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Suppression of semantic features in metaphor comprehension

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Abstract: Looking at Glucksberg's class-inclusion model of metaphor comprehension, this article suggests that metaphorical classes are created by a suppression-oriented mode of comprehension. To give a picture of this mechanism, it draws on a model according to which every metaphorical class is formed by the inhibition of the majority of semantic features and maintaining a very small set of those features. The product of this suppression-oriented mode of comprehension is a broad class which might include a lot of entities. All these entities create a metaphorical class which is defined by one, or at most, a few aspects of meaning. The suppressed aspects of meaning do not have any role in the creation of metaphorical classes. In other words, broad metaphorical classes are produced by a suppression- or inhibition-based mechanism through which the majority of semantic aspects are completely filtered out. Those semantic features which have a high degree of co-occurrence with other semantic features are not good criteria for defining metaphorical classes.

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PUBLIC INTEREST STATEMENT

Metaphor, the ubiquitous feature of daily language, has been the subject of a large body of research among psycholinguists, cognitive linguists, and cognitive psychologists. That is why we would not be surprised to see the increasing number of models that have been suggested to describe metaphor comprehension. This article discusses the mechanisms through which metaphors are processed in our mind. Drawing on a number of past empirical studies, it elaborates on a model according to which metaphorically-irrelevant information is disposed of throughout metaphor understanding. The principal argument is based on a model according to which metaphorical classes are formed by an inhibition-based mechanism. The product of this mechanism is a broad metaphorical class defined by one, or at most, a few semantic features. Then, the assumptions of this model are connected to and compared with some neural theories of language comprehension.

Subjects: Neuroscience; Computational Neuroscience; Neuropsychology; Language, Psychology of; Cognitive Neuropsychology; Cognitive Science; Cognitive Neuroscience of Language

Keywords: class inclusion; metaphor comprehension; metaphorical classes

1. Introduction

The class-inclusion theory is one of the major psycholinguistic theories that have been proposed by Glucksberg and his colleagues to describe metaphor comprehension processes (Glucksberg, 2001, 2003; Glucksberg & Keysar, 1990, 1993; Glucksberg, Newsome, & Goldvarg, 2001). According to this theory, the metaphor *X is a Y* is understood as a class-inclusion statement that puts *X* and *Y* into a common category. For example, the metaphor *My lawyer is a shark* is comprehended as a class-inclusion statement that casts *my lawyer* and *shark* into a common class of animals and people that are vicious, aggressive, and unpleasant (Glucksberg, Manfredi, & McGlone, 1997; Glucksberg, McGlone, & Manfredi, 1997). In other words, a broad or extended class is created in which both topic (*my lawyer*) and vehicle (*shark*) are included. In the metaphor *My lawyer is a shark*, the term *shark* is broadened to create the superordinate category to which the literal *shark* and *my lawyer* belong (Glucksberg et al., 2001). According to Glucksberg (2003), the vehicle of a metaphor can be used in two senses; in the literal sense, it refers to a specific category of entities; in the metaphorical sense, it refers to a general category to which the literal sense belongs. In other words, the literal sense of a term refers to a very specific and narrowly defined group of entities, such as the specific category of sharks. On the other hand, the metaphorical sense of the word refers to a broadly defined group of entities.

A question that might be raised here is the underlying difference between literal classes and metaphorical classes. To answer this question, we have to find how classes are created or defined. In other words, those characteristics which define a group must be identified. Literal classes are mainly hierarchical. For example, hammerhead is a kind of shark; shark is a kind of fish; fish is a kind of animal; and animal itself is a kind of living creature. In this hierarchical order, "living creature" is at the top and "hammerhead" is at the bottom. Each category in this hierarchical order includes a large number of subcategories; the category of shark includes various types of shark; the category of fish is larger and includes all types of shark as well as many other types of fish; the category of animal is even larger and includes all types of fish as well as a large number of other types of animal. When we move toward the top of a hierarchy, the categories become larger and larger. In this hierarchical order, larger categories are defined by a smaller number of semantic features. In fact, the category that is at the top of the hierarchy is defined by the minimum number of semantic features. On the other hand, those categories that are closer to the bottom of the hierarchy are more specific. These categories are defined by a larger number of semantic features. For example, if we want to define the category of hammerhead, we have to include all semantic features of sharks as well as a number of other semantic features that are specific to hammerhead. In fact, when we move toward the bottom of the hierarchy, we have to narrow the category by the inclusion of more semantic features in the definition of that category.

2. Metaphorical classes

Metaphorical classes cannot be included in the above-discussed hierarchical orders. In the metaphor *My job is a jail*, the term *jail* does not refer to a category of buildings (literal sense). Similarly, in the metaphor *Discipline is fertilizer*, the term *fertilizer* does not refer to a category of chemicals. In such cases, a metaphorical class refers to something that is more general than the literal class of the term. The metaphorical sense of the term *jail* refers to all restrictive conditions (Glucksberg & Keysar, 1990) and the metaphorical sense of the term *fertilizer* refers to a category of entities that cause growth in people's abilities. Khatin-Zadeh and Vahdat (2015) have suggested that metaphorical classes are defined on the basis of one or at most several salient semantic features. Therefore, metaphorical categories can be conceived as general categories that consist of a much larger number of members. The metaphorical class of *jail* refers to a large number of restrictive conditions; on

the other hand, its literal sense refers to a very specific type of buildings that are used to keep prisoners in. The metaphorical class of the term is defined by the salient feature of "restriction". We do not need to add any other semantic features to narrow this category. This is a very general class that is defined by a single semantic feature. On the other hand, the literal class of the term refers to a certain type of buildings. If we want to give a definition of this class, we have to include all semantic features of buildings as well as those semantic features that are specific to jails. This category is very specific and is defined by a large set of semantic features.

If we assume that metaphorical classes are understood on the basis of one or at most several semantic features, the other semantic features must be kept out during metaphor processing. Glucksberg et al. (2001) have used the terms *inhibition* and *filtering* to describe the process through which metaphor-irrelevant information is blocked during metaphor comprehension. Gernsbacher and Robertson (1999) have used the term *suppression* to describe a very similar mechanism by which the activation of extraneous or metaphor-irrelevant information is attenuated in metaphor comprehension. According to these views, while metaphor-relevant information (one or at most several aspects of meaning) is at the center of attention, the irrelevant information is pushed out. Giora's (2003) Suppression/Retention Theory holds that suppression following negation is sensitive to discourse goals and requirements. That is, some parts of information associated with an utterance are suppressed or disposed of if they are deemed unnecessary, regardless of negation (Giora, Fein, Metuki, & Stern, 2010). Giora (2006) argues that both negation and affirmation might lead to suppression or retention of information depending on the context and speaker's intention. Therefore, in this respect, negation and affirmation might not exhibit asymmetric effects (Giora, 2006, 2007; Giora, Balaban, Fein, & Alkabets, 2005; Giora, Fein, Ganzi, Levi, & Sabah, 2005). The terms of inhibition, filtering, and suppression refer to some kind of blockage. However, one might suggest that metaphors are understood by the mediation of a salient-making filter rather than by a blockage filter. In other words, metaphor irrelevant information might be activated during metaphor comprehension in the same way that it is activated during literal statement comprehension. However, during metaphor comprehension, the salient-making filter bolds one or at most several aspects of semantic features. To summarize, we have to make a distinction between the following two views:

(1) Metaphors are understood by the blocking of metaphor-irrelevant information. This blocking might take place from the very beginning or at a very early stage of metaphor processing.

(2) Metaphor-irrelevant information is activated during metaphor comprehension in the same way that it is activated during literal statement comprehension. However, the salient-making filter bolds metaphor-relevant information and gives it a significant priority over metaphor-irrelevant information.

3. Distributed models of conceptual representation

Throughout the above discussions, we looked at metaphor comprehension from the perspective of those cognitive models that assume the meanings of concepts are represented by smaller units of meaning. These small units of meaning are called features, properties, or attributes. According to distributed models of conceptual representation, each feature node is represented in a connectionist system, and a concept is processed by the coactivation of its feature nodes (Caramazza, Hillis, Rapp, & Romani, 1990; Masson, 1995; McRae, de Sa, & Seidenberg, 1997; Moss, Tyler, & Taylor, 2007; Tyler, Durrant-Peatfield, Levy, Voice, & Moss, 1996; Tyler & Moss, 2001; Tyler, Moss, Durrant-Peatfield, & Levy, 2000; Vigliocco, Vinson, Lewis, & Garrett, 2004). While some features are shared by the majority of concepts belonging to a category, others are not. These features which are shared by the majority of concepts are non-distinctive and cannot be a criterion for distinguishing among members. Those features which belong to only one member or to a small group of members are distinctive and can be a good criterion for distinguishing between that member (or that small group of members) and other members of the category. For example, in the category of animals, the feature of "having eyes" is shared by the majority of animals; therefore, it is non-distinctive. On the other

hand, the feature of "having stripes" is shared by members of a very small group of animals. Therefore, it is a highly distinctive feature that can distinguish between a tiger and many other animals.

Another important factor is the degree that two features co-occur. While some features have a high degree of co-occurrence, others might have a very low degree of co-occurrence. For instance, the two features of "having eyes" and "having tails" have a high degree of co-occurrence in the category of animals. On the other hand, the two features of "having legs" and "having stripes" have a very low degree of co-occurrence (Keil, 1986; McRae et al., 1997; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976; Tyler et al., 2000; Vinson, Vigliocco, Cappa, & Siri, 2003).

4. Formation of metaphorical classes

Metaphorical categories are mainly formed on the basis of those features which have a high degree of distinctiveness. Their high level of distinctiveness makes them salient and proper criteria for the defining of metaphorical categories. For example, "being nutritive and cause of growth" is the main aspect of meaning that defines the metaphorical reference of the term *fertilizer*. A number of other terms such as *vitamin* and *energetic drink* can also be included in this metaphorical category. In fact, all those edible substances that produce a lot of energy and power can be the members of this metaphorical category. By putting these terms in the vehicle position of the general metaphor *X is a Y* (*X* is the topic, and *Y* is the vehicle), many metaphors can be produced. All of these metaphors refer to something (*X*) as being nutrient and energy-producing. The metaphors *Discipline is fertilizer*, *Motivation is vitamin* (referring to a student who needs motivation), and *Encouragement is energetic drink* are some of these metaphors. The semantic feature of "being highly nutrient and being the source of a lot of energy" is the main feature of this metaphorical category. Every member of this category can be a good choice to be put in the vehicle position of the metaphor *X is a Y* (for referring to something as the cause of growth). The entities that are included in this metaphorical category have a very large set of semantic features. However, these semantic features are shared by many other entities that do not belong to this metaphorical category. For instance, the members of this category consist of elements, minerals, and organic materials. However, this semantic feature is shared by all foods and edible materials, some of which are not highly nutrient and rich sources of energy. This property or semantic feature cannot be a distinctive or defining feature for a metaphorical category, because it co-occurs with many other semantic features. In other words, only those semantic features which have a low degree of co-occurrence with other semantic features can be the proper choice for defining a metaphorical category. On the other hand, those semantic features which co-occur with a large number of semantic features are non-distinctive and unsuitable for defining a metaphorical category.

The proposal that metaphorical classes are created on the basis of a salient semantic feature that has a low degree of co-occurrence is in agreement with the Connectionist Attractor Network model of McRae and colleagues (Cree, McNorgan, & McRae, 2006; McRae & Cree, 2002; McRae, Cree, Westmacott, & Sa, 1999; McRae et al., 1997). McRae et al. (1997) reported that strongly intercorrelated features are processed faster than weakly intercorrelated features in online verification tests. The findings of another study suggested that distinctive features have a privileged access (Cree et al., 2006). This means that highly distinctive features are activated in an early stage of processing. Therefore, it can be said that in the process of metaphor comprehension, a salient distinctive feature is activated in an initial stage. This rapid activation of a salient feature of the vehicle creates a metaphorical class in the mind of a comprehender and prevents the activation of non-distinctive features. In other words, the rapid activation of a distinctive feature and the formation of a metaphorical class on the basis of this feature prevent the activation of literal meaning of that term. This is the process that has been described under the rubrics of elimination (Keysar, 1994), inhibition (Glucksberg et al., 2001), and suppression (Gernsbacher & Robertson, 1999). These are consistent with the findings of an ERP study made by Pynte, Besson, Robichon, and Poli (1996). Conducting four experiments, they found that when contextually relevant, the metaphorical meaning is the only one that is activated. In another related study, Giora et al. (2013) examined the comprehension of negative statements

that were unfamiliar, free of semantic anomaly, and unbiased by contextual information. They found that these utterances were interpreted metaphorically when presented in isolation in contexts strongly biasing them toward their metaphorical meaning than toward their literal meaning. It seems that these proposals are in agreement with the assumptions of the relevance theory according to which metaphor understanding is constrained by optimal relevance (Sperber & Wilson, 1995). That is, metaphors may be understood as soon as comprehender infer enough effects for the speaker's utterance to meet their contextual expectations (Gibbs & Tendahl, 2006).

5. Summary

Metaphorical classes are different from literal classes in that they are defined by a single semantic feature (or a few semantic features) that is highly distinctive. In other words, it has a low degree of co-occurrence with other semantic features. In an early stage of metaphor comprehension, this highly distinctive feature is activated. This early activation of metaphorically relevant feature prevents the activation of metaphorically irrelevant semantic features. Therefore, the literal sense of the term, which is defined by a large set of semantic features, is not activated during metaphor comprehension. This view is supported by the results of those studies that have found distinctive features have a privileged access (for example, Cree et al., 2006). In other words, the metaphor *X is a Y* is understood through the inclusion of *X* into a metaphorical class of *Y* that is defined by a single salient semantic feature. This metaphorical class is formed in the mind through an early activation of that salient distinctive semantic feature, leading to a blockage that prevents the activation of non-distinctive features. Consequently, the literal meaning that is defined by a large set of non-distinctive semantic features is not activated throughout metaphor comprehension.

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