Availability and Category Structure Determinants in Instantiation of Artifact and Natural Kind Concepts Using Features, Rated Similarities and Associations

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According to the instantiation principle, tasks that require the assessment of within-category structure, such as categorization and typicality judgments, are based on a limited subset of members from that category (Heit & Barsalou, 1996). To date, the mechanism on which instantiation is based has not been considered into detail. Crucially, in the few studies that investigated this proposal with natural concepts (e.g. Storms, De Boeck, & Ruts, 2000), the generation frequency of exemplars for a certain category was used as a measure of probability of instantiation. This introduces circularity, since this measure already reflects the typicality of category-members.

In this study, we investigate alternative instantiation processes in three semantic models based on associations, features and rated similarities.

Models

Proximity Measures

For 323 concepts from 12 different categories (e.g. fruits, vegetables, birds, vehicles) we obtained three qualitative different sources of proximity measures based on associations, rated features for each of the exemplars, and judged pair-wise similarities, together with typicality ratings for each concept (see Ruts et al., 2003). Rated similarities provided a direct measure of proximity. For the feature and association models, proximities were derived by creating a vector space, similar to LSA, containing features or associations by calculating proximities as the cosine between each vector pair.

Instantiation Measures

We identify two different principles on which instantiation can be based: (1) internal category structure, and (2) availability heuristics. According to the internal structure account, concepts that are central in the category space are instantiated. Alternatively, the most often encountered concepts (based on word frequency) or earliest acquired concepts (based on age of acquisition, AoA) might be instantiated more likely.

Experiments

Semantic Categorization

Decision latencies were obtained for each of the 323 concepts in two semantic categorization tasks. The two experiments differed in the use of fillers. In experiment 1, 44 participants performed a task where fillers were unrelated to the test items, while in experiment 2, 43 different participants performed a similar experiment with related fillers. The procedure consisted in the presentation of the category label at the beginning of each block, followed by the sequential presentation of the randomized list of test-items and fillers. Block presentation order was also randomized.

Results

Reaction times were best explained by the association model; while typicality data was captured to a larger extend by the feature model. For both types of data, rated similarities did not provide a good explanation of the data. Instantiation based on AoA gave a better account than word frequency based instantiation. Both these availability measures explained more variance than all internal structure measures of instantiation. The optimal number of instantiated exemplars was on average 15 for the association model and 10 for the feature model, thus showing that neither a prototypical exemplar nor a model consisting of the total set of category members gives the best account for the observed data. Finally, it should be noted that the association model captures this data well, even though the vector elements are not restricted to category-related information.

Acknowledgments

References

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