



Proficiency and sentence constraint effects on second language word learning



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ABSTRACT

This paper presents an experiment that investigated the effects of L2 proficiency and sentence constraint on semantic processing of unknown L2 words (pseudowords). All participants were Chinese native speakers who learned English as a second language. In the experiment, we used a whole sentence presentation paradigm with a delayed semantic relatedness judgment task. Both higher and lower-proficiency L2 learners could make use of the high-constraint sentence context to judge the meaning of novel pseudowords, and higher-proficiency L2 learners outperformed lower-proficiency L2 learners in all conditions. These results demonstrate that both L2 proficiency and sentence constraint affect subsequent word learning among second language learners. We extended L2 word learning into a sentence context, replicated the sentence constraint effects previously found among native speakers, and found proficiency effects in L2 word learning.

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1. Introduction

Word learning has long been an important part of exploring human language acquisition (Lew-Williams, Pelucchi, & Saffran, 2011; Yu & Smith, 2011). Because word learning is a determinant for individual language development, it has garnered much attention from educational and developmental psychologists (Deary, Penke, & Johnson, 2010; Deary, Strand, Smith, & Fernandes, 2007; Hauser & Huang, 1997; Strenze, 2007). Many studies on word learning have used a paradigm called paired-associative learning (Bower & Winzenz, 1970; Gathercole, Hitch, & Martin, 1997; Lang et al., 1988; Nation, 1982), by presenting a picture or an object paired with a visual or auditory word, while learners build the connection between form and meaning through repetition. By including the statistical properties of language, such as manipulating the co-occurrence rate between words and objects by pairing one object with many different words, the associative learning paradigm developed into implicit associative learning, or statistical learning (Breitenstein, Kamping, Andreas, Schomacher, & Knecht, 2004; Breitenstein et al., 2007), in which correct pairs and incorrect pairs are presented in different proportions, and learners do not know the potential rule. Another paradigm, called cross-situational word learning, also adopted a similar

way of statistical learning by pairing a word with many objects (Medina, Snedeker, Trueswell, & Gleitman, 2011; Ramscar, Dye, & Klein, 2013; Smith & Yu, 2008; Yu & Smith, 2007, 2011). The paired-associative learning paradigm made a great contribution for understanding the mechanisms of word learning by approximating the process of human word acquisition: seeing an object and hearing a word at the same time. At its core, the paradigm is essentially a kind of conditional reflex based on probability (Dehaene, Cohen, Sigman, & Vinckier, 2005), which relies on more general learning ability instead of language ability (Bloom, 2000; Markson & Bloom, 1997).

1.1. Language level and word learning

However, like many other advanced human cognitive activities, word learning is not as simple as paired-associative learning. It cannot be separated from prior language level.

Studies on native language vocabulary learning found that adults with different reading levels behave differently in subsequent word learning. More specifically, high-level readers learn novel words faster and more efficiently than low-level learners do (Balass, Nelson, & Perfetti, 2010; Perfetti, Wlotko, & Hart, 2005). In the study of Perfetti et al. (2005), adult English speakers learned rare words with definitions, and then made semantic relatedness judgments on trained words, untrained familiar words, and untrained rare words in the test. Event-related potentials were recorded during the word learning and testing

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stages. They found differential performances between skilled learners and less skilled learners. Skilled learners had higher accuracy and larger P600 amplitudes when recognizing trained rare words than untrained rare words. This was taken to mean that they understood the meaning of the trained rare words. Less skilled learners, on the other hand, could not distinguish trained rare words and untrained words. Balass et al. (2010) used the same method to train learners with different levels of skill to learn words in three conditions: orthography-to-meaning, orthography-to-phonology, and phonology-to-meaning. They also tested learners with a semantic relatedness judgment task to explore the differences among trained rare words, untrained familiar words, and untrained rare words. Again, event-related potentials were recorded during the testing stage. The results showed that high-skilled readers showed strong familiarity effects for trained rare words, while less-skilled readers did not. All these results demonstrate that learners with higher language levels are better at learning new words using prior knowledge and skill.

1.2. Reading and word learning

In natural environments, word learning is neither limited to childhood nor limited to simple paired association. When children have a certain level of language knowledge, the process of word learning is enriched when they begin to read (Nagy, Herman, & Anderson, 1985). Subsequently, they acquire most words through the context of reading (Krashen, 1989; Nagy, Anderson, & Herman, 1987; Nagy et al., 1985). For adults, the majority of new vocabulary also comes from different contexts, particularly reading (Berwick, Friederici, Chomsky, & Bolhuis, 2013). It is possible to acquire word meaning through one-time reading, in appropriate circumstances (Borovsky, Elman, & Kutas, 2012; Borovsky, Kutas, & Elman, 2010).

Many previous studies about word recognition and lexical access found sentence constraint effects in L2 processing (Duyck, Assche, Drieghe, & Hartsuiker, 2007; Schwartz & Kroll, 2006; Titone, Libben, Mercier, Whitford, & Pivneva, 2011; van Hell & de Groot, 2008), and in the studies of word learning through reading, the question of whether and how readers make use of sentence context to acquire new words also gets a lot of attention.

Chaffin, Morris, and Seely (2001) explored the role of informativeness of sentences in word learning using eye-tracking technology. They found that readers would gaze at a location longer if it provided more effective information for novel word meaning. Their results suggest that readers can and do make use of contextual information provided by sentences to infer word meaning. Borovsky et al. (2010) examined the effects of sentence constraint on the understanding and usage of novel words. Twenty-six native English speakers read high-constraint or low-constraint sentences with known or unknown words embedded. After each sentence, they made a plausibility judgment about the word usage. Event-related potentials were recorded during the experiment. Plausibility effects were observed in the N400 component when the novel word was acquired in a high constraint sentence, which demonstrates that native speakers rapidly acquired the novel word usage through high constraint sentences. Borovsky et al. (2012) then investigated the impact of sentence constraint on the integration of novel word meanings into semantic memory. Adult native speakers of English read high-constraint or low-constraint sentences ending with known or unknown words. Then after reading a sentence, they completed a lexical decision task in which ending words (known or unknown) served as primes for related, unrelated, and synonym target words. They found that N400 amplitudes to target words preceded by unknown word primes varied with prime-target relatedness, but only when the unknown word was embedded in high-constraint sentences previously. These results demonstrate that adult native speakers can rapidly integrate information about word meaning into their mental lexicons by reading high constraint sentences. Mestres-Missé, Rodríguez-Fornells, and Münte (2007) even directly observed the brain activity of word

meaning acquisition during sentence reading by recording the brain potential. Participants read three sentences including the same novel word, while in some of the three sentences the novel word could form a congruent meaning, in some other sentences the novel word could not form a congruent meaning. She found that in sentences that a novel word could form a congruent meaning, N400 amplitude decreased across the course of three sentences, which implied meaning acquisition of novel word.

All these studies so far indicate that native language learners can take advantage of immediate information provided by sentences to learn new words. Then what about L2 learners? Can they also make use of the sentence context when learning new words? And if new word learning relies on previous knowledge and language level, how important is L2 proficiency?

There are some studies exploring whether L2 learners can learn new words through reading (Pitts, White, & Krashen, 1989), and if so, how many encounters do they need (Horst, Cobb, & Meara, 1998; Ferrel Tekmen & Daloğlu, 2006; Pellicer-Sánchez & Schmitt, 2010; Waring & Takaki, 2003; Webb, 2008; Zahar, Cobb, & Spada, 2001). There are also some studies that examined the role of proficiency in L2 word learning, and they found that learners with larger L2 vocabulary size had greater word learning gains through reading and needed fewer encounters (Horst et al., 1998; Ferrel Tekmen & Daloğlu, 2006; Zahar et al., 2001).

Because most of these studies used published novels as reading materials, it was hard to control the familiarity and reading difficulty. Even so, there are still some studies that investigated the role of sentence context. Pulido and colleagues performed a series of studies focused on the topic familiarity of the reading materials (Pulido, 2003, 2007; Pulido & Hambrick, 2008). Pulido (2003) studied L2 vocabulary acquisition and retention through reading narratives, in which L2 learners with different proficiency levels read narratives of familiar or less familiar topics and which contained nonsense words. Then, participants completed recognition tests 2 and 28 days after reading the narratives. Topic familiarity effects were found on the initial measure of gain (2 days after), which demonstrated that sentence context could influence the gain of words. She also found that no matter how familiar the topic was, learners with high proficiency acquired more words through reading and maintained their learning better, which suggests that L2 word learning relies on existing language experience. Her following studies further confirmed that sentence context can influence word acquisition and that language-processing experience positively influences L2 passage comprehension (Pulido, 2007; Pulido & Hambrick, 2008).

All these studies give us a preview of the role of L2 proficiency and sentence context on word learning through reading. However, none of them has investigated the role of sentence constraint or the interaction of sentence constraint and proficiency on L2 word learning. In the present study, we designed an experiment to investigate the effects of L2 proficiency and sentence constraint on subsequent L2 word learning through reading. We strictly controlled many variables of the words and sentences, and used pseudowords as the learning items and two sentence constraint contexts (high-constraint and low-constraint) for each pseudoword. We used a whole sentence presentation paradigm, and a block of sentences was presented before a block of semantic relatedness judgment tasks that measured learners' behavioral performance.

L2 learners might or might not make use of the sentence context to learn new words, and their performance could vary with proficiency and sentence constraint. One possibility is that L2 word learning is similar to native language word learning such that L2 learners perform better in high-constraint sentences than in low-constraint sentences, and higher proficiency learners would outperform lower proficiency learners in L2 word learning. An alternative possibility is that L2 learners might not learn words like native speakers, thus we would fail to see effects of proficiency or sentence constraint on L2 word learning.

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