



# The impact of recent and long-term experience on access to word meanings: Evidence from large-scale internet-based experiments

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## ARTICLE INFO

### Article history:

Received 12 December 2013

revision received 16 October 2015

### Keywords:

Semantic ambiguity

Lexical ambiguity

Perceptual learning

Priming

Comprehension

Web-based experiment

## ABSTRACT

Many word forms map onto multiple meanings (e.g., “ace”). The current experiments explore the extent to which adults reshape the lexical–semantic representations of such words on the basis of experience, to increase the availability of more recently accessed meanings. A naturalistic web-based experiment in which primes were presented within a radio programme (Experiment 1;  $N = 1800$ ) and a lab-based experiment (Experiment 2) show that when listeners have encountered one or two disambiguated instances of an ambiguous word, they then retrieve this primed meaning more often (compared with an unprimed control condition). This word–meaning priming lasts up to 40 min after exposure, but decays very rapidly during this interval. Experiments 3 and 4 explore longer-term word–meaning priming by measuring the impact of more extended, naturalistic encounters with ambiguous words: recreational rowers ( $N = 213$ ) retrieved rowing-related meanings for words (e.g., “feather”) more often if they had rowed that day, despite a median delay of 8 hours. The rate of rowing-related interpretations also increased with additional years’ rowing experience. Taken together these experiments show that individuals’ overall meaning preferences reflect experience across a wide range of timescales from minutes to years. In addition, priming was not reduced by a change in speaker identity (Experiment 1), suggesting that the phenomenon occurs at a relatively abstract lexical–semantic level. The impact of experience was reduced for older adults (Experiments 1, 3, 4) suggesting that the lexical–semantic representations of younger listeners may be more malleable to current linguistic experience.

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## Introduction

The ability to rapidly and accurately retrieve word meanings is critical for successful language comprehension, but is particularly challenging for words with multiple meanings. For example, when reading “the boy heard

the loud BARK”, the reader must determine that the final word most likely refers to the sound made by a dog and not the outer covering of a tree. Given that over 80% of common English words have more than one dictionary definition (Rodd, Gaskell, & Marslen-Wilson, 2002), the processes that enable readers/listeners to select appropriate word meanings and reject contextually inappropriate meanings form a core (and much studied) component of the language comprehension system (Twilley & Dixon, 2000; Vitello & Rodd, 2015). The current experiments

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explore the hypothesis that learning mechanisms make an important, and previously underestimated, contribution to the efficiency with which ambiguous words are processed. We propose that lexical–semantic representations are reshaped throughout our adult lives on the basis of our linguistic experiences, such that information about how these words have been used across a wide range of timescales, from minutes to years, allows individuals to make better predictions about which meanings are more likely to be encountered in the future.

That the language system continues to be shaped by linguistic input throughout adulthood is now well established. Adult speakers can learn new word forms that enter the language (e.g., “blog”; Gaskell & Dumay, 2003) as well as new meanings for words they already know (e.g., “twitter”; Rodd et al., 2012). In addition to these abilities to learn *new* linguistic representations, an increasing body of evidence has shown that adults are remarkably skilled at ‘fine-tuning’ their *existing* linguistic representations to improve future comprehension. For example, adult listeners can rapidly adapt to unfamiliar speech accents (Adank, Evans, Stuart-Smith, & Scott, 2009; Bradlow & Bent, 2008; Clarke & Garrett, 2004; Cristia et al., 2012) and to the idiosyncratic pronunciation habits of unfamiliar speakers (Mullennix, Pisoni, & Martin, 1989; Nygaard & Pisoni, 1998). Similar retuning has also been observed at the syntactic level, where past syntactic experience helps listeners to predict upcoming words/phrases in sentence comprehension (Arai, Van Gompel, & Scheepers, 2007; Fine & Jaeger, 2013; Traxler, 2008). These adaptations at different linguistic levels and at different timescales, which retune listeners’ representations on the basis of experience, are now well established as making a critical contribution to language comprehension. For instance, adaptations to speech helps listeners’ ability to deal with between-talker variability, allowing them to accurately identify speech sounds that might otherwise have been ambiguous (see Samuel & Kraljic, 2009 for a review) and syntactic adaptations facilitate syntactic parsing and meaning interpretation, hence improving comprehension fluency (see Pickering & Ferreira, 2008, for a review). However, it remains relatively unexplored whether people also retune their lexical–semantic representations to linguistic input in adulthood. The current experiments explore the extent to which an adult’s lexical–semantic representations can be reshaped by recent exposure, and the time-course of these effects in different adult age groups.

The ability to adapt to interlocutors’ linguistic representations is argued to result from automatic alignment at different linguistic levels during language communication: interlocutors need to align their language systems in order to build up a common ground, against which they can accurately interpret words from each other’s speech and meanings from each other’s words and sentences (e.g., Pickering & Garrod, 2004). For instance, it has been observed that people assimilate each other’s accent, speech rate and articulation during dialogue (Giles, Coupland, & Coupland, 1991; Pardo, 2006); they gradually converge on the same terms (e.g., “couch” or “sofa”) to refer to an object (Clark & Wilkes-Gibbs, 1986); and they tend to

repeat each other’s syntactic structure in their utterances (Branigan, Pickering, & Cleland, 2000; Cai, Pickering, & Branigan, 2012). Though explicit attention may help interlocutors to align, most often, speakers and listeners can align by implicitly learning from each other’s linguistic input (Pickering & Garrod, 2004). Thus, it may follow that listeners may as well adapt their lexical–semantic representations with their conversational partners or according to their most recent experience. One typical example where such lexical–semantic alignment may occur is the interpretation of ambiguous words such as “gas” that have multiple meanings: successful communication would require a listener, for instance, to understand “gas” as referring to fuel when it is used by an American English speaker but as referring to an air-like fluid if it is used by a British English speaker (see Cai et al., 2015, for a demonstration). Similarly, if a word such as “pitch” has been previously used to mean the playing field (e.g., by a footballer/soccer player), or the throwing of a ball (e.g., by a baseball player) or as a musical-acoustic property (e.g., by a musician), a competent listener might take such recent experience into account when later interpreting the word in the same conversation in order to be able to process such word more accurately and fluently.

We therefore propose that the lexical–semantic representations of adults remain sufficiently malleable that our linguistic experiences can influence our interpretations of such words at a range of different time-scales. First, we suggest that our interpretations of such words are strongly influenced by our most recent experience, within the last few minutes. For example, a subordinate (low-frequency) meaning (e.g., the animal enclosure meaning of “pen”) might be relatively difficult to process the first time it was encountered during a conversation, but that this initial encounter would boost its subsequent availability making it easier to process later in the conversation. On the assumption that word-meanings are likely to be repeated within natural conversations, this would facilitate access of appropriate word meanings, relative to the situation where these meaning preferences were highly stable and only reflect the overall frequency of the meanings across the listener’s whole lifetime. Specifically, listeners/readers would be (i) faster to select the correct meaning on the basis of sentence context and (ii) less likely to assign an incorrect meaning. Given the ubiquity of lexical/semantic ambiguity in language, such a mechanism could potentially make a considerable contribution to the fluency of natural language comprehension. Such an effect would be akin to the processing enhancement seen for word recognition as a result of repetition priming, where words that have been most recently encountered are more easily recognised (See Wagenmakers, Zeelenberg, & Raaijmakers, 2000, for discussion of relationship between word frequency effects and repetition priming).

In addition, we propose that our linguistic experience can shape our lexical–semantic representations at longer time-scales, such that following repeated encounters with a particular word meaning over a period of days/weeks/years would increase the accessibility of that meaning relative to the word’s other meanings. This form of implicit learning would allow us to adapt to the changes in

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