Suppression in Metaphor Comprehension: A Perspective From Distributed Models of Conceptual Representation

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ABSTRACT

This article looks at the process of suppression in metaphor comprehension from the perspective of distributed models of conceptual representation. The aim is to present a picture of what happens during the process of suppression in metaphor comprehension. It is suggested that the process of suppression could take place differently depending on whether vehicle of metaphor is a living or nonliving thing. This difference is the result of differences between the nature of correlations among features in living and nonliving things. Then, a comparison is made between the ways that living and nonliving things function in the vehicle position of metaphors. It is proposed that the three factors of visual features, functional features, and strength of correlation among distinctive features of vehicle play a role in this regard. It is proposed that a visual-oriented mode of processing becomes dominant when a living thing is used in the vehicle position of metaphor. For those metaphors which use a nonliving thing in the vehicle position, functional features of vehicle play a key role in the understanding of metaphor. Finally, the strength of correlation among distinctive features in nonliving things is a key factor for those metaphors that use a nonliving thing in the vehicle position. In these metaphors, the set of distinctive features is the defining set of metaphorical class.

Key Words: Suppression, Metaphor comprehension, Distributed models, Distinctive features

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Introduction

Throughout the past two decades, a group of models has been suggested to explain the patterns of semantic deficits in patients suffering from brain injury. According to these models, different neuroanatomical regions of brain store different categories of knowledge (Caramazza and Mahon, 2003; 2005; Caramazza and Shelton, 1998). For example, features and neural networks that are involved in the representation of living and nonliving things have been claimed to be different (Taylor *et al*., 2008). It has been claimed that while visual features are central to the representation of living things, functional features are key to the representation of nonliving things (Warrington and McCarthy 1983; 1987; Warrington *et al*., 2001; Martin *et al*., 2000).

Among the suggested views, one set of models suggests that concepts are represented in a distributed network that consists of units corresponding to semantic features (Devlin *et al*., 1998; Durrant-Peatfield *et al*., 1997; Gonnerman *et al*., 1997; Tyler *et al*., 2000). One of these models is the Conceptual Structure Account (CSA). According to Taylor *et al*. (2011), the unique claim of the CSA is that correlational strength and degrees of distinctiveness of features determine how concepts are structured and processed in the mind of comprehender. In other words, the processing of every concept corresponds

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to an interaction between these two factors. It is claimed that living things and nonliving things tend to have different internal structures; that is, correlational strength and degrees of distinctiveness have different patterns in living things and nonliving things (P. 1373). It has been proposed that animate concepts have two characteristics: firstly, they have large clusters of shared features that are strongly correlated; secondly, they have relatively fewer distinctive features that have lesser degrees of correlation with other features (Greer *et al*., 2001; Moss *et al*., 1997; Moss *et al*., 2007). For example, the features of <has legs>, <has ears>, and <has eyes> are highly correlated. On the other hand, inanimate concepts have smaller clusters of features with relatively more distinctive features. Furthermore, these distinctive features tend to be more strongly correlated (Randall *et al*., 2004; Taylor *et al*., 2008; Tyler and Moss, 1997). For example, the feature of <stores electricity> and <can charge electrical devices> are distinctive features of some objects. These two features are strongly correlated.

Randall *et al*., (2004) summarizes the basic claims of CSA and says that highly distinctive features of living things are weakly correlated with other semantic features, while non-distinctive features are strongly correlated. Furthermore, in nonliving things, both distinctive and non-distinctive features tend to be strongly correlated, although their number is smaller (p. 394). The following section looks at the process of suppression in metaphor comprehension. Then, the implications of the CSA in the process of suppressing metaphorically-irrelevant information is discussed. The aim is to use the CSA to give a clear picture of how metaphorically-irrelevant information is suppressed when a metaphor is understood.

Implications of The CSA in Suppression

Suppression has been defined as a general cognitive mechanism through which the interference of irrelevant or inappropriate information is attenuated (Gernsbacher and Robertson, 1999). This process helps the comprehender to filter out unnecessary information and to focus on those parts of information that are necessary for interpreting a statement. For example, when the metaphor *My job is a jail* is understood, the literal features of the concept of "jail" are irrelevant. These features must be suppressed by the comprehender. Features such as "having high walls" and "having irony gates" are metaphorically irrelevant. They play no role in the interpretation of this metaphorical statement. Therefore, they must be suppressed or inhibited during the processing of this metaphorical statement. The structure of semantic space suggested by the CSA could help us to describe the process of suppression in metaphor comprehension. In such a description, we need to make a distinction between two types of metaphors: metaphors with a living vehicle and metaphors with a nonliving vehicle. In the metaphor *X is a Y*, *X* is topic and *Y* is vehicle. As was mentioned, the CSA suggests that the structure of semantic space varies from living things to nonliving things. Therefore, the process of suppressing metaphorically-irrelevant information could be different in these two types of metaphors. In the understanding of the metaphor *X is a Y*, the metaphorically-irrelevant features of *Y* are suppressed. Depending on the nature of relationship among semantic features of *Y*, this process of suppression could happen differently. The CSA holds that animate concepts are characterized by large clusters of strongly correlated features. When an animate concept is used as the vehicle of a metaphor, the suppression of one feature could significantly facilitate the suppression of other features because features are strongly correlated. In other words, a large number of features could be suppressed simultaneously or nearly simultaneously. For example, the features of <has eyes>, <has ears>, and <has nose> could be suppressed at the same time. Since metaphors are understood through a largely suppressive-oriented mode of processing (Gernsbacher and Robertson, 1999; Glucksberg *et al*., 2001; Keysar, 1994), it is the strong correlation among semantic features that contributes to rapid suppression of metaphorically-irrelevant information during metaphor comprehension. This is particularly the case with metaphors which have a living concept in the vehicle position, as the suppression of one feature facilitates the suppression of other strongly correlated features. The findings of a study conducted by Devereux *et al*., (2016) indicated that conceptual processing takes place in a general-to-specific pattern; that is, early activation of shared features is followed by the gradual activation of a specific target representation. Therefore, it might be said that the suppression of shared and metaphorically-irrelevant features could takes place at an early stage of metaphor processing. This could be simultaneous with or followed by the activation of a distinctive feature that is metaphorically relevant.

When a nonliving concept is used as the vehicle of metaphor, the mechanism of suppression may be different. As was mentioned, the CSA holds that inanimate concepts have smaller clusters of features with more distinctive features compared to animate concepts. Furthermore, in inanimate concepts, the distinctive features tend to be strongly correlated compared to animate concepts. Therefore, if we make a comparison between the suppression of metaphorically-irrelevant information in animate and inanimate concepts, we will see that smaller clusters of features must be suppressed in the understanding of those metaphors which have an inanimate concept in the vehicle position. Sine these features are more strongly correlated in inanimate concepts, the suppression of each cluster is easier. However, the number of distinctive features is higher in inanimate concepts. Therefore, a large number of clusters must be suppressed in the processing of those metaphors which have an inanimate concept in the vehicle position. If it is assumed that the suppression of all metaphorically-irrelevant information starts at the same point of time for all features, it could be said that the strength of correlation among features plays a key role in the process of suppression. Therefore, it could be said that the suppression of metaphorically-irrelevant features is easier for those metaphors which have a nonliving vehicle.

Saliency and Distinctiveness

Another point that may play an important role in suppression is the saliency of a specific feature. In some cases, a distinctive feature might not be a salient feature (Cree *et al*., 2006). For example, the feature of <has seven stomachs> is a highly distinctive feature of cow, but it is not a salient feature. On the other hand, in the category of animals, the feature of <can fly> is a salient feature of eagle, but is not highly distinctive because in the category of animals there are many birds that can fly. When the vehicle of a metaphor has a highly salient feature, this feature can play a key role in the suppression of other features. This is a point that have been emphasized by Khatin-Zadeh and Vahdat (2015). They suggest that the metaphorical class of the vehicle is defined by one or at most several semantic features. During the comprehension of the metaphor, the salient semantic feature, which defines the metaphorical class, remains active while the rest of features are suppressed. They add that topic of the metaphor is included in this metaphorical class. Here, the saliency of a specific feature is critical since the rest of features are overshadowed by it. In fact, the more salient is this defining feature, the easier the suppression of metaphorically-irrelevant features will be. If correlation among metaphorically-irrelevant features is stronger and degree of distinctiveness of salient feature is higher, the process of suppressing metaphorically-irrelevant information will significantly become facilitated. In other words, degree of saliency of defining feature of metaphorical class, degree of distinctiveness of this salient feature, and strength of correlation among metaphorically-irrelevant features are three interacting factors in the process of suppression.

Important Factors of Vehicle

When a comparison is made between the ways that living and nonliving things function in the vehicle position of a metaphor, three aspects need to be considered: visual features, functional features, and strength of correlation among distinctive features. As was mentioned, a number of researchers (for example, Martin and Chao, 2002; Ungerleider and Haxby, 2000) have suggested that visual semantic features are more important for the representation of living things than for representation of nonliving things. Therefore, visual characteristics may take a more salient role in those metaphors which have a living vehicle. This becomes particularly important when we look at cross-modal metaphors from the perspective of embodied theories of cognition. According to this view, when the metaphor *X is a Y* is processed in the mind of comprehender, those nodes that represent features of *Y* are activated in the neural network (Gallese and Lakoff, 2005). When visual features of *Y* are more salient, those nodes that represent visual features of *Y* take a central role in the processing of metaphor. In fact, a visual-oriented mode of processing becomes dominant in the understanding of those metaphors which have a living vehicle. For example, in the metaphor *Business is a living organism*, the concept of 'business' is understood in terms of physical features that can be perceived through visual sense. In fact, the development of a business is understood in terms of physical growth in a living organism. A fully-developed business is understood as a large and grown body of a living thing.

As was mentioned, functional features are another salient aspect which are particularly important for metaphors with a nonliving vehicle. In such metaphors, the function that is done by a nonliving object could be the base of the metaphor. For

example, when the term 'knife' is used as the vehicle of a metaphor, the function of the knife, cutting the objects, could be the semantic feature on which the metaphor is based. In such a metaphor, the function of 'cutting' may have different representations. In one metaphor, cutting may mean reducing; in another metaphor, it could mean dividing something into pieces; yet, in another one, it may mean harming somebody. Depending on the topic of metaphor and the context in which the metaphor is used, the term 'knife' and its function (cutting) could have different metaphorical meanings. However, this point should not be ignored that the visual features of nonliving vehicle may somehow be activated when such metaphors are understood. Although the function of knife (cutting) plays the key role in the understanding of such metaphors, the visual features of knife (for example, being a sharp metallic object) may somehow be activated in the mind of comprehender. In fact, the relationship between visual features of a nonliving thing and its function is a matter that may become salient in a metaphor depending on the topic and vehicle as well as the context in which the metaphor is used.

The third important factor is the nature of correlation among distinctive features in living and nonliving things. As was mentioned, for nonliving things, both shared and distinctive features have been claimed to be strongly correlated (Randall *et al*., 2004). The strong correlation among distinctive features could be particularly important for those metaphors in which a nonliving thing is used in the vehicle position. In such metaphors, a small group of strongly-correlated features could be the defining set of metaphorical class. This is consistent with a model suggested by Khatin-Zadeh and Vahdat (2015). According to this model, the metaphorical class of vehicle is defined by one or at most several semantic features. Based on this model and assumptions of the CSA, it could be said that the metaphorical class of a living thing is defined by one semantic feature; on the other hand, the metaphorical class of a nonliving thing tends to be defined by a set of several strongly-correlated features. In other words, depending on whether the vehicle of a metaphor is a living or nonliving thing, the metaphorical class of vehicle tends to be defined by either one or a several semantic features.

Levels of Meaning

Khatin-Zadeh and Vahdat (2015) have proposed that every term could have two levels of meaning: metaphorical class (deep meaning) and literal class (surface meaning). They say that metaphorical class is defined by one or at most several semantic features whereas literal class is defined by a large number of semantic features. Based on this model, metaphorical class is a broad category that includes a set of members. One of these members is the most typical one. This typical member could best represent the metaphorical class and is the most suitable member to be placed in the vehicle position of a metaphor. For example, the feature of <rapid spread> defines a metaphorical class that includes a set of members such as Helium, Oxygen, virus, etc. Since virus is the most typical or one of the most typical members of this metaphorical class, it is the best option to be used in the vehicle position of those metaphors that refer to rapid spread of something. For example, the metaphor *Rumor is virus* is a completely apt and understandable metaphor. In this metaphor, rumor is included in a metaphorical class that is defined by the feature of <rapid spread>, and virus is used to represent this metaphorical class. In fact, the metaphorical class of rapid spread has a lot of members, among which virus is a typical member and is a suitable member to represent this metaphorical class.

Khatin-Zadeh and Vahdat (2015) propose that literal class of every term is defined by a large set of semantic features. A combination of this model and a view suggested by Randall *et al* (2006) could have some revealing implications. Randall and colleagues suggest that distinctive features have a privileged role in computing word meaning and in distinguishing it from other members of the literal class. For example, when the meaning of the term *virus* is comprehended, the distinctive feature of <rapid spread among humans and animals> has a privileged role in distinguishing it from other microorganism. This distinctive feature distinguishes virus from other types of microorganism. At the same time, this feature defines a metaphorical class that includes many other members. Some of these members are not microorganisms, such as Helium. In other words, depending on the context, the privileged role of distinctive feature could have two functions: 1) In the literal sense of the utterance, this distinctive feature distinguishes virus from other types of microorganisms; 2) In the metaphorical sense, it defines a metaphorical class that includes virus as well as many other microorganisms and non-microorganisms.

When a word is processed in the mind of comprehender, the two levels of literal and metaphorical meaning compete against each other. If the context biases the literal meaning, a large number of semantic features, which define the literal meaning of the term, are activated. In fact, after the activation of one or several distinctive features, a large number of non-distinctive features are processed to compute the literal sense of the term (Khatin-Zadeh and Vahdat, 2015). This is a receptive-oriented (Banaruee *et al*., 2017) mode of processing, the result of which is the computation of literal sense of the word. If the context biases metaphorical sense of the term, only one or several semantic features that define the metaphorical class remain active while the rest of features are suppressed (Khatin-Zadeh and Vahdat, 2015). In fact, after the activation of distinctive features, the rest of features are suppressed or inhibited (Glucksberg *et al*., 2001; Gernsbacher and Robertson, 1999). This is a suppressive-oriented mode of processing (Banaruee *et al*., 2017). For example, the sentence *Rumor is virus* biases a metaphorical meaning for the term *virus*. In the interpretation of this sentence, the feature of <rapid spread> remains active while the rest of features such as <being the cause of diseases> and <the ability of multiplication> are suppressed. In fact, such features are metaphorically irrelevant and should be suppressed in order to derive the metaphorical meaning of the term *virus*. On the other hand, the sentence *Viruses are the cause of millions of deaths in poor countries* biases a literal meaning for the term *virus*. Here, a large number of semantic features are activated to derive the literal sense of virus. In fact, depending on the whole sentence and the context of the sentence, two different modes of processing could be employed to derive either literal sense or metaphorical sense of the term *virus*. To summarize, the term *virus* belongs to both a literal class and a metaphorical class. The literal class includes all microorganisms such as virus, fungus, bacterium, etc. A small number of these microorganisms have the feature of <rapid spread>. Therefore, this feature is a distinctive feature among members of the literal class. On the other hand, the metaphorical class includes all those entities that have the feature of <rapid spread>, such as Helium, Oxygen, virus, etc. Therefore, this feature is shared by all members of metaphorical class. In other words, a distinctive feature in the literal class is a highly-shared feature in the metaphorical class. The two classes are completely different in terms of the nature of members. However, 'virus' is a member that is shared by both of them.

Summary

In order to acquire a clear understanding of the process of suppression in metaphor comprehension, this article looked at the structure of semantic space in living and nonliving things from the perspective of distributed models of conceptual representations. A clear understanding of the structure of semantic space and the ways that semantic features are related to each other could help us to acquire a better idea of what happens during the process of suppression in metaphor comprehension. The semantic spaces of living and nonliving things are different. The nature of correlation among distinctive and non-distinctive features in living things is different from the nature of correlation among distinctive and non-distinctive features in nonliving things. Therefore, depending on whether vehicle of metaphor is a living or nonliving thing, the mechanism of suppression may take place differently. The CSA holds that both distinctive and non-distinctive features tend to be strongly correlated in nonliving things. Furthermore, nonliving things have smaller clusters of features, a larger number of clusters, and a larger number of distinctive features. If it is assumed that the suppression of metaphorically-irrelevant information starts at the same time for all features, it can be concluded that the mechanism of suppressing metaphorically-irrelevant information is easier for those metaphors which have a nonliving vehicle. In addition to the nature of correlation among distinctive and non-distinctive features, visual features and functional features of metaphor's vehicle can play a significant role in the understanding of metaphor.

Visual features were suggested to be more salient for those metaphors which have a living vehicle, compared to those metaphors which have a nonliving vehicle. This is particularly important for cross-modal metaphors in which features related to one sense are described in terms of features related to another sense. For example, in the metaphorical phrase *red voice*, auditory features of a sound are metaphorically understood in terms of visual features of a color.

Functional features were suggested to be more important for those metaphors which have a nonliving vehicle, compared to those metaphors which have a living vehicle. However, it should be

noted that in the understanding of a metaphor, visual features, functional features, and the nature of correlation among features could be in some kind of interaction with each other. The point that was emphasized here is that one of these features may become more salient for a metaphor, although the role of other features cannot completely be ruled out.

Finally, the role of a distinctive feature in the inclusion of a concept in a literal class or a metaphorical class was discussed. A distinctive feature distinguishes a certain member from other members of its literal class. On the other hand, this distinctive feature could define a metaphorical class whose members share that feature. When a concept is interpreted in its literal sense, the distinctive feature distinguishes between that concept and other members of its literal class. For example, the feature of <having mane> distinguishes between lion and other animals. When a concept is interpreted in its metaphorical sense, the distinctive feature defines a metaphorical class that is represented by that concept. For example, the metaphorical class defined by the feature of <rapid spread> is represented by the term *virus*. While the literal sense is formed by a receptive-oriented mode of processing, the metaphorical sense is formed by a suppressive-oriented mode of processing. Depending on the sentence and the context of utterance, one of these modes becomes dominant and produces the intended meaning.

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