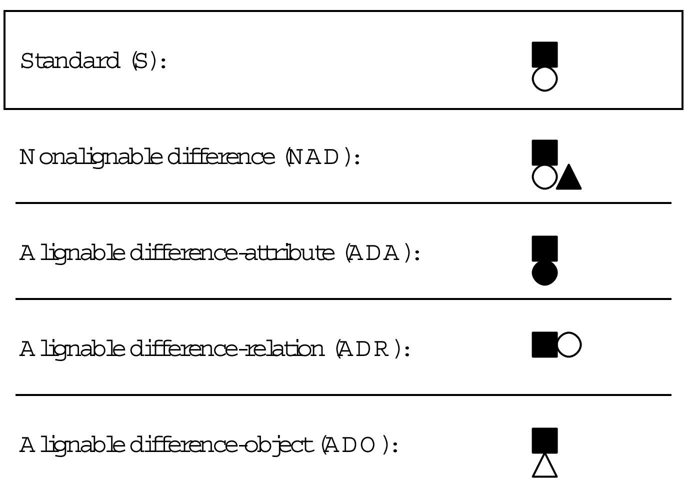
Structural Alignment in Similarity and Difference of Simple Visual Stimuli

Zachary Estes (zcestes@princeton.edu)
Uri Hasson (hasson@princeton.edu)
Department of Psychology, Princeton University
Princeton, NJ 08544-1010, USA

The present investigation tested the predictions of Structural Alignment theory (Gentner & Markman, 1997) in similarity and difference judgments of simple visual stimuli. Alignment theory explains comparison as a process of aligning the structure of one stimulus with the structure of the other stimulus. The theory makes a critical distinction between alignable differences, which are related to commonalities in the structures of two stimuli, and nonalignable differences, which have no structural correspondence in the two stimuli. Examples are shown in Figure 1. The difference between the standard stimulus S and the NAD stimulus is nonalignable because S has no element that corresponds to the black triangle in NAD. The difference between S and the ADA stimulus, on the other hand, is alignable because the white circle in S is aligned with, or corresponds to, the black circle in ADA. Alignable differences may also occur in the form of a different object (ADO) or a different relation between objects (ADR).

Figure 1: Stimuli used in Experiments 1 and 2.



These distinctions are critical for predicting similarity and difference judgments. Alignment theory predicts that "alignable differences count more against similarity than nonalignable differences" (ibid, p. 50). That is, items with an alignable difference (i.e., ADA, ADR, and ADO) should be judged less similar to (and more different from) the standard than should items with a nonalignable difference (i.e., NAD). A second prediction is that the more different the alignable difference is from the standard, the more it will detract from similarity (see Markman & Gentner, 1996).

Experiments 1 and 2. Stimuli consisted of all possible pairs of items shown in Figure 1 (excluding the standard stimulus), thus creating 6 item pairs. For each item pair, participants judged which of the two stimuli was more similar to the standard stimulus (Experiment 1) or more different from the standard stimulus (Experiment 2).

Table 1: Proportions of similarity and difference choices.

Item pair	Similarity	Difference
(1) ADA & ADO	ADA = .65	ADO = .70
(2) ADR & ADO	ADR = .55	ADO = .58
(3) ADA & ADR	ADA = .74	ADR = .57
(4) NAD & ADA	ADA = .74	NAD = .72
(5) NAD & ADR	ADR = .69	NAD = .68
(6) NAD & ADO	ADO = .53	NAD = .50

Discussion. Comparisons (1) and (2) in the Table above show that, of the items with alignable differences, ADO was most different from S. Comparison (3) shows that ADA was the least different from S, with ADR falling in between. Having established this hierarchy of alignable differences, we next examined whether the degree of difference of an alignable difference from S did affect the degree to which that alignable difference detracted from similarity (when judged with a nonalignable difference). As predicted, comparison (4) shows that the least different alignable difference detracted the least from similarity judgments (i.e., ADA = .74), while (6) shows that the most different alignable difference detracted the most from similarity judgments (i.e., ADO = .53). These findings extend and replicate those of Markman and Gentner (1996).

However, as apparent in the Table, in no case did an alignable difference (i.e., ADA, ADR, or ADO) detract more from similarity judgments than did a nonalignable difference (i.e., NAD). On the contrary, ADA and ADR actually counted less against similarity (and conversely more against difference) than did NAD. This result does not support the prediction of alignment theory.

Potential explanations of this failure to support alignment theory are that (i) alignment theory is not applicable to simple visual stimuli, (ii) the alignable differences used in these experiments were not sufficiently different, or (iii) NAD was not really a nonalignable difference, but rather was an alignable difference in the number of elements in the item. We would be delighted to discuss these and other possibilities with you at our poster.

References

Gentner, D. & Markman, A. B. (1997). Structure mapping in analogy and similarity. American Psychologist, 52, 45-56.

Markman, A. B. & Gentner, D. (1996). Commonalities and differences in similarity comparisons. Memory & Cognition, 24, 235-249.