The Modifier Effect with Unknown Subcategories

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In everyday language, concept combination is a ubiquitous phenomenon. We are continually combining words into phrases and phrases into sentences in order to communicate our thoughts and intentions. A basic issue is how people successfully accomplish the building and understanding of larger structures of thought out of simpler components. Many answers have been put forward. For example, theories in philosophy and semantics respecting the principle of Compositionality such as Informational Atomism (Fodor & Lepore, 1996, 2002), Formal Semantics (Pelletier, 2017) or the Classical model of concepts (Osherson & Smith, 1981), assume that combinations such as feathered ravens simply refer to the intersection of the sets of things denoted by the two words. That is, feathered ravens refers to the set of things that are both feathered and ravens. A second class of theories, such as the Selective Modification model (Smith, Osherson, Rips & Keane, 1988) and the Composite Prototype model (Hampton, 1987; 1988) using frame or schema representations of concepts, posit that adding a modifier such as feathered to the head concept ravens alters the concept schema. That is, the modifier increases the weight of the relevant modified dimension (in this case Skin Covering) while decreasing the weight of the other unmodified dimensions (e.g., the Color dimension).

Such alteration of the head concept schema has been documented by a recent study on concept combination. Connolly, Fodor, Gleitman and Gleitman (2007) found that a generic property sentence normally considered true, such as ravens are black, is judged less likely to be true when the head noun is combined with a modifier. For example, statements such as feathered ravens are black (with a typical modifier), jungle ravens are black (with an atypical modifier), and young jungle ravens are black (with multiple atypical modifiers) were rated increasingly less likely to be true compared to the unmodified statement ravens are black. This reduction in perceived likelihood of generic properties for combined concepts has been termed the Modification or Modifier effect (Gagné & Spalding, 2011; Jönsson & Hampton, 2012). Interestingly, the Modifier effect also occurs for subcategories that are created not by modification but by using novel single-term concepts. For example, if told that brinns are a kind of bottle, brinns contain liquids is considered less likely than bottles contain liquids (Gagné & Spalding, 2014). Such evidence indicates that the effect is actually a consequence of subcategorisation rather than modification. Pragmatic reasoning might lead people to expect subcategories to be distinct from their superordinates, and hence to show lower likelihood of inheriting prototypical properties.

The current study aimed to explore this possibility. Experiment 1 compared truth likelihood judgments of statements about an unmodified familiar category (e.g., ants live underground) with an unmodified and unknown subcategory (e.g., zaths are a kind of ant, zaths live underground). In addition, Experiment 1 compared these two types of statements with added typical modifiers (e.g., black ants live underground versus zaths are a kind of ant, black zaths live underground). Adding a typical modifier should in this case increase the likelihood of zaths inheriting typical properties, if the effect is caused by semantic similarity. Experiment 2 further tested whether having
an unknown subcategory is sufficient to fully depress likelihood ratings, or whether it is possible to depress likelihood further with an atypical or non-word modifier. If people feel unsure that *zaths live underground* because they only know that zaths are ants, they should not differentiate this sentence from a sentence such as *vaint zaths live underground*, since the same reasoning based on ignorance applies. However, a pragmatic intuition based on the distinctiveness of subcategories could produce a further reduction in likelihood. In both Experiments, participants were asked to indicate the likely truth of each sentence on a scale from 1 = very unlikely to 10 = very likely.

Data from both Experiments were analyzed using a Linear Mixed Model with subject and item as random factors. Results from Experiment 1 confirmed that novel subcategories like *zaths* are judged to have lower likelihood of possessing prototypical properties (e.g., *live underground*) than their categories (e.g., *ants*), replicating Gagné and Spalding (2014). In addition, adding a typical modifier (e.g., *black zaths*) did not improve the likelihood of those nonsense subcategories inheriting prototypical properties of the category. This finding indicates that the Modifier effect is not driven by semantic similarity as schema-based models would suggest. Results from Experiment 2 showed that modification with a nonsense word (*vaint zaths*) did further reduce judged likelihood of typical properties. Taken together these results suggest a pragmatic strategy underlies the Modifier effect, rather than anything involving the semantics of the concepts.

Our results show that adding a modifier to a novel subcategory has no effect if the modifier is typical, but has a negative effect on truth judgments if the modifier is also novel. Neither of these results fits with the prediction of a schema-based account of the effect, since the typical modifier should increase similarity to the parent concept (*ants*) while the addition of a nonsense modifier cannot change the similarity of the already novel subcategory to the parent concept.

As Gagné and Spalding (2011; 2014) argue, people are applying a pragmatic heuristic to their judgments, based on a meta-belief that subcategories are expected to be distinct from their superordinate category, and hence are judged less likely to possess prototypical properties of those categories. Each time a subcategory is formed (e.g. *ants > zaths > vaint zaths*) then confidence in the inheritance of default properties is reduced. The fact that *black zaths* were no different from *zaths* suggests that this heuristic can be moderated by the typicality of the modifier itself, as originally shown by Connolly et al. (2007).


