

Nominal Hierarchies: Hierarchical information interacts with shape on a novel word task

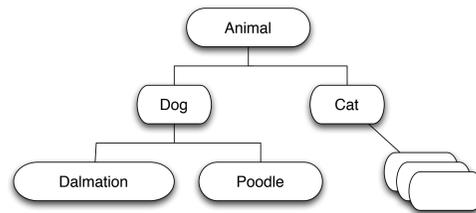
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Background & Motivation

This research examines whether identification of object kind is guided by hierarchical information regarding the object in question.

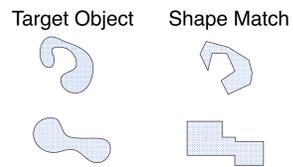
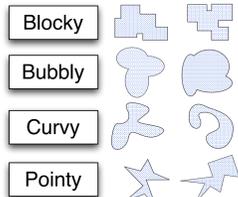
Research on structural hierarchies has investigated the mechanisms underlying the acquisition of inter-lexical relationships (Markman, 1989; Rosch et. al., 1976; Waxman & Gelman, 1986). We focus on whether acquisition of these relations is guided by a strict hierarchy bias (SHB). In a strict hierarchy, the set of possible referents of a subordinate term is a subset of the possible referents of the superordinate term. E.g., the set of possible entities that 'dog' refers to is a subset of what 'animal' refers to: All dogs are animals. However, not everything fits into a strict hierarchy: not all mushrooms are poisons.

Given that natural kinds often follow strict hierarchies, a SHB could aid word learning. It could guide a child's construction of inter-lexical relationships and delimit the real-world extensions of new words. The SHB would thus interact with other biases proposed in the literature.



Stimuli

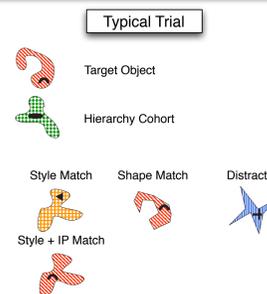
180 unique geometric shapes were used as stimuli, evenly divided into four taxonomic classes.



36 objects were randomly selected to be *target objects* and 36 *shape match* objects were created such that they matched the target in overall shape, but were of a different taxonomic class.

From the remaining objects, 36 *style match* objects were randomly selected from the same taxonomic class as the *target object*.

All objects were normed to ensure that (i) the style-property defined a recognizable class and (ii) that the individual shape-match did indeed match the target object in shape.



Shapes were randomly assigned internal pattern, color and internal detail properties (incidental properties, IP).

Objects were divided into trials. Participants saw the target object and another random object from the same class, and were required to choose one of three test objects, a *style match*, *shape match* and an unrelated *distractor*.

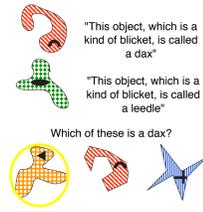
Experiment 1

This experiment was an eye-tracking study that pits SHB against the shape bias, to test which is more powerful in guiding adults' interpretation of novel words.

Predictions

If only the shape bias is present, we expect that they will choose the *shape-match* in all conditions. If the SHB is present, however we would expect them to choose the *style-match* in all conditions.

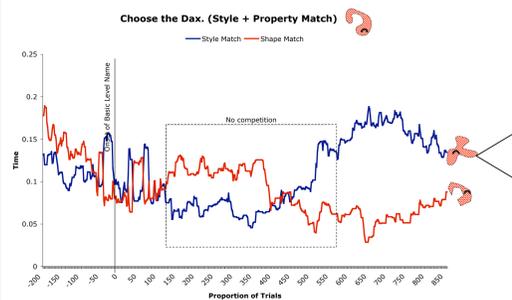
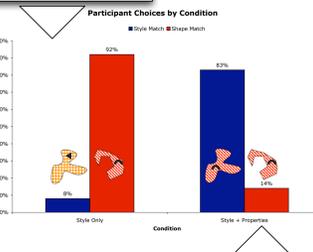
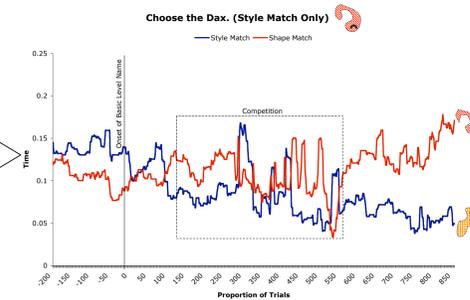
Style Only Condition



In this condition the style-match object (circled in yellow) matches the target only in style.

Online Results
Eye-tracking results reveal competition between *shape-match* and *style-match* object. Effect of hierarchy information.

Behavioral Results
Participants overwhelmingly chose the shape match over the style match. This result goes against the hierarchical information, suggesting that factors other than hierarchical inclusion affect their final decisions regarding object kind.

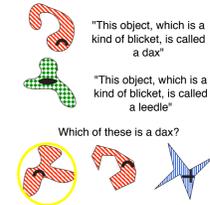


Behavioral Results
In this condition, participants overwhelmingly chose the style-match object over the shape-match object. This suggests that when all else is equal (i.e. incidental properties are identical) hierarchical information plays a larger role than overall shape in identifying object kind.

Online Results
No competition, trend for participants to examine the *shape-match* very early on, and then rapidly shift to the *style-match*.

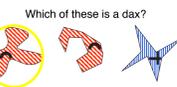
In this condition, the style match object (circled in yellow) is identical to the target on all incidental properties.

Style + Property Condition



"This object, which is a kind of blicket, is called a dax"

"This object, which is a kind of blicket, is called a leedle"



Conclusions and Ramifications

- A previously-uninvestigated bias, the Strict Hierarchy Bias, influences semantic processing and guides adults' interpretations of new words during real-time processing.
- This finding is relevant for lexical acquisition in adulthood, and also raises the possibility that children use SHB during word learning

Experiment 2

This experiment was an off-line study, that tested what happens when people receive no linguistic category information.

Predictions

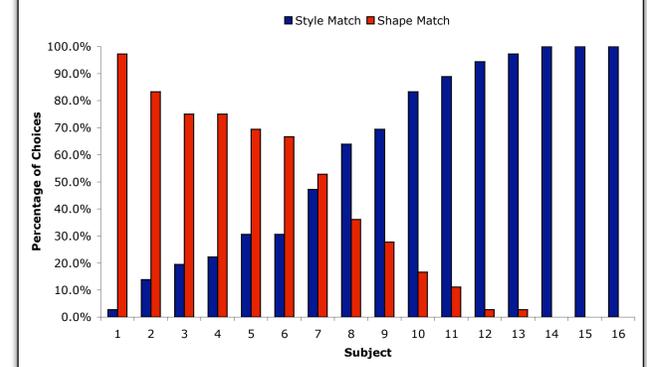
If the hierarchy information is playing no role in participant's selections, then we expect that these results will be identical to the results of the style + property condition of experiment 1.

Design

It is unclear whether participant's selections in experiment 1 are due solely to the SHB. This experiment tested this possibility, by examining whether subject responses differed in cases where the SHB is no longer applicable. This experiment was identical to experiment 1, except:

- It was off-line
- Participants did not receive any hierarchical inclusion information (linguistic cues, hierarchy cohort)
- All test objects matched the target in all IP's (similar to Style + Property Condition of experiment 1)

Choices by Subject



Results

No overarching preference for either Style-Match or Shape-Match. Instead a bimodal distribution: a participant tends to opt for one or the other. This contrasts with experiment 1, where within each condition, choices were incredibly consistent among all subjects.

- The results of experiment 2 suggest that even when no hierarchy information is present, individuals differ upon what sort of shape-related properties they take to be relevant to object kind.
- This suggests that the 'shape bias' may not be a unified phenomenon.