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Behavioral and Neurophysiological Investigations on the Mental Representation
of Polysemy in Mandarin Chinese
以行為及神經物理訊號探討漢語多義詞之心理表徵

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Abstract

How the ambiguity at different levels of language processing is resolved in the human cognitive system has been the focus of psycholinguistic research. Because most of the words in human languages are ambiguous, for the human mind to resolve the conflicts between multiple (unrelated) meanings of the same word form, it has been suggested that a homonymous word (e.g., bank) possesses one lexical representation but two distinct semantic representations. A polysemous word (e.g., paper) also has one word form with multiple (related) meanings. However, it is still under debate whether multiple meanings of polysemous words are represented distinctly in the mental lexicon.

Previous linguistic and psychological theories have proposed two major opposing models to describe how meanings of polysemy are represented. According to a derivational model, the multiple senses of a polysemous word are derived from a core meaning, which implies that polysemy does not possess multiple semantic representations. The processing of senses is instantaneously computed based on the context. An opposing model to the derivational model posits that although polysemy has a single lexical form, each of its senses has a distinct meaning representation in the semantic space.

The present study included three types of words, namely homonymous, polysemous, and unambiguous words, for a thorough comparison at lexical and semantic levels by employing a multiple prime paradigm in order to empirically investigate how polysemy is represented in the mind.

In Experiments 1 and 2, which adopted a short and long stimulus-onset asynchrony (SOA) between the primes and the target, respectively, the participants were required to perform lexical decision on the target to probe into the word-form representations. The results showed that the priming effects were similar across the three types of target words, suggesting that at the lexical level, all of homonymous, polysemous, and unambiguous words were represented by a single lexical form. Experiments 3 to 5, which varied the SOAs between the primes and the target across the three experiments, required participants to perform semantic relatedness judgment to probe into the processing at the semantic level. The results showed additive priming patterns consistently across

experiments in both reaction time (Experiments 3-5) and N400 (Experiment 4) measurements for homonymous and polysemous words. Such findings suggested that the two types of ambiguous words, whose multiple meanings are distinct at the semantic level, were represented differently from unambiguous words, which only have one semantic representation. The N400 effect evoked by the target words following different types of primes further supported the inference that polysemous words were similar to homonymous words in possessing discrete and independent semantic representations for each sense.

The results provided convergent evidence suggesting that polysemous words have discrete semantic representations for each of the multiple meanings. By providing empirical evidence from behavioral and brain responses, the present study sheds light on how polysemy is represented in the mental lexicon.

Key words：Lexical ambiguity; Polysemy; Homonym; ERP; N400; Semantic processing

中文摘要

人類的認知系統如何解決語言處理歷程中不同層次的模糊性，長久以來一直是心理語言學研究的重點。由於人類語言中大部分的字詞皆含有高度模糊性，為了讓人類心智可以解決對於詞形與多重(無關)意義之間的衝突，有研究建議，同音異義的歧義詞（例如英文的 bank）擁有一個詞彙表徵，但有兩個不同的語義表徵。而多義詞（如英文的 paper）也具有單一的詞形與多個(相關)的語意，然而多義詞的多重語義是否在心理辭典中佔有獨立的心理表徵，目前仍待商榷。

過去的語言學和心理學理論提出了兩個主要的相對模型來描述多義詞的語義是如何被表徵的。根據一個衍生模型，多義詞的多重詞意是由一個核心意義衍生而來，這意味著多義詞不具有多重語義表徵，不同語意的形成是依據語境當下計算產生出來的。相對於衍生模型的另一模型則認為，雖然多義詞有一個單一的詞形，在語義空間中，其每一詞義皆有獨立不同的語義表徵。

本研究提出以含括三種類型的詞，即同音異義歧義詞、一詞多義的多義詞、和單義明確的詞，透過採用多重語意促發的實驗派典，結合行為和電生理實驗工具，共同在詞彙與語意層面做完整的比較探討，以實徵性地研究多義詞在腦海中的表徵。本文檢驗橫跨三種目標詞類型（同音異義歧義詞、一詞多義的多義詞、和單義明確的詞）的促發效應下的加乘效果。

實驗一在促發詞和目標詞之間使用短的刺激呈現時距，實驗二則在促發詞和目標詞之間使用長的呈現時距，兩個實驗皆採用詞彙判斷作業來探索詞形的表徵，結果顯示橫跨三種目標詞類型的促進效應相似。這表示在詞彙的

層次，同音異義歧義詞、多義詞、和單義詞，皆由一個單一的詞彙形式作為表徵。實驗三至實驗五進一步在跨不同實驗間操弄促發詞與目標詞呈現之時距，並採用語意相關判斷作業，以探討語意層面的心理處理歷程。綜觀此三個實驗，無論是在反應時間（實驗三至實驗五）或是 N400（實驗四）的測量上，皆發現歧義詞和多義詞具有等比例的促發效果。這些研究結果表明，這兩種類型的模糊詞，其多重語義在語意層面是獨立分離的，其表徵方式與只有一個語義表徵的單義詞不同。接續在不同促進詞類型後的目標詞所誘發的 N400 效應，進一步支持多義詞與同音異義的歧義詞在語意層次的表徵方式類似，每個語義皆具有分離獨立的語義表徵。

　　本研究結果提供了多重的證據，顯示多義詞的每個語義皆有各自的語義表徵。藉由提供行為及大腦反應的實徵證據，本研究闡述了心理詞典中多義詞的表徵形式。

關鍵字：詞彙歧義; 多義詞; 同音異義詞; 事件相關腦電位; N400; 語義加工