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Influence of category coherence and type of base-rate acquisition on property generalization☆

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ABSTRACT

Category coherence involves identifying similarities between social categories, such as jobs and hobbies, and is primarily used for generalizing or drawing inferences about their properties. Category coherence is also used for drawing inferences from explicit information, such as base rates. For example, people generalize the properties of groups or brands from multiple sources (e.g., survey results and the share market in periodicals). However, generalizing the properties of categories using explicit base-rate information may not always involve category coherence; rather, it may involve directly analyzing base-rate information. Therefore, this study attempts to distinguish between conditions in which people use category coherence and explicit base-rate information. Specifically, we proposed that people acquiring explicit base-rate knowledge—described as a percentage—would generalize a category's properties according to its base rate; however, for base-rate information acquired via direct observation, the inductive strength in generalizing properties would be greater for categories with high levels of coherence. Our results (Experiment 1 and Experiment 2) validated these two predictions. Finally, the interaction between category coherence and type of base-rate acquisition was discussed.

1. Introduction

Faced with a lack of clear frame of reference when trying to make a probabilistic assessment of an event, people tend to make that assessment by relying on an arbitrary frame(s) of reference that can be easily explored (Kahneman & Tversky, 1973; Tversky & Kahneman, 1983). Such reference frames involve decision-making as in, which frame is (a) more specific (e.g., low specificity [an area in North America] vs. high specificity [California]); (b) a more easily retrievable piece of information (e.g., low availability [a word with R as its third letter] vs. high availability [a word with R as its first letter]); and (c) more prone to having two events occurring simultaneously (e.g., low concomitance [Events A and B occurred together once] vs. high concomitance [Events A and B occurred together three times]) (Kahneman & Tversky, 1973, 1982; Tversky & Kahneman, 1973, 1983).

People also apply such arbitrary frames of reference when generalizing the properties of category membership (Lee, Kim, & Li, 2014; Osherson, Smith, Wilkie, Lopez, & Shafir, 1990). The degree of similarity across the members (low category-similarity [dogs and bats] vs. high category-similarity [dogs and cats]) and the degree of typicality found in the members (low typicality [dolphins and mammals] vs. high typicality [cats and mammals]) affects one's confidence in property generalization (Osherson et al., 1990; Rips, 1975; Rosch & Mervis, 1975). When it comes to social categories represented by the same vocation and hobby, property generalization can also be affected by the degree of similarity and consistency found across the members that share the vocation or hobby (low category-coherence [book club membership] vs. high category-coherence [nursing community]) (Patalano, Chin-Parker, & Ross, 2006; Patalano & Ross, 2007).

As described above, applying heuristics (similarity, typicality, coherence) when making inferences about the properties of a category is called category-based induction (Lee et al., 2014; Osherson et al., 1990). In addressing the category-based induction, this study focused on social-category coherence (Patalano & Ross, 2007; Patalano et al., 2006).

Category coherence is a higher-order process[1] that involves identifying similarities between social categories such as jobs and hobbies and is primarily used to identify categories' generic properties. For example, people tend to perceive greater coherence for categories of people with similar hairstyles, manners of speaking, and attitudes, such that their attributes are perceived to be interrelated, but a lower coherence for

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[1] The term "higher-order" implies that the cognitive processes involved are more complex (involving more steps).

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categories of people with dissimilar appearances and attitudes. Furthermore, property generalization of high-coherence categories such as nurses is found to be stronger than that of low-coherence categories such as book club membership (Patalano & Ross, 2007). This phenomenon is referred to as the "coherence effect" (Patalano & Ross, 2007; Patalano et al., 2006).

1.1. Type of base-rate acquisition

As reviewed, category coherence is an important factor that affects people's inference about the properties of social categories. However, category coherence appears to allow its use only in limited circumstances, wherein the property base-rate information is either unclear or unavailable (Barbey & Sloman, 2007; Lovett & Schunn, 1999; Sloman, 1996).

Previous studies suggest that it is not possible to accurately assess a category's properties by calculating their base rates from case-wise observation of presented examples (Barbey & Sloman, 2007; Sloman, 1996); instead people tend to infer properties using information that is easier to apply, such as "concepts," involving category-specific similarities or contingency, and "event continuity," wherein properties are repeatedly observed in that category or context and frame of events (Barbey & Sloman, 2007; Case, Fantino, & Goodie, 1999; Kahneman & Tversky, 1982; Lovett & Schunn, 1999; Sloman, 1996; Tversky & Kahneman, 1973).

However, overtly stated base-rate information is often accepted as a rule and is used for inferential reasoning (Barbey & Sloman, 2007; Sloman, 1996). Even in the absence of a specific percentage, expressions such as "sure," "likely," "probable," and "a good chance" are generally important cues for judging base rates of a category's properties (Wallsten, Fillenbaum, & Cox, 1986; Weber & Hilton, 1990).

If base rates are explicitly asserted during inferential decision-making involving speculation, the likelihood of making rational decisions based on this expected value as well as probabilistic frameworks increases (Gottlieb, Weiss, & Chapman, 2007; Hertwig, Barron, Weber, & Erev, 2004). For example, when provided explicit base-rate information that blue and yellow balls have a 55% and 45% chance of being drawn from an urn, respectively, people are more likely to choose the blue ball. However, if people assess the base rate by observing each ball being drawn/not being drawn, they are generally unable to extract accurate base-rate information and tend to choose the color of the ball drawn last, reflecting a recency effect (Barron & Erev, 2003). That is, base-rate information obtained through direct observation is often neglected or used inaccurately, whereas overt base-rate information is accurately reflected in inference and decision making (Medin & Edelson, 1988).

Seen from this angle, the category-coherence effect observed by Patalano and Ross (2007) has a few limitations. First, despite Patalano and Ross (2007) having explicitly indicated the base-rate of properties, the coherence effect was encountered regardless. Such a finding is contrary to the results of other studies that had verified that acquirers of explicitly indicated base-rate information make inferences based on the acquired base rate. However, a close examination of the experimental method employed by Patalano and Ross (2007) reveals that the findings resulted from adding arbitrary experimental processes.

In more concrete terms, Patalano and Ross (2007) verified the category-coherence effect through tasks involving participants' attention to specific categories. In Experiment 1A, participants were required to write down the most important characteristic of the category for generalization so that they could cognitively process the category before performing a property-generalization task (e.g., Think about violinists and what they are like. What is one important characteristic associated with this category?). Moreover, Experiment 1B involved a property-generalization task after the participants wrote down a typical characteristic of a specific category (e.g., List one typical characteristic of bakers: _____). However, this experiment presented an extremely artificial scenario; people do not make inferences in everyday life by deliberately considering category properties, rather, they make inferences based on presented concepts and category representations (Rips, 1975; Rosch & Mervis, 1975; Smith, Osherson, Rips, & Keane, 1988).

Patalano and Ross' (2007) procedures may have led participants to believe that the categories were more important than all other information during property-generalization tasks. In fact, they presented information to control for the base rates of properties in generalization tasks (e.g., suppose that half of all people prefer broccoli and half prefer cauliflower); nonetheless, participants' responses suggested that they did not consider this information at all.

Additionally, it is possible that Patalano and Ross' (2007) findings regarding the category-coherence effect on property generalization were affected by participants' knowledge of the experimental hypothesis, which they may have inferred from the task: the same properties were applied to two different categories (i.e., categories with higher and lower coherence).

Patalano and Ross (2007) also noted that since the order of preferred properties was not counterbalanced, a stronger inductive generalization may have resulted because certain properties were more clearly associated with certain categories. For example, property effects may have resulted since only "corn bread is preferred over milk bread" was presented while "milk bread is preferred over corn bread" was not presented.

Considering such issues, this study investigated the effects of the interaction between base-rate acquisition patterns (explicit description vs. direct observation) and category coherence (low vs. high) on property generalization, which Patalano and Ross (2007) did not address. In addition, it supplemented the various issues raised above. The study thus aimed at making a clear distinction between the conditions in which people make inferences based on category coherence and conditions in which they rely on base rate for making inferences. If the study can demonstrate these points, it would contribute to a broad understanding of how the human mind works in higher-order cognitive processes.

1.2. Present research

The present study was conducted to verify Hypothesis 1 while addressing Patalano and Ross' (2007) limitations. The present study differed from Patalano and Ross' (2007) study in two ways: we omitted the instruction to write down the most important or typical characteristic of the category before the property-generalization task, which may have led participants to deliberately pay more attention to categories among other information during property-generalization tasks; and we counterbalanced the order of preferred properties (e.g., both a preference for "corn bread to milk bread," and "milk bread to corn bread") to avoid property effects.

If Patalano and Ross (2007) had not led participants to focus only on categories, it is very likely that they would have applied the 50% base rate for inferential reasoning (Barbey & Sloman, 2007; Sloman, 1996). Moreover, Patalano and Ross (2007) included these deliberate steps before the property-generalization tasks for practical purposes: the coherence effect would not have been observable if participants had not predicted categories, as they would have responded based on only the properties' 50% base rate.

However, if Patalano and Ross' (2007) participants acquired base rates empirically, through direct observation, they would have been more likely to organically generate inferences from the most recent categories instead of the properties' base rates, which are often inaccurately measured and difficult to apply to inferential reasoning (Gottlieb et al., 2007; Hertwig et al., 2004). That is, Patalano and Ross could have verified the category-coherence effect on property generalization more naturally by having participants empirically acquire the base rates of properties. Based on the above discussion, we suggest the following hypothesis on the effect of the interaction between base-rate