1 Children find it particularly *easy to reason* about categories.
- 2 Children are particularly *motivated to acquire* information about categories.
- 3 Children have particularly *accurate memory* for information about categories.
- 4 Children assume information about categories is *widely known*.

This list is not exhaustive; these four dimensions capture what we currently know on this topic, but researchers may discover other dimensions on which categories are privileged.

As an additional point of clarification, the argument and evidence in this article pertain most directly to representations of taxonomic categories of concrete objects such as TREE, DOG, or GIRL<sup>1</sup> (5, 11). People can represent equivalence classes on various other bases as well, such as perceptual similarity (e.g., white things, round things) or relational similarity (e.g., passenger, predator). The current argument is not intended to cover these other types of categories, not only because the relevant research has not been performed, but also because some of these other categories differ substantially from taxonomic ones in their cognitive characteristics and, relatedly, their developmental trajectories (5, 12).

The noncategory representations with which category representations are being contrasted here are heterogeneous and include both representations of individuals (e.g., this dog) and representations of various quantified sets (e.g., two dogs, some dogs, most dogs). At this point, the jury is still out on whether category representations are privileged relative to *all* types of noncategory representations on *all* the dimensions mentioned earlier (ease of processing, motivation to acquire, etc.). Most likely, there will be exceptions. Nevertheless, even a relatively cautious and circumscribed version of the claim of a privileged status for category representations goes beyond what current accounts of conceptual development can accommodate.

Finally, I wish to highlight a methodological feature of the research suggesting that categories are privileged. Because categories are abstract objects (13), physically presenting categories to participants is impossible. However, it is easy to talk about these abstract objects using a linguistic structure known as a *generic statement* (e.g., "POLAR BEARS are going extinct"; 14, 15). As a result, much of the research I will review relies on cat-

egory information provided and assessed linguistically via these statements. Although category representations can also be investigated via nonlinguistic judgments about specific category tokens (e.g., given that one *toma* made a sound when shaken, will infants try to shake another *toma* as well?), this method cannot match the flexibility and power of generic language as a vehicle for category information. This reliance on generic language has also led researchers to focus on children who are preschool-aged or older (rather than infants), as generics are reliably produced and understood only after age 2 (16, 17).

### CHILDREN FIND IT PARTICULARLY EASY TO REASON ABOUT CATEGORIES

By many objective standards, reasoning about categories is complex. For example, why does it seem legitimate to say that TICKS carry Lyme disease but not that AMERICANS are right-handed, even though the proportion of right-handed Americans exceeds the proportion of Lyme-disease-carrying ticks (18)? The rules that determine whether something can be said to be true of a category are so intricate that linguists and philosophers have spent decades debating them without reaching a clear consensus (15). By contrast, it is often trivial to spell out the formal conditions under which claims about quantified sets (e.g., *all* ticks, *some* ticks) are true. And yet, emerging research on children's reasoning about categories versus noncategory sets suggests that children show adult-like competence in reasoning about category facts *before* they show such competence in reasoning about broad noncategory facts that are identical in all other respects. This suggests a privileged cognitive status for category representations.

To illustrate, one study (19) compared how 3- and 4-year-olds and adults answered several types of questions: questions about categories (e.g., "Do BEARS have white fur?") and about sets defined by the quantifiers *all* and *some* (e.g., "Do *all/some* bears have white fur?"; see also 20, 21). Consistent with the argument of a privileged status for category representations, the category questions yielded no developmental differences: 3-year-olds answered these questions exactly as adults did. The only developmental differences occurred on the questions about quantified sets. Three-year-olds treated these questions as if they were asking about categories instead, as would be expected if categories were an easy cognitive fallback option. Only 4-year-olds differentiated the *all* and *some* questions from the category questions, approximating adults' responses. These findings have been replicated with children who speak languages whose structure differs considerably from English: Southern Peruvian Quechua (22) and Mandarin (23).

Further findings rule out alternative interpretations of these data. First, 3-year-olds know the meaning of the quantifiers tested in these studies (19, 21), so an inability to comprehend these terms cannot be the reason for their mistakes on the quantified questions. Second, independent evidence suggests that

<sup>1</sup>Throughout the article, I use capital letters to denote categories.

children as young as 2 or 3 understand when a speaker intends to refer to a category (17, 24, 25), which reinforces the conclusion that children's adult-like responses to the category questions reflected their underlying competence. Third, consistent with the claim that categories are cognitively easy, even adults sometimes mistakenly treat broad quantified sets (e.g., all ducks) as if they were categories (e.g., DUCKS; 26, 27), especially under time pressure (28). However, the converse errors (i.e., treating categories as if they were quantified sets) are much rarer, regardless of the circumstances. This asymmetry supports claims of a processing advantage for information about categories. In summary, despite its objective complexity, reasoning about categories seems easy for children, suggesting a privileged status for category representations.

### CHILDREN ARE PARTICULARLY MOTIVATED TO ACQUIRE INFORMATION ABOUT CATEGORIES

The processing advantage for category information is complemented by a heightened motivation to acquire such information. All things being equal, young children seem particularly eager to learn about categories of things rather than about individuals or sets of individuals. (The *all things being equal* caveat is important: Children may be curious about individuals who are salient in their lives, such as a sibling or the family pet.) To test this idea, JoAnn Park and I (29) provided 4- and 5-year-olds the option to learn a new fact about an unfamiliar category (e.g., PANGOLINS) or a new fact about an individual from that category (e.g., the pangolin in the experimenter's picture). Children's choices served as a measure of their motivation. As predicted, children preferred to learn about categories (by roughly a 2:1 ratio). This preference extended to facts about familiar categories (e.g., FROG, GIRAFFE) rather than being restricted to unfamiliar ones. However, children did not prefer to learn the category facts when the experimenter said she was ignorant but offered to guess some facts. Thus, children's preference for the category facts was not superficial; they were motivated to *learn* about categories and did not choose to hear the category facts when the quality of the information they would have learned was doubtful. Children also did not simply prefer facts about many objects to facts about a single one—their preference was specific to categories. In another study (30) extending the conclusions of this work, 4-year-olds were more motivated to learn *explanations* about the features of a kind (vs. an individual). Moreover, the motivation to learn about categories does not emerge simply because of exposure to formal schooling: In neither of the aforementioned studies (29, 30) did children's age correlate with their preference for this information. Further contradicting the idea that this curiosity about categories is a byproduct of schooling, it may exist even in infants (31, 32).

Mechanisms that prioritize learning about categories operate throughout life, not just in early childhood. For example, in one study (33), adults were similarly motivated to learn about cate-

gories by generalizing information about specific sets to the level of categories whenever appropriate. Participants were given facts about particular sets versus entire categories of unfamiliar objects and asked to remember these facts. Participants misremembered facts about sets as being about categories (but not vice versa), a sign of frequent set-to-category generalizations. However, the adults made fewer set-to-category memory errors for control facts that were not generalizable (e.g., facts describing temporary or accidental properties). In other words, participants seemed to unwittingly generalize information to the level of categories whenever such generalizations were warranted. Thus, the motivation to learn about categories operates below the level of awareness (in this case, this learning actually interfered with participants' explicit goal of remembering the facts accurately), with category facts routinely extracted from our experiences throughout life. To summarize, the acquisition of category information is a priority for the human mind, which further highlights the privileged status of this information.

### CHILDREN HAVE PARTICULARLY ACCURATE MEMORY FOR INFORMATION ABOUT CATEGORIES

Once acquired, knowledge about categories seems privileged in memory as well, insofar as it is retained more faithfully than knowledge about individuals or noncategory sets. Lucy Erickson and I (34) compared 4- to 7-year-olds' memory for new information about categories versus individuals (e.g., that DOGS vs. a particular dog like to chase an animal called *dax*). After a delay, children were more likely to remember the content of the category facts. This difference in memory accuracy was about as large as the difference between the memory of an average 5-year-old and an average 7-year-old in this task (Cohen's  $d_s \sim .70$ ). Our work also ruled out several alternative explanations (e.g., that children simply had difficulties referring to absent individuals during recall), highlighting the robustness of this phenomenon. The memory advantage for information about categories (vs. individuals) has been replicated using a different procedure and stimuli (35).

Children's memory for information about categories is also superior to their memory for broad quantified sets. Three- and 4-year-olds who were provided with facts about categories (e.g., that SPIDERS shed their skin) and quantified sets (e.g., that all/most spiders shed their skin) were generally able to remember the category facts as such, but misremembered many of the quantified facts as being about categories (26, 33, 36). The difference was not due to a shallow reason, such as an inability to remember the extra word in the quantified sentences (i.e., the quantifier). For example, in a control study, 3-year-olds seldom dropped the extra word in negation-initial facts (e.g., no spiders shed their skin). However, because this research examined only children's memory for the form of the facts (i.e., category vs. quantified), researchers should test whether children's memory for *content* shows a similar advantage for category facts. In

summary, information about categories is remembered particularly well, speaking to the privileged status of category representations.

### CHILDREN ASSUME INFORMATION ABOUT CATEGORIES IS WIDELY KNOWN

Finally, category information might be privileged in the sense of being the sort of information that children assume everyone knows. Consistent with this claim, young children expect category labels to be familiar to others in their cultural/linguistic community, even when these labels are unfamiliar to the children themselves (37–39). However, this expectation extends beyond labels to nonlinguistic facts about categories. To illustrate, Rose Scott and I (40) introduced 4- to 7-year-olds to unfamiliar facts about categories (e.g., that TIGERS catch many ruminants) or individuals (e.g., that a particular tiger catches many ruminants), then assessed whether children expect others (e.g., their parents, grownups in general) to know these facts. Children assumed that the category, not the individual, information was widely known (see also 41). Moreover, children did not expect knowledge of any broad set to be more widespread than knowledge of an individual: For example, they did not think that a fact about *some* tigers would be known by more people than a fact about a particular tiger. Rather, it was information about categories per se that children expected to be common knowledge.

If children assume category facts are widely known, then perhaps they also assume that they themselves know such facts—even when they do not, such as when they are learning new information. Consistent with this prediction, in another study (42), learning new facts about categories was accompanied by a heightened impression that this information was known all along (43, 44). This result suggests that new category facts immediately acquire an aura of self-evident truths, which might make them difficult to dislodge. In summary, these studies support claims of a privileged status for category representations in a metacognitive sense: Children assume that category information is present in the minds of those around them, as well as in their own.

### CONCLUSION

Classic work on conceptual development suggests that category representations are part of our mental lives from an early age. However, the new evidence I reviewed in this article points to a stronger conclusion: Categories occupy a privileged place in our cognitive architecture. For people, categories are not just one way among many to carve up the world. Rather, categories may be a *preferred* way of doing so, insofar as our minds seem structured to facilitate the acquisition, retention, and manipulation of category information.

As is often the case, the evidence reviewed here—and the corresponding claim of a privileged status for category represen-

tations—raises almost as many questions as it answers. I end by spelling out a few of these questions, in part to illustrate the potential contributions of this perspective. If the privileged status of categories is a structural feature of the human mind, we should find evidence of it in infancy (for a promising start, see 32). Because tests of this claim in infants cannot rely on generic language, we need to look elsewhere for suitable methods. Both traditional paradigms for studying infant categorization and inductive generalization (1), and newer, neuroscientific techniques (45) could be adapted for this purpose. The latter techniques could also provide insight into the physiological basis of the privileged status of category representations: How is the extra weight assigned to such representations implemented at the neural level? Are there pathways dedicated to processing category information? Alternatively, is reasoning about category and noncategory information accomplished via a shared pathway that is modulated differentially by other neural circuits? Questions also remain about the scope and boundaries of this privileged status. Relative to which noncategory representations does this differential status emerge, and on which dimensions (e.g., processing ease, memorability)? Questions such as these illustrate the depth of the claim that category representations are privileged by the human mind and highlight its potential to advance our understanding of conceptual development.

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