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Constraints on the production and evaluation of analogies

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Introduction

Over the past twenty years, a large amount of research has been conducted on subjects' ability to use analogy in a wide variety of contexts. An issue that has received particular attention is the relative use of structural and superficial similarity in analogical reasoning. Research has shown that structural similarity determines how people establish mappings between source and target and how they evaluate analogical matches. However, empirical work has also shown that the retrieval of analogical sources is mostly constrained by superficial similarity between the source and target. Generally, people retrieve sources if they have high superficial similarity with the target.

An important feature of previous laboratory studies is that subjects were provided with one, or a set of sources to retrieve from rather than generating their own sources. Real-world studies of analogical reasoning, where people generate their own sources, have shown that in those situations, analogies are mainly based on structural similarity (Blanchette and Dunbar, 1997; Dunbar 1996). In both the laboratory and the real-world studies, people need to retrieve a source. In laboratory studies, subjects retrieve from a predetermined and externally generated set, whereas in the the real-world studies, they retrieve the analog from their own knowledge base in long term memory. The discrepancy between real-world data and laboratory data was the focus of the present experiment. We hypothesized that when subjects are asked to generate their own analogies, they would generate analogies based on structural, and not superficial similarity. We used a target problem of political nature (the zero-deficit issue) to see whether they would produce analogies based on surface or structural similarity, or both.

Method

Subjects were put in a hypothetical situation where they had to imagine they were consultants hired to generate analogies to be used in a campaign either to argue for or against obtaining a zero-deficit. Participants were allowed 20 minutes to generate analogies. Subjects completed the task either in groups or individually. Participants were also asked to select their best two analogies.

Analogies were coded for structural and superficial similarity. For each analogy, the underlying structure was identi-fied. Analogies with similar structures were grouped into categories. The number of elements explicitly stated in both the source and the target was also recorded.

Superficial similarity was coded as either high or low. Sources were coded as having high superficial similarity if they mentioned money, budgets, personal finances, or if they were taken from the wider domain of politics or economics.

Results and discussion

The analogies produced by the subjects showed complex and varied underlying structures. A total of 262 analogies were produced and most exhibited a systematic underlying structure common to the source and target. These structures fell into one of ten identified categories. In the majority of these analogies (n=191, 73%), there was high structural similarity, but low superficial similarity. In these analogies, the source domains were very different from the target deficit problem but the structure underlying the source and target was the same. Only 71 (27%) of all analogies had high superficial similarity between the source and the target. These analogies used sources such as family budgets, debts, and mortgages. These results indicate that the retrieval of sources was not highly constrained by superficial similarity. This is contrary to what has been observed in laboratory studies asking subjects to retrieve sources from a predetermined set.

In addition to influencing the generation of analogies, structural features also influenced the evaluation of analogies. Analogies chosen as best ones contained, on average, a greater number of elements in the source. Because the analogies were based on complex relational structures, a greater number of elements is indicative of greater explicit structural similarity.

Conclusions

The results of the present study indicate that when subjects are put in a context where they generate, rather than being given sources, they will propose analogies that are not superficially similar to the target. This is consistent with the hypothesis that type of task given to the subjects will determine whether or not memory search is based on superficial features. Overall, these studies and our investigation of real-world reasoning indicate that people are indeed capable of generating and using analogies based on structure.