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# Category Learning and Comparison in the Evolution of Similarity Structure

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## Abstract

Tests of the influence of categorization and comparison on the representations of relational categories show: 1) a category-based similarity effect, and 2) an indirect role of comparison via facilitated learning with pairwise presentation.

The paths of explanatory power between similarity and categorization are difficult to trace. We suggest an evolution of the representations over which similarity operates following from category-level constraints. There is now evidence that learning to co-categorize items can increase their similarity (Kurtz, 1996) and even alter their perception (Schyns et al., 1997; Livingston et al., 1997). The present research further addresses these phenomena and asks whether these changes come about through learning sophisticated feature spaces (Kurtz, 1997) or through comparison processes that abstract, extend or alter structured representations (Gentner & Medina, in press).

**Method** Ss were shown pictures of rock arrangements (see Figure 1) and asked to classify them as to which of 3 cultures were the builders. Each category of 5 examples had a relational basis: 2 rocks on top of each other with same color and shape, a rock supported by 2 rocks, and a downward slope from left to right.

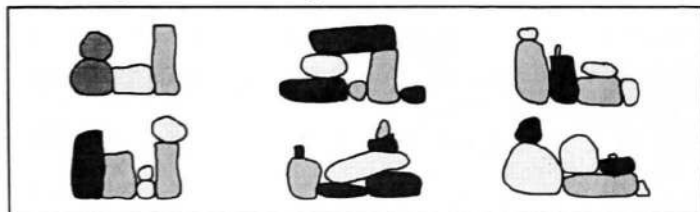


Figure 1. Sample Rock Stimuli

In one condition (Cat1), single item presentation was used. In a second condition (Cat2), each trial consisted of two examples shown together to invite comparison; Ss were asked to classify the pair (drawn from the same category). Both groups received corrective feedback after each trial and continued until reaching a criterion of 90% accuracy over an epoch of 30 presentations. In Cat1, an epoch was two passes through the 15 training examples. In Cat2, an epoch was one pass through each possible pairing.

After a transfer test, Ss rated the similarity (on 1-7 scale) of pairs drawn from one of two sets that included 30 training pairs (old-old) and 12 transfer pairs (old-new). Half

were same-category and half were different-category pairs. A Control group gave similarity ratings in the same manner without receiving prior exposure to the stimulus materials.

**Results and Discussion** We focus on two main findings. First, the data extend earlier findings of Kurtz (1996) to well-defined relational categories. We found increased similarity ratings of same-category pairs without decreased ratings of different-category pairs by Ss with category training compared to controls (see Table 1). Second, comparison served to facilitate category learning and possibly to promote re-representation. Ss in Cat2 took 2.7 epochs to reach criterion compared to 5.7 epochs in Cat1. The similarity data suggest that the influence of categorization on re-representation may be greater with pairwise presentation.

Table 1: Similarity Ratings.

Condition	Training		Transfer	
	Same	Diff	Same	Diff
Control (n=15)	3.75	2.63	3.64	2.74
Cat1 (n=23)	5.02	2.82	4.58	3.12
Cat2 (n=23)	5.14	2.62	4.87	3.04

In sum, we have shown a category-based similarity effect and facilitation of learning with pairwise presentation.

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## References

- Gentner, D. & Medina, J. (in press). Similarity and the development of rules. *Cognition*.
- Kurtz, K.J. (1996). Category-based similarity. *Proceedings of the 18th Annual Conference of the Cognitive Science Society* (pp. 790). Hillsdale, NJ: L. Erlbaum Associates.
- Kurtz, K.J. (1997). *The influence of category learning on similarity*. Doctoral dissertation, Department of Psychology, Stanford University, Stanford.
- Livingston, K.R., Andrews, J.K. & Harnad, S. (in press). *Categorical perception effects induced by category learning*. *Journal of Experimental Psychology: Learning, Memory and Cognition*.
- Schyns, P.G., Goldstone, R.L. & Thibaut, J-P (in press). *The development of features in object concepts*. *Brain and Behavioral Sciences*.