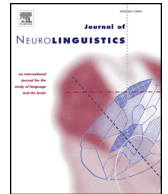




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Metaphorical meaning learning in contexts: An event-related potential study

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ABSTRACT

The current study explored whether the metaphorical meaning of novel words can be learned and how the metaphorical meaning was acquired during contextual reading. The novel words were embedded in two types of learning contexts: one supported the metaphorical meaning (metaphorical meaning learning condition: ML condition), and the other supported the literal meaning (literal meaning learning condition: LL condition). The learning effect was assessed via a semantic-relatedness judgment task with event-related potentials (ERPs) being recorded. In this task, the novel words served as primes, the literal corresponding concepts of the novel words (CC), the metaphorically related words (MR) and unrelated words (NR) served as targets. The results showed that the N400 amplitudes in response to the targets varied as a function of targets type in a graded manner increasing from the CC targets, to the MR targets, and to the NR targets in both learning conditions over the lateral electrodes. Furthermore, over the midline electrodes, the N400 difference between the CC and MR targets was gone in the ML condition; the N400 effect between the MR and NR targets was absent in the LL condition. These results suggested that learners could get the metaphorical meaning of newly learned words, and this process was influenced by the learning contexts. The study broadens our understanding on the learning of the lexical meaning of words.

1. Introduction

Metaphor is a crucial aspect of human language, which expands the meaning making resources available to the speakers (Halliday & Matthiessen, 1999). Conceptual metaphors involve establishing relationships between semantic domains. Conventional conceptual metaphors are encoded in the lexicon, in which a word has a literal meaning and a metaphorical meaning from different semantic domains (Ahrens et al., 2007; Lu & Zhang, 2012). In the domain of novel word learning, most previous studies mainly focused on the acquisition of the literal meaning, with the acquisition of the metaphorical meaning remaining to be explored. The current study aimed to investigate the learning of the metaphorical meaning of new words embedded in context during reading.

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1.1. Metaphorical meaning

A metaphor is made up of a topic and a vehicle. The topic is the object of a metaphor intends to describe, and the vehicle is used to understand the topic more easily (Camp, 2006). For example, in the metaphor “*the lawyer is a shark*”, the *lawyer* is the topic word, and the *shark* is the vehicle word. By establishing mapping relations between them based on their similarities, the words which served as the vehicles carry the metaphorical meaning (Lakoff & Johnson, 1980). The metaphorical meaning can be expressed in sentences or phrases (Gernsbacher, Keysar, Robertson, & Werner, 2001; Grauwe, Swain, Holcomb, Ditman, & Kuperberg, 2010; Jones & Estes, 2005, 2006). Previous studies on metaphor processing mainly focused on two questions (Gibbs, Bogdanovich, Sykes, & Barr, 1997). The first one is whether the processing of the literal meaning and the metaphorical meaning is different or not. The second question is how the factors, such as conventionality, aptness, and context, influence metaphor processing.

Based on lots of experimental evidence, researchers developed different models regarding the metaphor processing. According to traditional theories of pragmatics such as Grice's indirect access model, the literal meaning and the metaphorical meaning are processed in qualitatively different manners, with the precedence for the automatic processing of the literal one (Grice, 1975). The metaphorical meaning is obtained only after the literal meaning are computed and refuted by the context. However, more and more evidence found that there was no qualitative difference between the processing of the literal and metaphorical meanings (Gibbs et al., 1997). Researchers further proposed the direct access model (Gibbs, 1994; Glucksberg, 2001, 2003). This model suggests that the metaphorical meaning is as readily available as the literal meaning. The two meanings are processed concurrently and involve the same mechanisms.

In addition, a growing body of ERP research revised the indirect and direct access models and further developed new models, such as conceptual blending model (Fauconnier & Turner, 1998), the graded salience model (Giora, 1997), and so on. These heterogeneous models share the assumption that the processing of literal and metaphorical meanings relies on the same mechanisms (Coulson & Van Petten, 2002; Giora, 1997; Kintsch, 2000; Wolff & Gentner, 2000) which is in line with the direct access model. At the same time, these models also admit that there is difficulty in metaphor processing which is consistent with the indirect access model. However, different from the indirect access model which attributes the processing difficulty to the precedence of the literal meaning, these models postulate that difficulties in comprehension of the metaphorical sentences may be better explained in terms of mapping difficulty (Fauconnier & Turner, 1998) or salience of meaning (Giora, 1997). For instance, the conceptual blending theory proposed that people construct mental spaces continuously during language processing. A general cognitive operation, namely mapping processing among different spaces, builds networks of connected spaces. In metaphor processing, the connected mental spaces are built between the source and target domains which are distantly related. For the literal meaning processing, the mapping occurs between relatively close domains even in the same domain. For instance, in the literal use of “shark” in “the fish is a shark”, mapping is established between “fish” and “shark” on the basis of category membership. Therefore, the processing difficulty of metaphors could be attributed to the larger mapping difficulty between concepts in the metaphor comprehension than that in the processing of the literal meaning (Arzouan, Goldstein, & Faust, 2007; Coulson & Van Petten, 2002). Evidence came from ERP studies focusing on the N400 which is a well-established component reflecting the integration difficulty (Kutas & Federmeier, 2011). For instance, Coulson and van Petten found that words elicited larger N400s when they conveyed the metaphorical meaning relative to the literal meaning, indicating that the processing of the metaphorical meaning is more demanding than that of the literal meaning.

Besides the difference of processing between the literal meaning and the metaphorical meaning, researchers are also interested in the factors influencing the processing of metaphors. Previous studies have found that the conventionality (Giora, 1997; Laurent, Denhières, Passerieux, Iakimova, & Hardybaylé, 2006), aptness (Damerall & Kellogg, 2016), and context (Pynte, Besson, Robichon, & Poli, 1996) influence metaphor processing. Conventionality refers to the strength of association between a metaphor vehicle and its figurative meaning, namely a metaphor topic (Bowdle & Gentner, 2005; Giora, 1997; Wolff & Gentner, 2000). Based to this factor, metaphors can be divided into conventional metaphors and novel metaphors. For example, “*the lawyer is a shark*”, widely used in communication, is a conventional metaphor. While “*his sister is a megaphone*”, understood as his sister has a very loud voice or maybe she cannot keep secrets, is a novel metaphor made for occasional use (Dulcinati, Mazzarella, Pouscoulous, & Rodd, 2014). Lai, Curran, and Menn (2009) found that both conventional and novel metaphorical sentence-final words elicited larger N400 amplitudes compared to literal words, with a longer-lasting effect to the novel metaphorical words. These results indicated that the processing of novel metaphors was more taxing than that of conventional metaphors. Aptness refers to the degree to which the vehicle expresses an important feature of the topic (Blasko & Connine, 1993; Chiappe & Kennedy, 1999). For instance, “*that fashion model is a rail*” is a highly apt metaphor because the property (i.e., extremely thin) expressed by the vehicle is an important feature of the topic. In contrast, “*my filing clerk is a butcher*” is a less apt metaphor, because the property implied by the vehicle is irrelevant to the topic (Jones & Estes, 2006). Jones and Estes (2006) found that aptness could predict the speed and ease of metaphor comprehension. Context refers to the discourse in which the metaphor embedded. Previous studies have shown that the supportive context which explicitly described the relation between the topic and vehicle in a metaphor promotes metaphor comprehension (Bambini, Bertini, Schaeken, Stella, & Russo, 2016). In this study, they asked participants to process metaphors in two experiments. In Experiment 1, participants were presented with metaphors (e.g., “*Do you know what that lawyer is? A shark*”) and equivalent literal expressions (e.g., “*Do you know what that fish is? A shark*”) in a minimal context. In Experiment 2, the context was a supportive one, which contained cues expressing the relation between the metaphor's topic and vehicle (e.g., metaphorical condition: “*That lawyer is really aggressive. He is a shark*”; literal condition: “*That fish is really aggressive. It is a shark*”). Results showed that the critical nouns (i.e., *shark*) elicited different N400s between the two conditions in the first experiment but not in the second experiment. These results indicated that the supportive context can promote metaphor comprehension.

Understanding a metaphor and learning a metaphor may involve different cognitive processes, but little is known about how

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