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Authors

Wiemer-Hastings, Katja
Graesser, Arthur C.

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Interconcept Organization of Abstract Nouns, Concrete Nouns, and Verbs: Hierarchical versus Matrix Representation

Katja Wiemer-Hastings (KWIEMER@CC.MEMPHIS.EDU)
Arthur C. Graesser (A-GRAESSER@MEMPHIS.EDU)
The University of Memphis, Department of Psychology, CAMPUS BOX 526400, Memphis, TN 38152-6400

Two interconceptual organization forms can be distinguished: matrix organization (MO), where the interrelations of concepts are cross-classified, and hierarchy organization (HO), where concepts fall into separate word classes that are organized hierarchically. Graesser, Hopkinson & Schmid (1987) reported supportive data for the hypothesis formulated by Huttenlocher & Lui (1979) that verbs are interrelated in a matrix fashion and nouns are organized in hierarchies. Graesser et al. found that unconstrained sorting of nouns was better predicted by a constrained hierarchical sorting task (which taps HO) than by similarity ratings (which taps MO). The results for verbs, however, drifted toward the matrix end of this organization continuum.

Interestingly, most hierarchy models for nouns do not include abstract nouns. Presumably due to their lack of perceivable attributes, they present a difficulty. Experiment 1 is a replication of the experiment by Graesser et al., but explicitly compares abstract and concrete nouns.

Experiment 1. Some abstract nouns are derived from verbs (e.g., *react-ion*). Thus, one could claim that they must resemble verbs in their organization. However, they are nouns, so, according to Huttenlocher & Lui, they should be organized in a hierarchy. The purpose of this experiment was to contrast three word sets (32 words each) that were randomly sampled: One with concrete nouns (e.g., *bassoon)*, one with verbs (e.g., *react*), and one with abstract nouns derived from the verbs (e.g., *reaction)*. 60 subjects completed an unconstrained sort task, a similarity rating for all word pairs in the set, and a hierarchical sorting task.

A multiple regression analysis was performed to assess the extent to which the cooccurrence of word pairs in one category in the unconstrained sort task could be predicted by MO and HO. The beta weights are different for abstract nouns (b_{HO} = .53 / .15, b_{MO} = .32 / .34) and verbs (b_{HO} = .22 / .35, b_{MO} = .52 / .32). This supports the view that they are organized in different ways. With respect to abstract and concrete nouns, the results were inconsistent. The pattern of one set confirmed the results of Graesser et al. ($b_{HO} > b_{MO}$). For another set, MO and HO score were about equal. A second experiment was designed to dissect the conflicting results.

Experiment 2. We suspected that the findings of Graesser et al. as well as in the present experiment might have depended on the selected word sample, which may or may not fall nicely into hierarchies. To test this, eight adjacent categories (like *artifacts, plants, abstract objects* etc.) were selected from the ontological hierarchical tree model for concepts proposed by Keil (1979). For each category, 30

nouns were randomly sampled. For word set 1, two nouns were randomly selected out of each category. For set 2, eight nouns were selected out of two adjacent categories. For set 3, sixteen words were selected out of one category. If the effects found for nouns by Graesser et al. were due to sampling, a clear prediction advantage of the HO should be found for set 1. For set 2, the prediction by HO should be lower, the one by MO higher than for set 1. For set 3, MO should be a much better predictor than HO.

All of the predictions were supported. For set 1, the unconstrained task was predicted better by the HO score than by the MO score (b_{HO} = .74 > b_{MO} = .14). For set 2, the beta weights were about equal (b_{HO} = .41, b_{MO} = .48), with MO higher and HO lower than for set 1. For set 3, MO was significantly higher than HO (b_{HO} = .03 > b_{MO} = .83).

Discussion. The results suggest a modification of the hypothesis of Huttenlocher & Lui. The data demonstrate that sets of verbs and nouns can be organized in similar ways, depending on the words in the total reference set. Further research will have to show whether there are *verb* sets that are organized *hierarchically*. It is conceivable that both organization forms, HO and MO, can be found for verbs, too, like it was found for nouns in experiment 2. Further experiments are required to investigate on differences between the organization of abstract vs. concrete nouns, as the reported findings are confounded with word selection.

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