

MIT Press • Open Encyclopedia of Cognitive Science

Ad Hoc Categories

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MIT Press

Published on: Apr 22, 2026

URL: <https://oecs.mit.edu/pub/lug9d2y7>

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Because the members of an ad hoc category are dissimilar to one another, they are not normally perceived as a category. Children, pets, and family heirlooms, for example, do not appear to form a category because of their dissimilarity. During a fire in one's home, however, they emerge as the ad hoc category of things to save in a fire (sharing the feature "invaluable"). In contrast, because the members of a common taxonomic category are usually similar to one another, they are perceived as a category without a relevant context. Robin, pigeon, and hawk obviously form the category of birds without the presence of a context that highlights their shared features (e.g., wings, feathers, and beaks). People constantly construct ad hoc categories to achieve goals in the world. To take a holiday, people construct the ad hoc categories of places to visit, ways to get there, and things to pack in a suitcase. When constructing these categories, people are remarkably creative and adaptive, illustrating the impressive power of human cognition. When a specific goal is pursued regularly, the novel ad hoc categories constructed become well established in memory, supporting expertise and habitual behavior. Surprisingly, the members of ad hoc categories become organized in much the same way as common taxonomic categories, with prototypical members at the center. Interestingly, the determinants of typicality differ.

History

Research in the 1970s showed that *taxonomic categories*, such as mammals, reptiles, clothing, and tools, are salient because they align with the *correlational structure* of the environment ([Rosch et al., 1976](#)). These categories emerge from the complex perceptual milieu because they organize entities into clusters that share correlated features. Whereas mammals share one set of correlated features (e.g., fur, warm blooded, and live young), reptiles share a contrasting set (e.g., scales, cold blooded, and internal fertilization).

Further important findings showed that taxonomic categories have *internal structure*, taking the form of a *typicality gradient*, in which some members of a category are *better examples* than others (e.g., dogs are better examples of mammals than are dolphins; [Rosch & Mervis, 1975](#)). Additionally, a category member's typicality reflects its *family resemblance* to other category members (i.e., how similar it is to the features of other members on average). Dogs, for example, are more similar on average to other mammals than are dolphins, making dogs more typical.

Subsequent findings in the 1980s demonstrated the widespread presence of ad hoc categories in human cognition ([Barsalou, 1983, 1985](#)). Interestingly, these categories could only be perceived when a relevant goal made them salient. They also did not appear to be well established in memory, instead being constructed dynamically in an ad hoc manner as needed to achieve a goal.

Surprisingly, ad hoc categories were found to exhibit typicality gradients as robust as those in common taxonomic categories ([Barsalou, 1983, 1991](#)). Notably, family resemblance did not predict typicality in ad hoc categories as it did in common taxonomic categories, whereas the proximity to goal-related ideals did ([Barsalou, 1985](#)). An ideal is a feature that a category member should have to optimally achieve a goal

related to the category (e.g., zero calories for the ad hoc category of foods to eat on a diet). Whereas the features in a family resemblance become important for typicality because many category members share them, ideals become important because they support achieving goals optimally, even when rare or nonexistent among category members (e.g., zero calories is rare for foods to eat on a diet).

Much subsequent work addressed the roles of family resemblance and ideals in organizing the internal structure of diverse categories, including common taxonomic categories, ad hoc categories, social categories, and consumer categories ([Barsalou, 1985, 1991](#); [Borkenau, 1990](#); [Chaplin et al., 1988](#); [Loken & Ward, 1990](#); [Read et al., 1990](#)). Surprisingly, ideals were found to play a central role in structuring all these categories, not just ad hoc ones, suggesting that all categories support goal achievement, including common taxonomic ones. The ideal of maximally nutritious, for example, structures the common taxonomic category of vegetables (together with family resemblance; [Barsalou, 1985](#)). Surprisingly, family resemblance tends to primarily be important for common taxonomic categories but not for many others. Later reviews and work have confirmed these initial conclusions ([Voorspoels et al., 2013](#)).

Still later work increasingly extended applications of ad hoc categories to other areas (see the section “Broader connections”). Theoretical accounts of how ad hoc categories are constructed were developed from the classic cognitivist perspective ([Barsalou, 1991](#)) and later from the grounded perspective ([Barsalou, 1999, 2003](#); see [Barsalou, 2021](#), for a review).

Most recently, linguists have developed methods that automatically discover ad hoc categories in texts, leading to insights about their linguistic properties ([Mauri et al., 2021](#)). These methods offer a powerful new approach for identifying ad hoc categories in everyday life and better understanding their properties.

A final historic wrinkle is that the term “ad hoc category” has come to be used in ways that diverge significantly from its original use. Specifically, other researchers have begun to use the same term when referring to the dynamic representation of all concepts, not just those that violate the correlational structure of the environment ([Barrett, 2017](#); [Casasanto & Lupyan, 2015](#)). The basic idea is that whenever any category is represented cognitively—including a common taxonomic one—it never takes the same form twice but is always contextualized dynamically, adapting to a wide variety of current constraints and influences (see the section “Questions, controversies, and new developments”).

Core concepts

Ad hoc categories violate the correlational structure of the environment

Common taxonomic categories are naturally salient because they align with the correlational structure of the environment (e.g., categories such as birds and fish circumscribe contrasting sets of correlated features; [Rosch & Mervis, 1975](#)). In contrast, ad hoc categories are not salient because they violate this correlational structure. Specifically, the members of an ad hoc category are typically drawn from diverse common taxonomic categories, such that they exhibit strong dissimilarities and appear unrelated ([Barsalou, 1983](#)). In things to pack in a suitcase, for example, shirt, toothbrush, and book are drawn from

the common taxonomic categories of clothing, toiletries, and written materials, respectively. Because these entities cut across correlational structure, they have many different features and do not appear to have anything in common.

Ad hoc categories only become salient in contexts relevant to goal pursuit

Pursuing a goal successfully typically requires constructing relevant ad hoc categories ([Barsalou, 1983, 1991](#)). Achieving the goal of taking a trip, for example, might require constructing ad hoc categories for places to stay overnight, transportation at the travel destination, and things to pack in a suitcase. Once these categories become salient, they highlight relevant features of their respective members and background irrelevant features. As a result, the members of each ad hoc category appear related, even though they violate correlational structure. When planning things to pack in a suitcase, for example, the features of small, light, and essential become highlighted, with their many irrelevant differences becoming backgrounded. In the process, relevant members from diverse common taxonomic categories become salient and form a coherent category (e.g., shirt, toothbrush, and book).

Ad hoc categories are constructed with a composition process, not acquired with exemplar learning

Classic accounts of category learning assume that people acquire common taxonomic categories during an extended exemplar learning process. As people are exposed to members of a common taxonomic category over time (exemplars), they perceive their shared correlated features and induce the category in a largely bottom-up manner ([Medin & Schaffer, 1978](#); [Rosch, 1978](#); [Smith & Medin, 1981](#)).

In contrast, ad hoc categories appear to be constructed using a top-down compositional process ([Barsalou, 1991, 1999](#)). Specifically, when constructing a plan to achieve a goal, a person first activates a frame for the activity containing attributes that need to be instantiated effectively. When planning a holiday, for example, attributes in the frame for trip must be instantiated, including attributes for location, transportation, and things to pack in a suitcase. These attributes are then refined via a compositional process that adds relevant constraints and optimizations to them. The location attribute, for example, might be refined to specify that a possible holiday location should be reachable via train (a constraint), with as few stops as possible (an optimization).

The refined attribute then functions as a concept to highlight an ad hoc category of possible locations that meet the selected constraints and optimizations. For someone living in Glasgow, a suitable set of holiday locations might include Inverness, London, Brussels, and Paris. One or more locations is then selected from the category as the travel destination (e.g., Inverness). Ad hoc categories for other relevant frame attributes are constructed similarly (e.g., things to pack in a suitcase).

Once members of relevant ad hoc categories have been selected for the current plan, they provide an interface between cognition (the frame that represents the plan for the trip) and the world (all the physical entities in the world that realize the plan; [Barsalou, 1991, 2021](#)). Things to pack in a suitcase, for

example, links the respective frame attribute to the actual things in the world that need to be packed. In this manner, the relevant ad hoc categories integrate the cognitive plan with the physical entities in the world needed to implement the plan. Without these categories, effective action to achieve the trip's goal could not occur.

Ad hoc categories can become well established in memory and lexicalized

Although novel ad hoc categories are often constructed spontaneously, ones used regularly become well established in memory, supporting expertise when pursuing habitual goals. For some people, the categories of things to pack in a suitcase and foods to eat on a diet become well established. To account for such categories that are no longer ad hoc, the term *goal-derived categories* was proposed to cover all categories that violate correlational structure while supporting goal pursuit, both ad hoc and well established ([Barsalou, 1985, 1991](#)).

Interestingly, many well-established goal-derived categories are so important culturally that they become lexicalized in language ([Barsalou, 1991](#)). Consider foods. One might not consider foods to be a goal-derived category, but it violates correlational structure as it maps edible entities in the world into the frame for eating. Specifically, the foods attribute in the eating frame draws on common taxonomic categories for specific plants (e.g., apples), animals (e.g., salmon), and artifacts (e.g., baked goods) to create a category of things in the world that are edible, nutritious, and tasty. Because not all plants, animals, and artifacts meet these constraints and optimizations, foods violate correlational structure. Nevertheless, because people use the category every day, it becomes well established in memory, taking a unique form for each individual that satisfies the constraints and optimizations that bear on their eating habits.

Additionally, because the category is so important culturally, it has become lexicalized in language with the word “food.” Many other important examples of lexicalized goal-derived categories exist, including seller, buyer, merchandise, and payment in the frame for buy ([Barsalou, 1991](#)).

Ad hoc categories contain salient typicality gradients structured by ideals but not by family resemblance

All goal-derived categories, including both ad hoc and well-established ones, appear to contain typicality gradients as salient as those in common taxonomic categories ([Barsalou, 1985, 1991](#); [Borke, 1990](#); [Chaplin et al., 1988](#); [Loken & Ward, 1990](#); [Read et al., 1990](#); [Voorspoels et al., 2013](#)). In general, the members of a goal-derived category become increasingly typical as they approximate their category's ideal features, but not as their family resemblance increases. This pattern indicates the importance of goal-derived categories for achieving goals, while they simultaneously violate correlational structure. Additionally, typicality in a goal-derived category increases as a member instantiates the category increasingly often and becomes more familiar ([Barsalou, 1985](#); [Voorspoels et al., 2013](#)). Increasing typicality for the members of a goal-derived category generally indicates they are increasingly useful for achieving relevant goals.

Ad hoc categories exhibit unique linguistic properties that enable their automatic detection in texts

Ad hoc categories exhibit unique prosodic, morphological, and syntactic features that allow them to be automatically detected in texts ([Mauri & Sansò, 2018](#)). For example, placeholders (e.g., “things” and “kinds”), approximators (e.g., “like” and “sort of”), extenders (e.g., “and stuff” and “or whatever”), and list constructions (e.g., “X, Y, and Z”) all tend to indicate the potential presence of an ad hoc category. Linguists increasingly understand the diverse linguistic forms that ad hoc categories take, the pragmatic functions they serve in communication, and the abstraction process that creates them in social contexts ([Mauri et al., 2021](#)).

Questions, controversies, and new developments

Developing a more complete account of ad hoc categories

Relatively little is known about ad hoc categories ([Barsalou, 2021](#)). Many outstanding issues remain, including how conceptual, linguistic, social, and cultural processes construct ad hoc categories spontaneously, how they become well established in memory to support expertise and habitual behavior, how they interface cognition with the world, how they become grounded in experience and the environment, and how they are implemented in the brain and body. Computational and neural models of all these processes would also constitute significant contributions.

Different uses of the term “ad hoc category”

Researchers have increasingly used the term “ad hoc category” in a way that diverges from its original use. Specifically, it has been increasingly suggested that all concepts are “ad hoc” ([Barrett, 2017](#); [Barrett & Miller, 2025](#); [Casasanto & Lupyan, 2015](#); also see [Connell & Lynott, 2014](#), who do not use the term “ad hoc”). According to this perspective, any concept that is used to represent any category adapts uniquely to the current situation, producing infinite context-dependent variability in the category’s representation—the category is never represented the same way twice.

Much earlier work proposed the same idea, namely, that the concepts representing all categories, not just ad hoc ones, exhibit extensive variability as they adapt to different situations ([Barsalou, 1987, 1989](#)). Rather than using the term “ad hoc” when referring to this phenomenon, the terms “context dependence,” “concept instability,” and “dynamic construction of concepts” were used instead. Later attempts to ground concepts in sensory-motor systems similarly proposed that the multimodal simulations representing a particular concept vary widely because the situations in which they are constructed vary (see the distinction between a simulator and its simulations in [Barsalou, 1999, 2003](#)).

For a variety of reasons, it is important to distinguish between categories that violate correlational structure to achieve goals versus the infinite variability of conceptual representations as categories are represented dynamically. Both are important phenomena and should not be lumped together.

Broader connections

Basic cognitive processes

During problem solving, people construct and use ad hoc categories, with targeted training promoting their ability to do so ([Chrysikou, 2006](#)). In memory, using ad hoc categories as organizational tools can improve both working and long-term memory ([Ishiguro et al., 2025](#)) [see [Memory](#)]. Relatedly, goal-derived categories produce false memories as readily as common taxonomic categories, demonstrating their robust conceptual salience in cognition ([Soro et al., 2020](#)).

Social and affective cognition

Much work demonstrates that ideals play a central role in structuring trait concepts such as extroversion and conscientiousness (e.g., [Borkenau, 1990](#); [Chaplin et al., 1988](#); [Read et al., 1990](#)). Ad hoc categories also motivate a novel approach to understanding the development and construction of emotion categories ([Hoemann et al., 2020](#)). More generally, ad hoc categories offer a way of conceptualizing emotion categories ([Barrett, 2017](#); [Lebois et al., 2020](#)).

Consumer behavior

Consumer research has found that ideals play important roles in structuring consumer categories. As products approach ideals associated with their product category, they become more desirable to consumers ([Loken & Ward, 1990](#)). Ideals for product categories can emerge from both consumers and consumer situations ([Ratneshwar et al., 2001](#)). Additionally, ad hoc categories offer a useful way to understand the representation and use of food categories ([Gandolini et al., 2025](#); [Ross & Murphy, 1999](#)).

Determinants of typicality gradients across disciplines

A variety of projects have explored the nature and origin of typicality gradients across diverse disciplines. Some time ago, linguists began addressing ideals as a source of structure in cognitive metaphor ([Lakoff, 1987](#)). Cross-cultural work has addressed the origins of typicality gradients in natural categories such as trees, finding that ideals vary as a function of cultural group ([Lynch et al., 2000](#)). More recently, neuroscientists have begun exploring the neural bases of typicality gradients, along with their stability and flexibility ([Folstein & Dieciuc, 2019](#)).

Further reading

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