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Metaphors and conceptual structure☆

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Abstract

The paper focuses on the relations between metaphor use and a particular kind of conceptual organization: taxonomic categorization. The introductory section reviews some recent studies suggesting that various aspects of the use of metaphorical mapping (in, e.g., metaphor identification, appreciation and development) are constrained by the structure of the taxonomic categories to which the concepts comprising the metaphor belong.

However, most of these studies do not relate directly to a crucial question: what kind of conceptual structure is the 'product' of metaphor interpretation? The present paper develops a recent answer (made notably by Glucksberg and Keysar, 1990), namely, that metaphor consists of an ad hoc categorization of the concepts comprising the metaphor. Developing this view, the present paper suggests that some of the principles underlying metaphorical ad hoc categorization are identical to the major principles underlying natural, common categorization.

The paper focuses on principles and phenomena relating to two major aspects of categorization: (1) The internal, prototype structure of categories; (2) The basis of categorizing a set of objects into a category. Two experiments are described, which provide some empirical support for the proposal that these categorization principles equally apply to ad hoc, metaphorical categorization.

1. Introduction: Taxonomic categories constrain aspects of metaphor use

Recent studies of metaphor have become increasingly engaged in exploring the way metaphor is constrained by our conceptual organization, particularly by a special kind of conceptual organization – taxonomic categories. These studies have mainly been concerned with the refutation of the traditional view according to which metaphor consists of the mapping of an isolated concept (the source) onto another

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isolated concept (the target). Unlike more traditional views of metaphor, various modern studies have provided evidence that metaphor consists of the mapping of an entire conceptual domain (rather than an isolated concept) onto another one. Furthermore, the notion of 'domain' has been widely interpreted as standing for a specific type of conceptual domain, namely those taxonomic categories to which the concepts comprising the metaphor belong. The general argument, then, is that (various aspects of) metaphor use are highly constrained by the structure of the taxonomic categories to which the concepts comprising the metaphor belong. This has been the main context in which students of metaphor have studied taxonomic categorization. Let us briefly review some of these studies.

Perhaps the most obvious constraint is revealed in the very definition of metaphor as the mapping of concepts from one domain (i.e., a category) onto another. Such a definition implies that the very existence of metaphors presupposes the existence of taxonomic categorization. For example, in the metaphor 'Rage is a volcano', the concepts comprising the metaphor belong to two different categories, namely, 'emotions' and 'natural phenomena', respectively. By contrast, what presumably renders literal comparisons like 'Museums are like galleries', or 'Cigarettes are like cigars', literal (i.e., non-metaphorical) is the fact that they compare concepts belonging to the same common categories (see e.g., Shen, 1992). Our common stable categories constrain metaphor identification, in that metaphorical comparisons must violate the common categorization in order to be identified as such. (See Shen, 1992, for an elaboration of some empirical support of the above argument.) The above argument can be extended to predicative metaphorical expressions, i.e., metaphors consisting of a predication on some argument. Thus, 'An honest stone' is a predicative metaphor in which the adjective 'honest' predicates the argument 'thought'. According to a proposal put forward by Keil (1981), on the basis of Sommers' theory, our knowledge consists of ontological categories such as: conscious beings, plants, non-living inanimate objects, and events. Each concept belonging to such an ontological category is spanned by certain predicates. When a given predicate is attached to a concept which lies beyond its spanning scope, a metaphor is created. In the above case, the predicate 'honest', which normally spans the category of 'human beings', is applied to a concept from a different category, namely, 'stone', resulting in a metaphorical expression.

Keil (1981) reports experimental findings which support the above theory of metaphor identification. They indicate that the very distinction between metaphorical and literal predications is highly sensitive to categorization.

Other aspects of metaphor use (beyond metaphor identification) have also been shown to be constrained by the taxonomic categories dominating the source and target concepts.

One such aspect is metaphor appreciation. In a study conducted by Tourangeau and Sternberg in the framework of their theory of aptness in metaphors (Tourangeau and Sternberg, 1981), it was observed that in metaphor, aptness is highly sensitive to the 'distance' between the categories to which the concepts comprising the metaphor belong: the larger the distance, the more apt the metaphor becomes, all other things being equal. For example, the metaphor 'Ronald Reagan is a shark among world leaders', is judged as more apt than 'The wolf is the shark among (forest) animals'. The reason proposed is that the distance between the categories 'fish' and 'world leaders' (in the former case) is higher than the distance between the categories 'fish' and '(forest) animals'.

Another aspect of metaphor use which is constrained by taxonomic categorization is the development of metaphorical competence. Previous findings (presented by Keil, 1986) suggest that the development of the ability to interpret metaphors is highly constrained by factors pertaining to the scope of taxonomic categorization. In a study conducted by Keil (1986), it was found that the development of this ability proceeds on a domain-by-domain basis, rather than constituting an 'across the board' type of development. For example, the child's ability to understand a certain metaphor involving the mapping of 'texture terms' onto the category of 'human characters', e.g., 'John is smooth', develops at about the same age as his or her ability to understand other mappings between these two categories (e.g., 'John is smooth/soft/delicate'). Thus, a child's systematic ability to comprehend metaphors conforms to the scope of the category: if at a certain age, s/he understands a certain metaphorical expression, s/he is likely to understand all the mappings of the two categories involved. If, however, s/he does not understand one term, the child will in all likelihood understand none of the other mappings.

Yet another aspect of metaphor use which is constrained by the structure of taxonomic categorization is the conventionalization of metaphors in ordinary language. Lakoff and Johnson (1980) observed that metaphorical expressions which have undergone conventionalization in language represent instantiations of a larger 'system' of metaphorical expressions, organized around 'deep' conceptual metaphors. Consider, for example, the conceptual metaphor 'PERSONAL CHARACTERS ARE TEXTURE TYPES' (as in 'John is a smooth/soft/delicate person'). This 'deep' conceptual metaphor may generate several expressions which are instantiations of it, including 'John is a smooth/soft/delicate ... person'. The point made by Lakoff and Johnson is that the conceptual categories (domains) involved – in this case the category of 'human characters' and 'texture types' – constrain the conventionalization of expressions such as the one cited above. On the one hand, if a single mapping between these two categories has been conventionalized in a given language, it is more likely than not that other mappings between these categories will also be conventionalized. On the other hand, note that this process of conventionalization is restricted to members included in the scope of the categories in question. Somehow, this last point has not been made explicit in previous studies of conventional metaphors.

By the same token, it has been observed (see Keil, 1986; Kittay and Lehrer, 1981) that, historically, as soon as one member of a semantic field (say, 'smooth' as part of the semantic field of 'texture terms') becomes extended metaphorically, so also do the other members of the field (e.g., 'slippery', 'rough' and 'soft'). Admittedly, the notion of a 'semantic field' differs in some respects from the notion of a taxonomic category, since taxonomic categorization is only one major conceptual organization which can be lexicalized in language. Nevertheless, categories make an important contribution to the aforementioned examples.

In sum, then, most recent research into the role played by taxonomic categorization in metaphor use has focused on the notion that metaphor consists of the mapping of entire domains, rather than isolated concepts. Its emphasis, therefore, was on the ways metaphor use is constrained by these categories.

2. Metaphorical mapping consists of an (ad hoc) categorization

Note, that most of the above studies, while pertaining to various aspects of metaphorical mappings, do not relate directly to one crucial question: What is the very nature of the mapping itself? Put differently: What kind of conceptual structure is the 'product' of metaphor interpretation (or its 'ground' or 'shared property' or 'matching property' or related terms)?

Recent studies of metaphor comprehension, notably Glucksberg and Keysar (1990), as well as Shen (1989, 1992), Honeck et al. (1987) and others, have developed a new answer to this question. Their response takes into consideration a totally different, though equally important, kind of relation between metaphor (comprehension) and taxonomic categorization. It relies on the assumption that metaphorical mapping consists of an (ad hoc) *categorization* (that is, grouping) of the conceptual world (see Barsalou, 1983; Glucksberg and Keysar, 1990; Shen, 1989, 1992). Under this view, the producer of the metaphor 'Rage is a volcano' is suggesting an alternative grouping of 'rage', this time with 'volcano', as members of an alternative ad hoc category which can roughly be described as 'things that erupt violently and unexpectedly'. (This is merely a label for a certain semantic/conceptual content which represents the ad hoc category in question, rather than the only possible verbal description of this content; alternative verbal descriptions of the assumed conceptual content are equally adequate.)

The notion of metaphor as an ad hoc categorization is still in its infancy in many respects, and needs further development. The present paper focuses on a central question, left unanswered by previous studies. What are the principles underlying the ad hoc re-grouping associated with metaphorical mapping? In response I would like to propose the following thesis:

> The principles underlying metaphorical ad hoc categorization are identical (to a large extent) to the major principles underlying natural, common categorization (see Shen, forthcoming, for an elaboration of this argument).

Clearly, my proposal adopts the strong form of the notion of ad hoc categorization, to argue that the ad hoc category created is a 'natural' category, not merely a class, or an arbitrary conglomeration of elements sharing a certain property (or properties). Its 'naturalness' derives from its conformity to major principles of common natural categorization.

In order to demonstrate the analogy between principles of natural taxonomic categorization, and principles of metaphorical categorization, I will introduce several similarities between the principles and phenomena of taxonomic categorization (based on recent studies of object categories like 'animals', 'plants', 'human artifacts') and the corresponding principles and phenomena of metaphorical categorization.

Note that the term 'metaphorical categorization' covers various cases of groupings of metaphorically related concepts, that is, of concepts belonging to different taxonomic categories, such as 'metaphor' in its restricted sense, comparisons, analogies and so on.

I will focus on principles and phenomena relating to two major aspects of categorization: (1) The internal structure of categories, i.e., the prototype structure; (2) The basis of categorizing a set of objects into a category.

3. Taxonomic and metaphoric categorization share similar principles

3.1. The internal structure of categories: The prototype structure

Unlike the classical (Aristotelian) view of categorization, modern approaches to categorization (e.g., Rosch, 1975, 1978) have shown that categories are prototypically structured: certain members are shown to be more prominent, or more prototypical than others: 'a robin' is a more prototypical member of the category 'bird' than 'a chicken', and 'a chair' is more prototypical than 'a carpet' with respect to the category 'furniture', and so on.

This prototype structure has several implications with regard to the way concepts are organized in memory, which in turn affects comprehension. Let us briefly review two such phenomena.

The first phenomenon has to do with the accessibility of a given member in the context of its respective category. Studies of taxonomic categorization (e.g., Rosch, 1975) have argued that prototypical members are more accessible in memory than non-prototypical members, in the context of their superordinate category. For example, Rosch (1978) showed that when subjects are presented with labels for categories (e.g., 'bird') and are asked to list the first four members of each category that comes to mind, they, typically, tend to come up with prototypical members (e.g., 'robin', 'sparrow') first, while non-prototypical ones (e.g., 'penguin', 'chicken') are usually not activated at all, or are infrequently activated.

The corresponding phenomenon in the case of metaphorical categorization has to do with effectiveness in prompting the recall of the metaphorical 'ground'. In an important study conducted by Verbrugge and McCarrell (1977), the authors found that the grounds were more effective in prompting recall of sentences containing the original vehicle than of sentences containing the original topic. These experiments clearly suggest that, in the context of the metaphorical ad hoc category, the more prototypical member (the vehicle) is more accessible in memory than the less prototypical one (the topic). (See Shen, 1992, for an elaboration of this argument.)

A second phenomenon has to do with the directionality of comparisons between (taxonomically and metaphorically related) concepts. A major characteristic of concepts which are taxonomically related is that, when placed in a comparison structure

('A is like B'), they show a basic asymmetry which is directly related to their respective prototypicality (see Tversky, 1977). These studies imply that a less prototypical member of a given category is conceived of as closer (i.e., more similar) to the more prototypical member than vice versa.

For example, Tversky and Gati (1978) argue, on the basis of a series of well-known studies of judgments of similarity, that the comparison 'Poland is like Russia' is preferred (as making more sense, as showing higher similarity and so on) than its inverse 'Russia is like Poland'.

A corresponding asymmetry has been pointed out in metaphors (see e.g., Ortony, 1979; see also Glucksberg and Keysar, 1990): when reversed, metaphorical comparisons yield either anomalous comparisons (i.e. comparisons to which it is relatively difficult to assign interpretation) or an entirely different interpretation. (This has been discussed elsewhere, see Shen, 1989.)

4. Prototypicality and sentence structure in recall

The preceding two phenomena reflect the analogy between taxonomic and metaphorical categorization with respect to the prototype structure of both category types. This analogy, however, can be extended to another major aspect, which has not been previously investigated: *the sensitivity of sentence structure to the prototypicality of the concepts it presents.*

Let us start with taxonomic categorization. Consider, for example, the following sentences:

[1] a. 'The man bought an orange and a lemon in the grocery store'
b. The man bought a lemon and an orange in the grocery store'

The difference between [1a] and [1b] is that, in the former, the prototypical member of the category mentioned (an orange) occurs before the non-typical member (a lemon), while in [1b] the order of presentation is inverted. Kelly et al. (1986) have examined the relationships between prototypicality and the structure of sentences in recall, preference ratings, and natural dictionary definitions. Their main finding was that sentences such as [1b] were systematically changed in recall to place prototypical instances of categories before non-prototypical instances. In addition, they have pointed out that sentences such as [1a] were judged as more natural than sentences such as [1b]. Based on these findings we may formulate the following principle pertaining to taxonomic categorization:

[2] Prototypical concepts of a taxonomic category represented by the sentence predicate tend to precede non-prototypical ones.

The corresponding phenomenon in metaphorical categorization occurs in a figure of speech called 'zeugma'. In zeugma a word stands in the same relation to two other non-synonymic terms. Usually a verb governs two objects, as in: 'She caught an aeroplane and a husband'. Under the present view, the zeugma constitutes a kind of a (metaphorical) *category*, in which the predicate represents the category label, while its arguments represent the 'members' or 'instances' of that category. Consider, for example:

[3] a. 'The boy swallowed milk and kisses in his warm bed'
b. 'The boy swallowed kisses and milk in his warm bed'

In [3a] the predicate represents a category ('things one swallows'), whose members are 'milk', and 'kisses'. Note, that this is a metaphorical category since the members are metaphorically related to each other. The question of interest now becomes whether the principle in [2] may be extended to cases of zeugmatic structure as well. In other words, assuming that 'milk' is more prototypical than 'kisses', would [3a] represent a more 'basic' or 'natural' order than [3b]? In order to answer this question, I conducted an experiment which basically replicates Kelly et al.'s recall experiment design, but this time with metaphorically related concepts. Let me briefly report on this experiment. (For an elaboration see also Shen, forthcoming).

4.1. Method

Subjects: 32 undergraduates of Tel-Aviv University (mean age 25 years), two of which were males. All subjects were Hebrew native speakers. They volunteered to fill the questionnaire during one of their classes.

4.2. Materials

A set of 14 pairs of questions and answers were composed (a sample of pairs used in the experiment is introduced in Table 1). Each answer consisted of a predicate (a verb or an adjective) and two nouns referring to two members of the predicate (ad hoc) category. One noun was high, and the other low, in prototypicality of the (ad hoc) category represented by the predicate, as in [3].

Table 1
Sample of pairs used in Experiment 1 (Translated from Hebrew)

1. What did the baby do?
The baby swallowed milk (kisses) and kisses (milk).
2. What happened in the opening scene of the movie?
In the opening scene the hero smelled a flower (light) and a light (flower).
3. What did the man dream?
The man dreamed that he has crossed his love (road) and his road (love).

The relative prototypicality of each noun relative to its corresponding predicate was normed in advance. Three judges were given the pairs of nouns appearing in the above questionnaire, each were accompanied by its respective predicate (e.g., for the pair of nouns 'milk' and 'kisses', the accompanying predicate was 'to swallow');

they were then asked to judge which of the nouns is the relatively prototypical and which is the relatively non prototypical member of the category represented by the predicate (e.g., 'things one swallows'). The judges reached an agreement of 90% (most disagreements were resolved through discussion).

Half of the sentences displayed the 'canonical order', namely, the highly prototypical noun was placed first, followed by the low-prototypical noun (as in [3a]). The other half of the sentences consisted of the inverse order (example [3b]). These were randomly presented to the subjects. Each subject read either the 'canonical order' of each pair or its inverse.

The repeated variable was the subject, since each subject was tested under two conditions, namely, the canonical and non-canonical orders of nouns (in the exposure phase). In all, each subject was exposed to 14 zeugmas: 7 in the canonical and 7 in the non-canonical order.

The questions that were paired with the sentences consisted of the 'framing' part of each sentence: for example, the question for the sentence in [3] was: 'What did the soldier do on his way to war?'. These questions were constructed so as to serve as cues for recall, without any mention of the category names or any of the nouns.

4.3. Procedure

The experiment was run in a classroom. In the first (exposure) stage of the experiment the subjects were asked to read the above list of question–answer pairs (as in Table 1). Then, after 7 minutes, they were told that they are about to be given a series of questions regarding the sentences they had previously heard, and that they are asked to answer each question as accurately as they could on the basis of what they remembered from the previous stage. At that point the experimenter started reading each question at a time. After introducing each question the subjects were given 15 seconds to write down their responses.

The general prediction was that the principle in [2] may be extended to metaphorically related concepts as well, and that the same pattern obtained in Kelly et al.'s experiment would be found. More specifically, the prediction was that the mean number of sentences which will be inverted in recall will be significantly higher for non-canonical sentences than for canonical ones.

4.4. Scoring

Each subject was assigned two inversion scores, separately for each condition: i.e., (1) How many of the seven canonically ordered zeugmas that he was exposed to, were inverted in recall? and (2) How many of the seven non-canonical zeugmas that he was exposed to were inverted in recall?

4.5. Results and discussion

A repeated measures analysis of variance was performed, in order to determine the inversion measure, namely, the number of cases in which the subjects inverted the original order of elements which they had initially [illegible]

My prediction was confirmed: the inverse measure for sentences with non-canonical order (*Mean*=0.594; *SD*=0.712) was significantly higher than for those with canonical order (*Mean*=0.219; *SD*=0.552): $F(1,31)=5.94$ $p<0.0208$.

These results clearly show that the subjects tended to reverse the order of the two nouns in each sentence when deviation from the canonical order occurred. The results, then, provide further support for the claim that the principle in [2] can be extended to metaphorical categorization.

In addition, a similar analysis was performed on the recall measure, namely, the number of sentences that were recalled (regardless of whether they were inverted in recall). The reason for conducting this analysis, was that Kelly et al.'s (1986) study (after which the present experiment was modelled), also measured recall. In that study measuring recall did not yield an unequivocal result, in that only in one type of sentences they have examined (phrasal conjunct) a significant difference was found in recall, while no such difference was found for declarative sentences (see Kelly et al., 1986). In order to gain some information as to whether the order (canonical vs. non-canonical) affects recall for zeugmas recall was also measured.

Scoring: Only sentences in which the two nouns were fully and correctly remembered were counted as recalled sentences. Sentences which were only partly recalled (i.e., those in which none or only one of the nouns was recalled) were not counted.

Each subject was assigned two recall scores: (1) How many of the seven canonically ordered zeugmas that he was exposed to did he recall (regardless of the order in which he recalled them)? and (2) How many of the seven non-canonical zeugmas that he was exposed to did he recall (regardless of the order in which he recalled them)?

This analysis yielded no significant difference between the recall of non-canonical (*Mean*=1.875; *SD*=1.40) vs. canonical order sentences (*Mean*=2.25; *SD*=1.586): $F(1,31)=2.07$, $p<0.1606$

In other words, recall was not improved significantly as a function of order of presentation of the nouns. As already explained, the Kelly et al. study, did not yield an unequivocal result, in that recall was affected by the order variable only under a certain condition (namely, the type of sentence used). A possible explanation for our results, namely, the fact that recall was not improved as a function of the order variable, is that two conflicting factors operated in recall: On the one hand, the naturalness of the canonical order increased its recall rate; on the other hand, the less natural order may have caused the subjects to spend more cognitive effort to comprehend those sentences, yielding a better recall for those sentences. The outcome of these conflicting factors may have resulted in non significant differences in recall between the two types of sentences.

5. The basis of categorization: Similarity of connected vs. isolated properties

The second major aspect of taxonomic categorization has to do with the basis of its formation. The question here is: What makes the class of entities (say, 'a robin', 'an eagle', 'a hawk' and so on) a coherent or 'natural' class. This question is crucial,

given the large number of ways of categorizing any given object, that is, of grouping it with other objects (see e.g., Goodman, 1968, and Murphy and Medin, 1985). In other words, what is the basis for the preference of certain groupings over others?

The standard answer, set forth by most studies of categorization so far (both classical and modern 'prototype' paradigms), emphasizes the key notion of 'similarity of features' (see Tversky, 1977; see also Murphy and Medin, 1985, for a discussion). The idea has been that members of a given category are similar to each other in that they share 'similar' features, or correlated sets of features. For example, various kinds of birds share, so the argument goes, several features which are common to all (or at least most) birds, and which are not shared by non-birds. Thus, members of this particular category supposedly share properties such as 'ability to fly', 'having feathers', 'having wings' and so on. Given that these properties are not shared by members of other categories, this similarity provides the basis for the grouping of such concepts as 'robin', 'eagle' and so on into the category 'bird'.

However, recent studies of categorization (see Murphy and Medin, 1985) have provided compelling arguments against such a 'similarity-based' approach, demonstrating its inadequacy in accounting for a large number of data categorization cases. One major idea emerging from these arguments is that similarity is a too general notion with respect to principles of grouping: it appears that people do not simply look for undifferentiated similarity between concepts, but rather seek the similarity of certain properties and not others. The question, of course, is: *Which properties are more central to the grouping?*

Several principles have been proposed in this respect. A major principle on which I would like to focus concerns the preference for connected over isolated properties as a basis for grouping. Let us elaborate on this point.

According to recent findings in the study of categorization (see Murphy and Medin, 1985), the properties of a given concept are not independent of each other. For example, all the properties that are characteristic of a bird do not make it a bird – unless these properties are held together in a 'bird structure' which provides causal and other explanatory relations between properties. Note that we are not talking about scientific explanations, but rather about our folk theories or beliefs regarding the concept. According to this view, properties which are related to other properties via these explanatory and causal relations are structurally more central than features displaying fewer relations. For example, the ability to fly is more central to the bird concept than the ability to sing, since it is interrelated in an explanatory fashion with other properties of birds such as 'having wings' or 'living in trees'. On the other hand, properties such as the bird's color do not participate in this explanatory system of interrelations.

Let us call the more central properties 'connected' properties, since they are not isolated properties, but are constrained by the 'bird structure', that is, they play some role in that structure, according to our folk theories about birds. Isolated properties are those which are not related to the other properties of the concept in question.

Turning back to the issue of grouping principles, the following principle is proposed:

[4] Similarity of connected properties is preferred over isolated ones in the classification of objects.

Various studies which have examined the principles used in classification tasks support this principle. Medin et al.'s comprehensive research (1987, studies 5 and 6) constitute a case in point. Here follows a schematic description of those aspects of their research which are relevant to the present paper. Subjects were presented with descriptions of hypothetical diseases, and were asked to classify them in the most natural way. Without going into too many details, the point was that the descriptions could be classified in one of two ways: either on the basis of isolated properties, or on the basis of connected properties. For example, descriptions A and B shared a pair of isolated properties such as 'earache' and 'high blood pressure', while C and D shared another pair of isolated properties such as 'sore throat' and 'skin rash'. Thus, subjects' reliance on isolated properties would generate the grouping of A and B in one category and C and D in another.

Alternatively, the four symptoms could be classified on the basis of connected properties. Thus, if A and C shared two connected properties, such as 'dizziness' and 'earache' (assuming that both are the result of an ear infection) and B and D shared another pair of connected properties, such as 'sore throat' and 'raised white cell count', grouping on the basis of connected properties would result in classifying A and C together, on the one hand, and B and D together, on the other.

The results clearly showed that the subjects tended strongly to classify objects on the basis of connected rather than isolated properties. Furthermore, they mentioned such links to justify their grouping decisions.

The Medin et al. study, then, provides some support for the grouping principle in [4], with respect to common taxonomic categorization, such as the classification of kinds of diseases.

Turning now to metaphorical categorization, the major source of evidence for the argument that the same grouping principle applies equally to metaphorical categorization, comes from a grouping experiment I have recently conducted. Let me briefly report on this experiment. The purpose of this experiment was to establish whether the above classification principle applies to metaphorically related concepts as well. (A full and detailed report is presented elsewhere (Shen, forthcoming).)

6. The experiment

The purpose of the experiment was to test the prediction that the principle in [4] determines the classification of metaphorically related objects. More specifically, the prediction was that subjects would prefer to classify on the basis of connected, rather than isolated, properties.

In general, this experiment was similar in many respects to Medin et al. (1987), though several important modifications of its design were incorporated.

6.1. Method

We created eight sets, each of which was comprised of one target, which was marked as such, and two metaphorically related items (henceforth: bases). The target item contained three properties, two of which were causally related, while the third described the target but was not causally related to the others. The two bases had a similar structure: they contained three properties, two of which were causally connected. The properties in the bases were designed to resemble the ones of the target. The following is an example of one such a set:

[5] The target
a. *The target item: John.*
John has RED HAIR; he is currently SICK and is, therefore, RECEIVING MEDICAL TREATMENT.
The metaphorically related items:
b. CAR 1:
Sonya's car is RED; it has recently been in a car accident, and, therefore, BROKE DOWN.
c. CAR 2:
Tanya's car has an open roof; it BROKE DOWN recently and is therefore undergoing REPAIR IN THE GARAGE.

Note, that this set consists of descriptions of three objects, [5a,b,c]: [5a] is the target object (in this case, 'John') while [5b,c] represent the other two objects (in this case, car 1 and car 2) which are metaphorically related to the target. Each description consists of three properties with one causal relation between two of the properties. Thus, in [5a] John was described as follows: 'John has red hair; he is currently sick and is therefore receiving medical treatment'. The two properties that are causally connected are the latter two; this causal relation is marked by the use of the causal connector, 'therefore'.

Now, the other two objects, [5b] and [5c] consist of descriptions of two metaphorically related concepts, namely, two cars each of which share two properties with John. The difference is that car 1 ([5b]) shares two isolated properties with John (its being 'RED', and its being BROKEN DOWN), while car 2 ([5c]) shares two causally related properties with him (its being BROKEN DOWN which brings about the need for it to BE REPAIRED IN THE GARAGE).

The causal connections between the appropriate properties were explicitly stated because in a pilot study we conducted it became evident that what seemed clear causal relations to the experimenters was not always perceived that way by the subjects. Thus, and in order to minimize non-causal interpretations, the causal connector was explicitly stated.

(Note also that all the descriptions in [5] include a causal connector, to block the possibility that subjects would use this very connector as the basis of their grouping.)

Subjects: 26 undergraduates of Tel-Aviv University (mean age 25 years), two of which were males. All subjects were Hebrew native speakers. They volunteered to fill out the questionnaire during one of their classes.

6.2. Materials and procedure

The final questionnaires contained 8 sets. As described above, each set consisted of one target, which was marked as such, and two bases. In the instructions the subjects were given an example set, and were asked to 'decide which of the two bases will be grouped with the target, in a way that seemed to you most natural'; they were also asked to justify their decision. The subjects were reminded that 'each two items (i.e., target-base a, target-base b) share only two features', and were asked to 'base the decision solely on the features in the sets', and not 'pay attention to features that are not explicitly present, even if they might be inferred'.

The questionnaires were distributed in a university class, and the subjects were given as long as they liked to fill them. Usually the task did not take more than 25 minutes.

The prediction was that (despite the fact that the target shares exactly two features with each of the metaphorically related items) subjects will prefer to group the target with the base that shares causally related properties rather than with the alternative base.

7. Results and discussion

One subject did not finish her questionnaire, and hence was excluded from the analysis. A post-hoc analysis revealed that in one of the eight sets one of the two metaphorically related items shared three (instead of two) properties with the target items; this set was excluded from the analysis, which left us with seven sets.

Scoring: We scored both subjects and sets. Each subject's score represented the number of sets in which the subject's grouping was in accordance with my hypothesis. Thus, each subject had a score that ranged from 0 to 7 (a score of 7 was given in case the subject grouped all seven sets according to the hypothesis). Each metaphorical set was given a score representing the number of subjects that grouped it according to the hypothesis, and thus each metaphorical set had scores that ranged from 0 to 25.

7.1. Results

I conducted two t-tests both for subjects and sets. The results confirmed my prediction, namely, that both for subjects ($Mean$=4.52, SD=1.17) and for metaphorical sets ($Mean$=17.5, SD=3.96) the means deviated significantly from chance in accordance with our prediction (t=3.13, DF=6, p<0.05, and t=5.21, DF=24; p<0.01, respectively). Thus, we are able to conclude that subjects did prefer to group the target to the item with which it shared two causally connected features.

This study, then, may provide some initial support for the claim that the principle in [4],which had been previously shown to underlie taxonomic categorization, equally applies to metaphorical categorization,

This finding is compatible with related phenomena in the area of metaphor/analogy comprehension. For example, Clement and Gentner (1991) have found that con-

nected properties are judged by subjects as more important to the analogy between two, metaphorically related, objects, than isolated ones.

Another source of evidence has to do with the aptness of metaphors. Given the distinction between connected vs. isolated properties, we may introduce the distinction between 'connected metaphors' vs. 'isolated metaphors'.

Consider for example the metaphors in:

[6] A. 'Cigarettes are like pacifiers'
B. 'The sun is like an orange'.

The difference between [6A] and [6B] is that in [6A], the ground represents a connected property, namely, something like 'providing oral satisfaction and soothing' – this property is related to various components of the concept of pacifier, such as its general shape, its context of use, the manner of using pacifiers and so on. By contrast, [6B]'s possible ground, namely, 'the color orange', or its 'being round', represents isolated properties of the concept 'orange' (the fruit).

Various studies of metaphor (e.g., Gentner and Clement, 1988) have pointed out that 'connected' metaphors such as in [6A] are judged as more apt and interesting ones than the 'isolated' metaphors in [6B]. This observation supports the above grouping principle in [6]. It seems that the reason for preferring [6A] over [6B] is closely related to the reason underlying the preference of connected over non-connected properties in metaphor interpretation. Under the present account, [6A] allows for a connected property to serve as the metaphor ground, while in [6B] the ground represents an isolated property. Thus, the 'ad hoc category' constructed for [6A] (e.g., the property 'providing oral satisfaction and soothing' of the concept 'pacifier') seems 'more natural' than the one constructed for [6B] (presumably, 'round' in the case of the concept 'orange'). This explains why the corresponding comparisons are judged as more and less apt, respectively.

8. Concluding remarks

The main proposal put forward in this paper has been that metaphor comprehension is based on similar principles to those of taxonomic categorization. Such an assumption, it was argued, would enable us to account for several major observations regarding metaphor comprehension.

This proposal should be evaluated in opposition to the standard 'comparison (or abstraction) view', whose origins can be traced back to Aristotle's Poetics. Under the latter view, metaphors are analyzed as (implicit or explicit) comparisons, and metaphor comprehension consists of seeking out the 'ground', namely, those features which are shared by the tenor (target concept) and vehicle (source concept) of the metaphor. (For a detailed discussion of the assumptions underlying this view, see Tourangeau and Sternberg, 1982; see also Chomsky, 1964.)

Note, however, that this standard 'abstraction view' is inadequate, in that it fails to account for most observations regarding metaphor comprehension introduced in the present paper. It fails, for example, to account for the asymmetry between, say 'lectures' and 'sleeping pills', since the similarities shared by lectures and sleeping pills should be the same as those shared by sleeping pills and lectures. Even if we modify the 'similarity view' to handle such cases of asymmetry, in the spirit of proposals such as Tversky's theory (Tversky and Gati, 1978), the similarity view still fails to account for the second observation regarding the preference for connected properties over isolated ones. This is because, according to the 'simple similarity view,' any shared property between two concepts should be as good as any other, and metaphor interpretation should not involve the preferences we have described. For the same reason, this view is incapable of accounting for the fact that metaphors generate inferences beyond the similarities required for comprehending the metaphor, and so forth (I have elaborated on these inadequacies of the 'standard comparison view' elsewhere (Shen, 1992).)

From a more general perspective, the present study should be viewed as part of a recent effort in the cognitive sciences to establish the link between major cognitive activities and the more novel and creative usages of language and concepts. This link goes both ways. On the one hand, it has recently been proposed (perhaps most forcefully in Gibbs, 1994; see also Lakoff and Johnson, 1990) that various 'poetic' modes of language and thought, notably metaphor (as well as other non-literal usages of language), constrain, structure and shape many major aspects of our ordinary, common, non-poetic usage of language and thought. The very title of Gibbs' monumental contribution to the study of mind, namely, 'The Poetics of Mind', beautifully illustrates this view. On the other hand the present paper has shown that the creative re-organization of concepts exploited by metaphors, is, in itself, governed by principles of 'ordinary cognition', namely, principles of common, natural, taxonomic categorization.

Taken together, these bi-directional relations between creative (e.g., metaphorical) and non-creative uses result in a more unified view of the various uses of language.

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