Studies in Second Language Acquisition (2024), **46**, 818–840
doi:10.1017/S0272263124000317

RESEARCH ARTICLE

How well are primary and secondary meanings of L2 words acquired?

Beatriz González-Fernández[1] and Stuart Webb[2]

[1]School of English, University of Sheffield, Jessop West, 1 Upper Hanover Street, Sheffield, S3 7RA, UK and [2]Faculty of Education, University of Western Ontario, 1137 Western Road, London, ON, N6G 1G7, Canada
Corresponding author: Beatriz González-Fernández; Email: b.gonzalez-fernandez@sheffield.ac.uk

(Received 01 June 2023; Revised 01 March 2024; Accepted 13 March 2024)

Abstract

Most words in a language have more than one meaning. Yet, few studies have explicitly examined the acquisition of secondary meanings of L2 words and the extent to which polysemy and homonymy affect vocabulary learning. This study explores the effect of polysemy and homonymy on the deliberate acquisition of the form–meaning connections of L2 words. Thirty-six EFL learners (compared with a control group of 30) learned secondary polysemous and homonymous meanings of familiar words and primary meanings of unfamiliar words using flashcards. Knowledge of target words was measured using meaning–recall and meaning–recognition tests immediately after the treatment and again one week later. The findings indicated that learning another meaning for a familiar word was just as difficult as learning the primary meaning of an unfamiliar word, suggesting that the type of meaning (primary, secondary polysemous, or secondary homonymous) might not be an influencing factor in the deliberate acquisition of L2 words.

Introduction

The acquisition of word meaning is crucial for vocabulary use. Research investigating vocabulary learning has typically focused on gaining knowledge of the link between a word's form and its most frequent meaning (Schmitt, 1998) because these are the meanings that are most likely to be encountered and used. However, the successful and appropriate use of a word in diverse contexts and situations also requires knowledge of at least some other aspects of vocabulary knowledge, including the various meanings that a word can take (Nation, 2020). There have been relatively few studies (specifically in second languages [L2]) that explicitly examined the acquisition of the secondary meanings of words and how vocabulary learning is affected by polysemy and homonymy. This is surprising because multi-meaning words (particularly polysemous ones) are very common in language (Hoshino & Shimizu, 2018). This is especially the case for the most frequent words (conforming with Zipf's law), with some estimations suggesting that the 3,000 most frequently used English words could have up to 10,000 different meanings (Stahl & Nagy, 2006). This multi-

meaning phenomenon implies that the meanings of a vast number of words in English (as many as 84%, according to estimates by Baayen et al., 1993) might be ambiguous. Given this ubiquity, a lack of knowledge of the various meanings of these words can prevent successful comprehension and communication. Logan and Kieffer (2021) found that a lack of knowledge of the different meanings of L2 polysemous words (both academic and everyday words) led to worse reading comprehension abilities over time. Importantly, Kellerman (1986) suggests that knowing the range of meanings of familiar words can compensate for L2 learners' limited vocabulary size during communication. Therefore, learning the different meanings that words convey is important for L2 learners' lexical and language development.

Yet, research indicates that learning a word's different meanings is challenging for even advanced L2 learners (Crossley et al., 2010; Schmitt, 1998), leading some researchers to claim that it is among the latest aspects of word knowledge to be acquired (González-Fernández & Schmitt, 2020; Wolter, 2009). Historical linguistics classifies the different meanings that words can take into two main categories: polysemous (i.e., various senses that derive from the same origin and share an underlying theme) and homonymous (i.e., discrete meanings that derive from different origins and thus are unrelated). Although several L2 studies have investigated polysemy (Hoshino & Shimizu, 2018; Kellerman, 1986; Verspoor & Lowie, 2003), the acquisition of L2 homonymy is largely unexplored. Thus, it is still unclear how homonymous meanings of words are learned by L2 speakers compared with polysemous senses[1]. In addition, research to date has not compared how secondary meanings of familiar words and the main meaning of unfamiliar words are learned in an L2. Exploring these issues is necessary to enhance our understanding of L2 meaning as a holistic concept and to begin developing a theory of meaning acquisition in second languages that can provide more systematicity to vocabulary research and pedagogy.

The present study addresses these gaps by examining the effect of polysemy and homonymy on the deliberate acquisition of L2 meaning by Spanish-speaking EFL learners. It compares the learning of secondary homonymous and polysemous meanings of familiar words with learning the primary meanings of unfamiliar words. This should provide some indication of the degree to which learning the form–meaning connections of words continues after learning their primary meanings. Moreover, if different learning gains of homonymous and polysemous meanings are found (as is the case in most L1 research), we can conclude that the etymological distinction between these types of meanings influences their acquisition. If, on the other hand, no differences are found in the learning of the various types of meanings, this could be an indication that, unlike in L1 acquisition, the etymological distinction between them might not be a determining factor in L2 meaning acquisition.

Describing polysemy and homonymy

Different linguistic criteria have been proposed to define and differentiate between polysemy and homonymy (e.g., etymological, syntactic, semantic), but researchers have

[1]Following linguistic conventions, the multiple meanings of polysemes are referred to as *senses*, while the various interpretations of a homonym are labeled *meanings*. *Meaning* will also be used as the umbrella term to cover both of these cases together (Klein & Murphy, 2001).

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

typically favored the etymological approach for being more reliable (Foraker & Murphy, 2012; Hulme et al., 2019). The etymological approach distinguishes meanings with the same vs. different origins (i.e., polysemous vs. homonymous, respectively)[2]. For example, this etymological distinction is the most popular among lexicographers to structure word meanings into dictionary entries; polysemous senses appear listed within the same entry, whereas homonymous meanings appear as separate word entries (Rodd et al., 2002). In this study, we adopted the etymological definition to operationalize the distinction between polysemous senses and homonymous meanings, to examine whether this conceptualization influences L2 vocabulary acquisition.

According to the etymological approach, polysemous senses are those meanings of a word that derive from the same origin and thus are related to each other. For example, the word *chair* can mean "a seat for one person" or "a person in charge of a group or organization," and both meanings derive from the same Old French word (i.e., *chaiere*), making them polysemous senses. Polysemy arises through a linguistic, and often logical, extension of senses somewhat related to the core sense. These semantic extensions can be metaphorical, that is, figurative uses of a word (e.g., *head* is "a part of the body" but also refers figuratively to "a person in charge of a meeting") or metonymic, such as an object/substance semantic relation, when the same word is used to refer to an object and the substance that makes it up (e.g., *walnut* is a tree [object] that is the source of the *walnuts* fruit [substance]) (Vicente, 2018). In contrast, homonymous meanings derive from different origins and thus are discrete and unrelated. For example, *bat* can mean "staff used to play certain games," which comes from Old French *batte*, or "flying nocturnal mammal," which derives from Middle English *bakke*. Homonyms usually evolve accidentally through a historical coincidence in which a word divides up into different meanings or in which two different meanings converge on the same phonological or graphical form (Vicente, 2018). This classification of meanings into polysemy and homonymy can also be understood as a continuum. This is because the senses of a polysemous word vary in their degree of semantic relatedness, with some being highly related to the core sense (e.g., metonymy) and others less semantically related (e.g., metaphor), which might make them behave closer to homonymy (Klepousniotou et al., 2012).

From this etymological definition, it might seem possible that learning polysemous senses of a word would be easier for L2 speakers than learning homonymous meanings, insofar as senses share a common origin and are somewhat interrelated. It has also been suggested that polysemous knowledge (specifically of senses closely related to the core meaning) might transfer from the L1 onto an equivalent word in the L2 (Kellerman, 1986), which would offer polysemy an acquisitional advantage over homonymy when learning second languages. However, to the best of our knowledge, L2 research has not yet explored the acquisition of these two types of meanings, and thus it is unclear whether polysemes or homonyms are easier or more difficult for L2 learners to acquire. Exploring the deliberate acquisition of polysemy and homonymy together is important to further advance our understanding of meaning acquisition, and would also enable us to assess whether this commonly employed etymological distinction is readily apparent to L2 learners and applies to L2 education (e.g., if L2 learners are consciously or subconsciously unaware of this linguistic distinction, it is unlikely that it can influence their acquisition of different meanings).

[2]We refer to polysemous and homonymous *meanings* instead of *words* because some words can have both polysemous senses and homonymous meanings, and thus cannot be classified as polysemes or homonyms (e.g., *arm* comprises the polysemous senses "part of the human body" and its extension "part of furniture where you rest your arms," but also the homonymous meaning "weapon").

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

L1 acquisition of new meanings

There is no consensus among researchers regarding how learning entirely new words (one-to-one mappings) compares to learning novel meanings for known words (one-to-many mappings). Some studies suggest that learners find it easier to acquire new additional meanings for familiar words than for completely new words. This is because there is support from prior knowledge of the word so that learners can focus their efforts only on the mapping of the new meaning onto a known form, rather than having their attention divided between the new form and the new meaning (Storkel et al., 2013; Storkel & Maekawa, 2005). In contrast, other research contends that acquiring new meanings for already familiar words is harder for learners, because the known and novel meanings compete with each other during the integration process (Fang & Perfetti, 2019; Maciejewski et al., 2020; Rodd et al., 2002). For example, Maciejewski et al. (2020) examined the effect of learning new, fictitious meanings for familiar words on L1 speakers' processing of the existing meanings for those words using a semantic-relatedness decision task. They found that speakers' responses to the familiar words were slower after learning the additional meanings than before, supporting the view that learning new meanings for familiar words is harder for learners due to the competition effect between the newly acquired and already known meanings. Finally, some research reports a combined facilitation and competition effect for familiar words. Fang et al., (2017) examined the intentional learning of new (invented) meanings of known and unknown words by L1 English speakers and assessed learning via meaning recall and recognition tests immediately after and one week later. They found that familiar words exhibited higher and quicker meaning gains than novel words in the beginning learning stages, but this pattern reversed later on, with the meanings of novel words being learned and integrated quickly. This suggests that in the earlier stages of meaning acquisition, the form similarity of multi-meaning words facilitates learning, but later meaning interference occurs among the various meanings of the known words, which might hinder this acquisition, at least temporarily (Fang & Perfetti, 2019).

A reason for these mixed results might lie in the type of secondary meaning being examined for the familiar words, specifically the polysemous or homonymous relationship between the known and novel meanings. Maciejewski et al. (2020) argue that meaning relatedness regulates the degree of competition effect among the multiple meanings of familiar words, with fictitious new meanings of familiar words showing a smaller competition effect and better recall when they were semantically related to the existing meaning (mimicking polysemy) than when they were unrelated (homonymy). In line with this, Rodd et al. (2012) found a facilitation effect of polysemy, with polysemous meanings being learned significantly better than homonymous ones in an offline meaning recall task, and recognized more quickly in a lexical decision task, probably due to the semantic interrelation among the senses. Klepousniotou and her colleagues (Klepousniotou, 2002; Klepousniotou et al., 2008, 2012) also compared polysemy and homonymy involving subdividing the polysemous senses into two levels of meaning relatedness (more or less related). They found that more related polysemous senses had a stronger facilitation effect in online priming lexical decision tasks, while less related senses behaved somewhere in between homonymy and polysemy. Conversely, Klein and Murphy (2001) observed that encountering a contextualized polysemous word being used in one of its senses provided no facilitation for recognizing it when used in a different sense; in fact, it tended to slow down the recognition of the word in the second sense. This suggests a lack of facilitation in the comprehension and acquisition of polysemous senses and indicates a similar competition effect among

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

polysemous senses and homonymous meanings. Overall, the research shows a general advantage of polysemy over homonymy in L1 meaning acquisition, indicating that L1 speakers can recognize the connections among polysemous senses, and providing support for the linguistic distinction between polysemy and homonymy in the L1.

L2 acquisition of polysemy and homonymy

The acquisition of multi-meaning words[3] has been a neglected topic in L2 lexical studies. Given that the most frequent words in a language have multiple meanings, language learners are likely to encounter multi-meaning words often in L2 input. Thus, the investigation of how learners acquire multiple meanings is essential to understanding lexical development in second languages.

The few L2 studies available on the topic have focused on investigating polysemy alone (Crossley et al., 2010; Hoshino & Shimizu, 2018; Verspoor & Lowie, 2003). Verspoor and Lowie (2003) examined the intentional learning of unknown polysemous words by advanced L2 learners. Their results showed that teaching L2 learners the core meaning of an unknown polysemous word facilitated guessing and retention of the word's peripheral senses, as assessed via an offline meaning recall test (L2–L1 translation). Verspoor and Lowie attributed the findings to the semantic relationships among the senses of a polysemous word, which promote stronger networks in the mental lexicon. These networks, in turn, allow learners to recognize semantic relationships between the senses, benefiting their instruction and learning.

In a study exploring the incidental development of various word-knowledge aspects, including polysemy, Schmitt (1998) found that his advanced L2 participants' knowledge of various senses of the target words increased over time, although very slowly, and that the learners only achieved partial knowledge of all the possible senses of the target words. Building on Schmitt's study, Crossley et al. (2010) examined the oral production and development of frequent polysemous words and various senses of those words by low-proficiency adult L2 learners over a year. They found that L2 learners begin to use a higher number of and more frequent polysemous words initially, but with few sense extensions (typically only the most common sense), and later, with more exposure to the language, they slowly develop some extra senses of those words. Yet, the knowledge of the various possible senses remained partial. In line with Verspoor and Lowie's (2003) conclusion, Crossley et al. suggest that their findings are likely a result of learners establishing connections among the various senses of a word.

Based on the findings from the prior research, it can be stated that L2 learners' knowledge of a word's multiple meanings can increase with exposure to the language (both intentional and incidental) and that this growth seems to be enhanced by the lexical connections made with other words. However, these studies also show that even advanced L2 learners struggle with learning the different meanings that words convey, with only partial knowledge of the possible senses being developed over time (Crossley et al., 2010; Schmitt, 1998). Consequently, it has been argued that knowledge of the multiple meanings of a word is one of the most difficult lexical aspects (or even the most difficult one) to be acquired by L2 learners (Wolter, 2009), and thus should be expected to develop later in the acquisition process (see González-Fernández & Schmitt, 2020 for the order of acquisition of word-knowledge aspects).

[3]We employ the term *word* to refer to the same word form since homonyms can be considered independent words that share the same form.

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

The limited research on the topic means that it is unclear which factors influence the learning of multiple meanings in an L2. Specifically, the focus of the previous studies only on polysemy means that it is unknown whether the polysemous or homonymous nature of meanings affects their acquisition by L2 learners, and whether the typical advantage of related meanings/polysemy found for L1 speakers also applies to L2 learners. It might be that the common origin and semantic links among all the senses of a polysemous word may facilitate the learning of new polysemous senses (even peripheral ones, Verspoor & Lowie 2003) over homonymous meanings, providing learners are consciously or subconsciously aware of these links. Alternatively, it seems likely that L2 learners, particularly those with low proficiency, may not be able to independently establish those semantic connections between senses, which would result in similar learning of homonyms and polysemes. In this case, the etymological distinction would be irrelevant in L2 acquisition, and thus impractical for L2 instruction.

Additionally, no study to date has investigated the acquisition of L2 meaning in isolation from the acquisition of new word form; that is, how learning new secondary meanings for words they already know in their most frequent meaning compares to learning the most common meaning of new unknown words. It is possible that having established knowledge of the L2 word form may leave more attentional resources open to learning its meaning, which might render learning multi-meaning words easier than learning primary-meaning unknown words; alternatively, secondary meanings of familiar words might be harder to learn than the most common meaning of an unfamiliar word due to their greater abstractness, figurativeness, and lower familiarity and the competition between novel and old knowledge. The present study seeks to address these areas by examining the deliberate acquisition of secondary meanings of familiar words in an L2 in comparison to the acquisition of the main meaning of unknown words.

The current study

This study expands on the findings and limitations of previous research in three ways. First, unlike all prior L2 research (Crossley et al., 2010; Schmitt, 1998; Verspoor & Lowie, 2003), the current study compares the acquisition of polysemous and homonymous meanings in a second language, which enables the investigation of this etymological distinction and its practicality in the L2. Second, the study is the first to compare the acquisition of secondary meanings of familiar words to the primary meanings of unknown words, allowing for a more comprehensive and precise examination of L2 meaning acquisition. Finally, the current study examines real secondary meanings of the target words, rather than the fictional meanings employed in L1 research, and assesses high-frequency multi-meaning words instead of low-frequency words (i.e., Schmitt, 1998; Verspoor & Lowie, 2003). This enhances the study's ecological validity and provides a more accurate representation of the polysemy/homonymy phenomenon because it is the most frequent words that tend to have the most meanings. The study adopts a quasi-experimental pretest, treatment, and posttest design to address the following research questions:

RQ1. To what extent can new polysemous and homonymous meanings of familiar L2 words be learned deliberately and does prior L2 vocabulary knowledge affect this learning?

RQ 2. Are there any differences between the deliberate acquisition of polysemous and homonymous meanings of familiar words, and the primary meaning of unknown words?

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

Methodology

Participants

The participants consisted of 66 L1 Spanish EFL learners (60 females, 6 males) with an education degree at a university in Spain whose ages ranged between 20 and 35 years (M = 22.21, SD = 2.48). Participants had an academic learning history in L2 English of between 2 and 20 years (M = 13.98, SD = 3.36), but only a quarter of them (27.3%) were studying English formally at the time of data collection. Two students had spent 3+ months in an English-speaking country (4 and 6 months specifically). Most of the participants (57.6%) reported themselves as having low-to-intermediate general proficiency in English, with just over a third (34.8%) considering themselves as having an upper–intermediate level, and 7.6% rating themselves as advanced learners of English. An objective measure of their estimated vocabulary level in English was collected through the administration of the updated Vocabulary Levels Test (uVLT), a standardized measure of L2 receptive knowledge of the most frequent 5,000 English word families (see Webb et al., 2017 for test development and initial validation). On average, participants knew just over half of the words in the test across the five sections (M = 55.1%, SD = 14.68) (see Appendix 3), corresponding to receptively understanding approximately 2,700 word families in English. Overall, participants can be considered to have low-to-intermediate English proficiency.

Target items

The target items were 30 English words selected to represent each of the three types of target meanings (secondary polysemous, secondary homonymous, primary). The most frequent meaning of each of the 10 polysemous target items and 10 homonymous target items was familiar to the learners. The remaining 10 words were unfamiliar to the learners, and we targeted their primary meanings, defined as the most frequent use of a word for the target users. The most frequent meaning for each target word was identified upon consultation with two corpus-based dictionaries which list a word's different meanings according to intra-word frequency (i.e., *Cambridge Advanced Learner's Dictionary, Longman Dictionary of Contemporary English*), and corroborated by experienced English teachers of EFL Spanish learners (details in Appendix 1). The target words and meanings were selected following a small-scale norming study examining their imageability, relatedness, and familiarity, which confirmed their validity for the study's purpose (description and results in Appendix 1).

The 30 target items were controlled in length, cognateness, part of speech (PoS), and frequency:

a) words were three to five letters long (total M = 4.07, SD = 0.12 [polysemous M = 4.2, homonymous M = 4, primary M = 4]).
b) target meanings were noncognates with the participants' L1 to control for L1 influence (Kellerman, 1986).
c) the familiar and target meanings refer to noun categories, in an attempt to make them as concrete as possible (Hulme et al., 2019); thus, typical homonyms that are formed by changing the PoS (e.g., noun to verb, *bear*, *duck,* or *book*) were not included. These are also considered more ambiguous by L1 speakers than homonyms from the same PoS (Twilley et al., 1994).
d) the 20 familiar words with new secondary meanings had to be within the first 2K frequency bands (according to the BNC-COCA-25 list, in Lextutor's

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

VocabProfiler, Cobb, 2023), to increase the chances of the main meaning being known, while the unknown words had a lower frequency (3K–12K) while still meeting all the previous criteria.

Appendix 1 presents the list of target items, their frequency band, target meaning, and the type of meaning they represent.

Following previous literature (Klein & Murphy, 2001; Klepousniotou et al., 2012; Rodd et al., 2002), we defined polysemy and homonymy according to the etymological distinction. The classification of the secondary target meanings as homonymous or polysemous was verified by consulting standard and etymological dictionaries. Dictionaries are considered a simple yet reliable resource to classify these meanings (Klein & Murphy, 2001) because they follow and respect the linguistic etymological distinction between polysemy and homonymy, list the different meanings of homonymous words as separate entries, and list the various senses of polysemous words within a single entry. Thus, in this study a meaning was classified as homonymous when it appeared in a separate entry in the *Oxford English Dictionary*, and polysemous when it appeared in a different sense of the same entry.

The study's aim requires secondary meanings to be unknown to learners. To ensure that the secondary polysemous senses were unknown and discernible from the primary meaning, peripheral senses of the polysemous items were chosen instead of those immediately closer to the primary meaning. Targeting closer senses may have invalidated the study, as research has found that they are difficult to distinguish from the primary meaning even by L1 speakers with linguistic expertise (González-Fernández, 2018). Most learner dictionaries respect the sense dominance by listing the main sense of polysemous words first and then the extended or peripheral senses (Klepousniotou et al., 2012; Moore, 2023 [personal communication], although see Mouritsen, 2010 for a review of three general dictionaries that do not). In this study, peripheral senses were considered those listed at least in third place in the *Cambridge Advanced Learner's Dictionary* entry, without counting phrasal meanings (e.g., *save face*). This approach not only minimizes the interference between the known primary meaning and the new secondary sense but also allows for a more balanced comparison of the secondary homonymous and polysemous meanings, as the items' meaning-relatedness results of the norming study confirm. The likelihood that the secondary meanings would be unknown to the participants was corroborated by English teachers with experience teaching L1-Spanish learners similar to the target participants (see Appendix 1 for details).

Instructional materials

Paper flashcards were employed as the instructional technique to teach the new meanings of the target items. This method was selected because a) it is an effective and efficient technique for creating and strengthening the form–meaning mapping of words (Nakata, 2020), making it appropriate for the current study's goal of linking either a familiar or an unknown L2 word to a new meaning; and b) it is a familiar teaching/learning method to the target students, as confirmed by Spanish EFL teachers, which provides ecological validity to this technique.

The cards measured 10.5 × 7cm to make them easy to handle and were printed on hard, opaque paper to prevent the students from seeing through from one side to the other. Each flashcard included the target L2 word form on Side A and the L1 translation

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

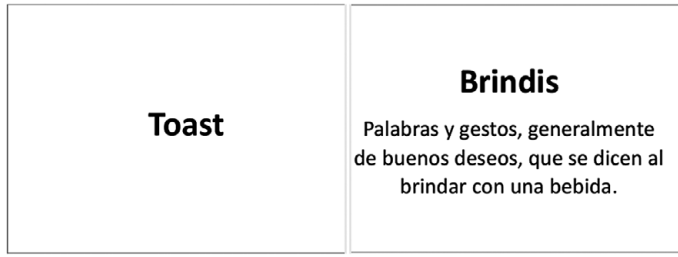

Figure 1. Flashcard sample.

English Word	Spanish Translation / Definition
toast	¿Conoces algún otro significado de esta palabra? Si es así, escríbelo en español a continuación:

Figure 2. Sample item for the meaning recall test.

and definition of the word's target meaning on Side B (see Figure 1). The target–meaning translation was checked in bilingual learner dictionaries, and the L1 definition was adapted (i.e., shortened) from the *Diccionario de la Lengua Española* (Dictionary of the Spanish language).

Measures

Learners' knowledge of the target meanings was measured via two purposefully designed tests assessing learning at two sensitivity levels: meaning recall and meaning recognition. The same tests were used as pretest, immediate posttest, and delayed posttest.

The meaning recall test took the form of an L2–L1 translation task, in which learners were asked to provide an L1 translation or definition of the primary and secondary meanings of a given word (see Figure 2). In the subsequent sample, the first gap required students to provide the main translation/definition of the target item that came to their mind, whereas the second gap asked them to report any other meanings of the word they might know (translates as "Do you know any other meaning of this word? If so, write it down in Spanish below"). In some cases, a nontarget but still accurate secondary meaning of the word was provided. For example, for the word *toast*, some students wrote the meaning "tostar" (to toast) instead or as well as the target meaning. However, only the target–meaning responses were considered for analysis. Learners were encouraged in the instructions to provide as many details as possible to reflect their knowledge of the words' meanings. If they could not remember the meaning of the word, they were instructed not to guess blindly and to leave the item blank (Cronbach's alpha across administrations =.923–.966).

The meaning recognition test (Figure 3) consisted of a multiple choice task that presented the target words and required learners to select the appropriate meaning

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

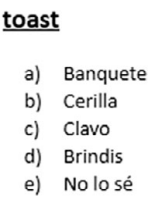

Figure 3. Sample item for the meaning recognition test.

among five options, including the correct answer, three distractors, and an "I don't know" option to minimize guessing (Zhang, 2013; see also Stoeckel et al. [2019] for a discussion on the possible variable effects of adding this option). The distractors were single words with the same PoS as the target words (nouns), and were designed using the following criteria:

a) Two distractors were not semantically related to the item being assessed and were the answer keys for two other target items.
b) The other distractor was a word for a concept semantically associated with the main, familiar meaning of the target word, but could not be considered a correct answer for that primary meaning of the word.
c) For the unfamiliar words, which targeted only their primary meaning, this last distractor was replaced by another answer key of a target item in the test.

For an illustration of the distractor criteria, in Figure 3 option a) Banquete (translates as *banquet*) represents the distractor semantically related to the main meaning of the word toast. Options b) Cerilla and c) Clavo are the answers to two other target items in the test (*match* "stick to light fire," and *nail* "metal piece to join two things together," respectively). Finally, option d) Brindis is the correct answer, being the translation of the secondary meaning of *toast* as "expression of good wishes when drinking" (Cronbach's alpha across administrations =.969–.983).

The instructions in both tests and answer options in the recognition task were provided in the participants' L1 to increase comprehensibility. The order of the items in both tasks and that of the answer options in the recognition test was randomized across tests and administrations to avoid item order and test fatigue affecting the results.

Apart from these two tests assessing the target meanings, learners were administered the uVLT test (version B) to obtain an estimation of their prior vocabulary level in English and a language background questionnaire. More details about each measure, their piloting, and the complete test battery are available in Appendix 2.

Procedure

Participants were randomly assigned to either a treatment group ($n = 36$), who took the tests and received deliberate instruction on the target meanings, or a no-treatment control group ($n = 30$), who only took the tests. Only data from participants who completed the three tests (pretest and posttests) was included in the analysis (resulting in data from an additional 13 learners who missed one or more of the sessions being excluded). After receiving informed consent from each participant, the data was collected in three sessions. One week prior to the experimental treatment, all

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

participants completed the pen-and-paper tests in the following order: meaning recall, uVLT test, meaning recognition, and language background questionnaire (lasting approximately 70 minutes).

In the second session, participants in the treatment group were taught, via paper flashcards, the target meanings (10 polysemous and 10 homonymous meanings of familiar words, and 10 primary meanings of unknown words). Each participant in this group received, face down, a randomly organized set of flashcards so that the items assessing the same type of meaning did not appear all together. Participants were instructed to independently learn the meanings in the flashcards by doing multiple rounds and to test themselves by retrieving these meanings/translations multiple times. They were allowed to learn the words as they liked but without writing them down, and learners typically verbalized the words' meanings and/or forms. Following the results from a piloting with similar L2 learners, participants were given 15 minutes to learn and practice retrieving the meanings through multiple rounds (10 mins for learning the word, and 5 mins for retrieval practice), and were required to shuffle the cards between each round of retrievals. After the learning period, the flashcards were collected. As a filler task to counteract recency effects, the participants then engaged in a 10–minute discussion about their general experience as L2 English learners. Immediately afterward, it was emphasized that we were interested in whether they remembered the meanings they had just studied, and the meaning recall and recognition posttests were completed. The whole treatment session (flashcards and posttests) took approximately 1 hour.

One week after the treatment, the participants were tested on their knowledge of the target items (lasting approximately 45 minutes). The participants were not forewarned of the delayed posttest to prevent rehearsal of the items and the use of memorization techniques between sessions. The control group did not receive any training and only completed the tests (pretests, uVLT, language background questionnaire, immediate and delayed posttest) at the same intervals as the experimental group. The purpose of the control group was to determine the extent to which learning might occur as a result of completing the pretest and immediate posttest. Upon conclusion of the study, participants were provided with a certificate of participation and a report of their test results.

Scoring and analyses

The items in the tests were scored dichotomously, as learned (1) or not learned (0) (partial credit scoring was considered too lenient given the explicit L2–L1 translation instruction). For the meaning recall test, which involved open-ended answers, any ambiguous responses (e.g., "part of the body" for *flesh*) were considered not learned. Additionally, two raters proficient in both English and Spanish randomly assessed 20% of the responses at each administration (n = 13), and an agreement of 96% on average was achieved (ICC results in Appendix 2).

Because real words were used in this study, correct responses were expected for some of the items on the pretest. Target meanings were considered learned when they were not known in the pretest, but known in the posttests (i.e., absolute gains). Items known in the pretest but not in the immediate posttest (i.e., successful guessing in the multiple choice test) were considered unknown. To take into account the fact that some participants might have known more items to start with and could have had fewer items to learn, relative gains rather than absolute learning gains were compared.

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

Relative gains account for learners' pretest scores and gains relative to the number of items, and thus provide a more precise measure of learning than absolute gains (Webb & Chang, 2015). Relative gains were calculated using the formula: [(posttest score–pretest score)/(number of test items–pretest score) × 100].

Following descriptives and preliminary analyses, a series of generalized linear mixed-effect models were fitted using the *lme4* package (Bates et al., 2021) in *R* (version 3.6.2) to explore the effect of type of meaning (polysemous, homonymfous, and primary) on the acquisition of L2 meanings, while taking into consideration factors such as participants' prior vocabulary level or intralexical features of the items (i.e., word frequency or length) (see Results section for details of these statistical procedures).

Results

Preliminary analyses

The treatment and control groups were compared statistically to make sure that they did not differ significantly. The results of a Mann–Whitney test (data nonnormally distributed) showed that both groups were matched in age, overall prior vocabulary level (uVLT scores), recall knowledge of the primary meanings of the familiar words, and recognition and recall knowledge of the new target meanings in the pretest (see Appendix 3 for these analyses).

Overall knowledge of new meanings

Table 1 shows the descriptive statistics for the meaning recall and recognition test scores across groups and times of testing. As expected, in the immediate posttest and delayed posttest the treatment group outperformed the control group in overall meaning recognition and meaning recall scores.

The overall meaning gains across groups and testing times were also compared. A one-way between-groups multivariate analysis of variance confirmed that there was a statistically significant difference between the two groups across the three testing times with a large effect size ($V = 959$, $F(6,59) = 228.699$, $p = .000$, $\eta p^2 = .959$). The comparisons between the immediate and delayed posttest scores across groups and test types were all statistically significant at the $p = .000$ level with a large effect size

Table 1. Descriptive statistics (in percentages) of overall meaning test scores by group

		Meaning recognition		Meaning recall	
	Group	*M*(SD)	Range	*M*(SD)	Range
Pretest	Treatment	6.94(6.1)	0–21.8	0.65(1.7)	0–6.6
	Control	6.88(5.3)	0–21.8	0.44(1.4)	0–6.6
Posttest	Treatment	89.58(13.6)	50–100	71.29(21.6)	30–100
	Control	8.75(5.3)	3.1–25	0.55(1.5)	0–6.6
Delayed posttest	Treatment	84.38(13.7)	50–100	42.77(19.3)	13.3–83.3
	Control	10.93(5.4)	3.1–25	1.88(2.3)	0–6.6
Relative gains (pre–post)	Treatment	88.96(14.2)	46.6–100	71.23(21.7)	30–100
	Control	0.92(5.7)	–16–11.1	0.10(1.4)	–3.6–3.4
Relative gains (pre–delayed)	Treatment	83.14(14.5)	46.4–100	42.46(19.3)	10.3–83.3
	Control	3.19(6.4)	–12–16.6	1.44(2.3)	–3.6–6.6

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

(ηp^2 between. 67 and. 94). No difference was found between the two groups in the pretests (meaning recall pretest $F(1,64) =. 259$, $p =. 6$, $\eta p^2 =. 004$, and meaning recognition pretest $F(1,64) =. 002$, $p =. 961$, $\eta p^2 =. 000$). This indicates that the two groups experienced different meaning gains, with an obvious advantage for the treatment group.

To estimate the increase in knowledge of the new meanings, the gains across the various testing times were compared for each group. A Friedman test showed a significant difference in the relative gains of the recall and recognition tests across the three administrations for the treatment group ($\chi^2(5) = 168.054$, $p =. 000$), as well as for the control group ($\chi^2(5) = 48.733$, $p =. 000$). For the control group, a Wilcoxon Signed Ranks Test of the meaning recall scores found no difference (Bonferroni adjusted alpha value $p <.017$) between the pretest and the immediate test ($Z = -.406$; $p =. 68$), or between the pretest and the delayed posttest ($Z = -2.096$; $p =. 04$), but a statistically significant difference was found between the immediate and delayed posttests ($Z = -3.125$; $p =. 002$, $r =. 571$). The meaning recognition scores showed no difference between the pretest and the delayed posttest ($Z = -1.349$; $p =. 18$), but a significant difference was found between pretest and immediate posttest ($Z = -3.217$; $p =. 001$, $r =. 587$) and between immediate posttest and delayed posttest ($Z = -2.808$; $p =. 005$, $r =. 513$). These differences indicate that some learning occurred for the control group, although this was minimal (1.44% in the delayed recall test and 3.19% in the delayed recognition test, which is less than 1 word on average [0.43 and 0.96, respectively]).

For the treatment group, the pairwise analysis of the meaning recall tests using a Wilcoxon signed-rank test showed a significant difference between the scores in the pretest and the immediate posttest ($Z = -5.235$; $p =. 000$, $r =. 873$), the pretest and the delayed posttest ($Z = -5.234$; $p =. 000$, $r =. 872$), and between the immediate and delayed posttests ($Z = -5.203$; $p =. 000$, $r =. 867$). As for meaning recognitio, the post hoc Wilcoxon signed-rank test showed that there was a significant difference between the pretest and the immediate posttest ($Z = -5.233$; $p =. 000$, $r =. 872$), pretest and the delayed posttest ($Z = -5.232$; $p =. 000$, $r =. 872$), and between the immediate and delayed posttests ($Z = -3.226$; $p =. 001$, $r =. 538$). These results indicate that the treatment group experienced a significant increase in recall and recognition knowledge of the new meanings of words with a large effect size ($r >.6$; Plonsky & Oswald, 2014), although there was also a significant decline in scores during the week between the posttests.

Knowledge of new meanings by type

This section compares the learning gains by type of meaning (polysemous, homonymous, and primary meaning).

Meaning recognition. Table 2 presents the descriptive statistics for each type of meaning in the recognition test across the three testing times. In the pretest, the three types of meanings were known to a similar degree by the treatment group, although the control group seemed to know slightly more polysemous meanings than the other two categories. The results of the immediate posttest indicate that the treatment group learned the three different types of meanings to a similar extent. The delayed posttest shows virtually no attrition of knowledge of unknown words by the treatment group, while knowledge of polysemous and homonymous meanings decreased slightly.

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

Table 2. Descriptive statistics (%) of recognition tests by type of meaning

		MRecog polysemy		MRecog homonymy		MRecog unknown	
		M(SD)	Range	*M*(SD)	Range	*M*(SD)	Range
Pretest	Treatment	6.94(7.1)	0–30	7.07(7.6)	0–27.3	6.82(7.9)	0–27.3
	Control	9.33(9.8)	0–30	6.06(4.9)	0–18.2	5.46(7)	0–27.3
Relative gain (pre–post)	Treatment	92.84(13.1)	40–100	87.4(16.1)	50–100	86.75(20.1)	30–100
	Control	1.29(13.3)	–42.8–20	0.63(3.76)	–11–10	0.20(6.4)	–25–11.1
Relative gain (pre–delayed)	Treatment	83.62(14.2)	50–100	79.23(17.4)	40–100	86.38(18.9)	22.2–100
	Control	4.97(17.5)	–42.9–25	1.96(4.9)	–11.1–18.2	1.99(6.9)	–12.5–30

To statistically analyze learning differences among the three types of meanings in the recognition test, the gains were compared using generalized linear mixed effects models with binomial distributions (the outcome was binary: learned/not learned). The analysis was conducted using the relative gains for the immediate and delayed posttests (see Analyses section). Two separate models were fitted: one for the immediate posttest and one for the delayed posttest. Model fitting began with a core model which included type of meaning (polysemous, homonymous, primary), group (treatment, control), and the interaction between the two variables predicting the learning outcome. The interaction was included in the model to check whether the treatment had a different effect on each type of meaning. These core variables were kept in the models regardless of their significance. To explore if other learner and item factors influence learning, the following covariates were considered: word frequency, word length, and prior vocabulary level. Participants' prior vocabulary level was estimated using the composite score of the five sections of the uVLT. Due to its key role in L2 vocabulary acquisition (Webb et al., 2017), prior vocabulary was maintained in the model irrespective of its significance. The interaction between uVLT and meaning type was also included to check whether learners' prior vocabulary level had a different effect on each type of word meaning. For the delayed posttest model, the score on the immediate posttest was also added as a covariate. A step-by-step backward model selection procedure was applied by excluding one-by-one any nonsignificant predictors (starting with those with smaller z values), and explicitly comparing every new model to the previous one to ensure that they were not significantly different. The nested models were compared using the chisquared test for significant differences between them, as well as the Akaike information criterion (AIC) and Bayesian information criterion (BIC) scores, to ensure the best model was chosen (see Appendix 3 for model comparison results). This procedure was followed until all the covariates remaining in the models were significant. The models also contained random effects for participants and items. Compliance with the assumptions of linearity, independence, approximate normality of residuals, and homogeneity of variance was visually inspected and confirmed for each model. The best-fitting models for the immediate and delayed posttests are reported in Table 3.

The models in Table 3 show that there was a significant direct effect of group in both the immediate and delayed posttests, indicating that the treatment group was significantly more likely to experience greater meaning recognition gains and retention than the control group. Interestingly, the models show that type of meaning was not a significant predictor of meaning acquisition in either the immediate posttest or the delayed posttest. This does not indicate any difference in the overall learning of homonymous, polysemous, or primary meanings of L2 words at the recognition level of mastery.

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

Table 3. Models predicting recognition gains

	Immediate posttest				Delayed posttest			
Fixed effects	*β*	*SE*	*z*	*p*	*β*	*SE*	*z*	*p*
Intercept	1.261	0.56	2.249	.02*	–0.968	0.51	–1.885	.06
Homonymy	–0.177	0.35	–0.499	0.62	–0.029	0.41	–0.071	0.94
Primary	–0.191	0.36	–0.539	0.59	0.710	0.43	1.670	.10
Control group	–5.115	0.38	–13.58	.000***	–3.628	0.48	–7.614	.000***
uVLT Total	0.011	0.01	1.954	.05*	0.006	0.005	1.184	.24
Immediate test score	*N/A*				2.417	0.21	11.692	.000***
Homonymy*Control group	–1.879	0.68	–2.783	.005**	–1.284	0.51	–2.535	.01*
Primary*Control group	–1.592	0.61	–2.603	.009**	–2.169	0.54	–4.051	.000***
Random Effects	***Variance***	***SD***			***Variance***	***SD***		
Subject	0.58	0.76			0.31	0.55		
Item	0.36	0.60			0.61	0.78		

Variables were dummy coded, and the reference levels were *Polysemy* for the variable "meaning type" and *Treatment* for "group."
* p <. 05 ** p <. 01 *** p <. 001

Prior vocabulary level had a significant positive effect in the immediate posttest, suggesting that larger vocabulary scores increased the probability of new meanings being learned immediately after treatment. However, this effect disappeared in the delayed posttest. For the delayed posttest, the score on the immediate posttest was a significant positive predictor, indicating that the meanings that were initially learned were more likely to be known after one week.

Finally, the interaction between type of meaning and group was significant in both models, suggesting that the two groups behaved somewhat differently regarding their recognition knowledge of the various types of meanings (see Figure 4). Post hoc contrast analyses were conducted using *emmeans* to explore the effect of type of meaning on each group separately (p-values corrected for multiple comparisons with the Tukey method). Model probability estimates (odds ratio) for the two groups across the immediate and delayed recognition tests are presented in Appendix 3. Pairwise comparisons showed no significant differences in the probability of learning the three types of meanings for the treatment group, either immediately or in the delayed test (p between. 18 and. 99). Thus, the treatment group had similar chances of deliberately learning the three types of meanings. However, the control group was found to have a greater probability of knowing polysemous meanings than homonymous and primary meanings (p =. 01) in the immediate posttest (7.8 and 5.9 times more likely, respectively), and of knowing polysemous meanings over primary (p =. 03) in the delayed posttest (4.23 times). This suggests that the control group had a slight advantage in learning and retaining secondary polysemous senses at the recognition level.

Meaning recall. Table 4 presents the descriptive statistics for each type of meaning in the recall tests across the three testing times. The results of the pretest show that participants had virtually no recall knowledge of any type of meaning prior to the treatment. As was the case for recognition knowledge, the control group experienced some learning as a result of testing, but this was insignificant (less than a tenth of a word in each case). The treatment group learned between 65% and 79% of the new meanings in the immediate posttest and retained between 33% and 50% of the meanings after one week.

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

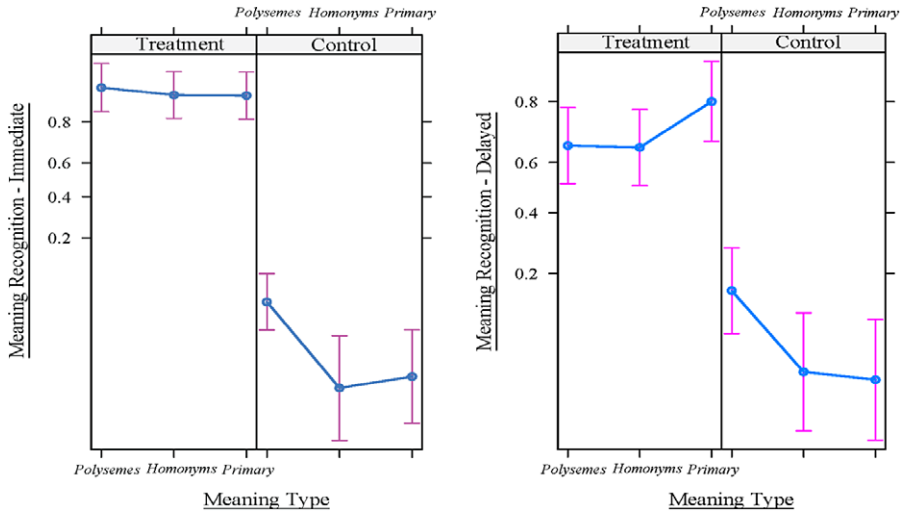

Figure 4. Meaning type and group interaction.

Table 4. Descriptive statistics (%) of recall tests by type of meaning

		MRecall polysemy		MRecall homonymy		MRecall unknown	
		M(SD)	Range	*M*(SD)	Range	*M*(SD)	Range
Pretest	Treatment	.56(2.3)	0–10	.83(3.7)	0–20	.56(3.3)	0–20
	Control	.33(1.8)	0–10	.33(1.8)	0–10	.67 (2.5)	0–10
Relative gain (pre–post)	Treatment	78.86(20.4)	30–100	64.69(28.1)	10–100	70.28(23.5)	30–100
	Control	.30(3.3)	–11.1–10	–.37(2.0)	–11.1–0	.33(1.8)	0–10
Relative gain (pre–delayed)	Treatment	49.14(20.6)	10–80	32.72(20.2)	0–80	45.69(25.3)	10–90
	Control	3.33(4.8)	0–10	–.04(2.8)	–11.1–10	1.0(3.05)	0–10

Generalized linear mixed-effects models were fitted to statistically explore differences in recall learning across the three types of meanings and the two groups. The same approach described for meaning recognition analysis was applied to meaning recall. Table 5 shows the best-fitting models for the meaning recall immediate posttest and delayed posttest.

The analysis indicated that the treatment group was more likely to learn and retain more meanings at the recall level than the control group. The model for the immediate posttest showed a significant direct effect on the type of meaning, which suggested that homonymous items were less likely to be learned than polysemous items, but no other significant differences were found among meaning types. However, in the delayed posttest, this significant effect of type of meaning disappeared, indicating that the advantage of polysemy was only temporal and that there is no indication of differences in the retention of homonymous, polysemous, or primary meanings of words at the recall level of knowledge.

As in the recognition results, a greater prior vocabulary level increased the probability of new meanings being learned at the recall level, but this effect was significant only immediately after training. For the delayed posttest, the score on the immediate posttest was a significant predictor, so meanings that were initially learned at the recall level were more likely to be retained after one week.

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

Table 5. Models predicting recall gains

	Immediate posttest				Delayed posttest			
Fixed effects	*Estimate*	*SE*	*z*	*p*	*Estimate*	*SE*	*z*	*p*
Intercept	–0.581	0.76	–0.766	.44	–2.190	0. 609	–3.627	.000***
Homonymy	–1.063	0.49	–2.184	.03*	–0.761	0.46	–1.657	.10
Primary	–0.689	0.49	–1.412	.16	–0.060	0.46	–0.130	.90
Control group	–7.968	0.96	–8.298	.000***	–2.791	0.46	–6.029	.000***
uVLT Total	0.030	0.01	3.742	.000***	0.0105	0.006	1.830	.07
Immediate test score	*N/A*				1.551	0.21	7.335	.000***
Homonymy*Control group	–12.307	694.1	–0.018	.99	–1.370	1.078	–1.272	.20
Primary*Control group	1.193	1.16	1.031	.30	–0.784	0.65	–1.210	.23
Random effects	***Variance***	***SD***			***Variance***	***SD***		
Subject	1.13	1.06			0.58	0.76		
Item	0.97	0.98			0.87	0.93		

Finally, contrary to what was found at the recognition level, the interaction between the type of meaning and group was not significant in either posttest. Post hoc contrast analyses (Appendix 3) confirmed a lack of significant differences in the probability of learning and retaining the three types of meanings in either the treatment (*p* between. 08 and. 99) or the control groups (*p* between. 15 and. 99). This suggests that the three types of meaning had similar chances of being learned and retained at the recall level, regardless of the presence of treatment.

Discussion

Deliberate acquisition of polysemy and homonymy

The results indicate that the treatment group, which received explicit meaning instruction, learned and retained polysemous and homonymous meanings to the same extent, both at the recognition and recall levels. For the control group, a slight temporal advantage of polysemous senses was found, but only in the immediate recognition posttest, with polysemous and homonymous meanings being known equally well in recall and delayed posttests. Taken together, the findings indicate that L2 learners acquire new polysemous and homonymous meanings of familiar words similarly, at least when taught explicitly. This suggests that the nature of the various meanings of words may not be a determining factor in the deliberate acquisition of new secondary meanings of familiar words in second languages.

These results are inconsistent with several L1 studies which report a clear advantage of polysemy over homonymy for L1 speakers (e.g., Klepousniotou et al., 2012; Rodd et al. 2002; Rodd et al., 2012). Those studies support the view that the etymological distinction between homonymy and polysemy is psycholinguistically real in the L1. The findings in the present study question the practical distinction between polysemy and homonymy in L2 education, at least at low proficiencies, as they show that the two meaning types result in similar gains in meaning acquisition despite the inherent conceptual link between the polysemous senses. For learners to benefit from the core meaning of polysemes, they need to notice (consciously or subconsciously) the semantic connections among all these senses, and be able to access this semantic information efficiently (Crossley et al. 2010; Verspoor & Lowie, 2003). It is possible that the smaller lexical knowledge of L2 learners compared to L1 speakers prevented the low-proficiency participants of this study from establishing the necessary links among

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

and within words that might enable a polysemy advantage. The finding of a positive effect of prior vocabulary on meaning acquisition immediately after treatment, by which chances of learning new meanings increased for learners with greater vocabulary knowledge, seems to point to this conclusion. It is also worth mentioning that, unlike the current work, the L1 studies supporting the etymological distinction between polysemy and homonymy typically examine senses of the polysemous words which are strongly interlinked semantically. Previous research suggests that even L1 speakers can struggle to distinguish between some of the strongly related senses of polysemous words, which would inevitably lead to a stronger facilitation effect of polysemy. For example, González-Fernández (2018) found that L1 English linguists were not able to appreciate the difference between the senses of the polysemous word *accept* in "accept an offer" (meaning "saying yes") or "accept a manuscript" (meaning "approving"), both identified as separate senses in dictionaries. This provides support for the use of more peripheral senses to examine the polysemy/homonymy effect (Klein & Murphy, 2002). However, it also suggests that employing peripheral senses of polysemous words in research may reduce the potential beneficial effect of polysemy (although this needs to be empirically explored in future research).

Alternative network models suggest that there is likely to be similar processing and representation of polysemy and homonymy in the L1 mental lexicon (i.e., separate entry view, Foraker & Murphy, 2012; Klein & Murphy, 2001, 2002). According to the separate entry view, both polysemous senses and homonymous meanings of words behave similarly and are stored as separate lexical entries in the mental lexicon, questioning whether the theoretical distinction between polysemy and homonymy applies in practice even for L1 speakers. In this sense, the current study's finding of a comparable learning and retention rate for homonyms and polysemes in the L2, at least during the beginning stages of deliberately learning additional meanings, seems more in line with this separate entry view. To corroborate/refute this tentative interpretation, though, research that compares the L1 and L2 processing of homonyms and polysemes directly is required. It is important to note that, as in the present work, previous studies endorsing the similar behavior of polysemy and homonymy investigated senses of polysemous words that were considered conceptually separate from each other by the participants (i.e., less semantically overlapped). For example, in their studies, Klein and Murphy (2001, 2002) selected senses of the target items that were most commonly identified by L1 speakers as being separate. Thus, when assessing senses of polysemous words that speakers view as representing different concepts, the behavior of polysemes and homonyms seems to be similar, leading some authors to claim that "perhaps there is no reason to distinguish [polysemy and homonymy]" in practical terms (Klein & Murphy, 2002, p. 568).

The present study's result that L2 learners' deliberate acquisition and retention of secondary meanings are unaffected by their etymological difference indicates that this theoretical distinction between polysemy and homonymy may not materialize in practice in EFL learning, at least when peripheral senses are targeted. It seems that the core meaning and semantic connections underlying the various senses of polysemous words are not obvious for L2 learners (at least those of lower proficiency) and might require explicit teaching to become apparent (Verspoor & Lowie, 2003). This means that, in L2 learning, the nature of the different types of word meanings does not seem essential for the deliberate instruction of secondary meanings, at least when the primary meaning of those words is well established and the polysemous senses do not overlap strongly. While it is somewhat unsurprising that L2 learners were not influenced by the etymological difference between a word's meanings, this distinction is by far the most popular in linguistic theory and research, and thus it was important to

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

investigate its appropriacy in L2 learning. This investigation suggests that while the etymological approach seems to be the best way to operationalize this distinction between polysemy and homonymy for theoretical purposes (e.g., linguistic analysis), it may not be the most appropriate for L2 pedagogy.

From the previous discussion of findings, it follows that homonymy and polysemy can be better seen as relative concepts. Not all the polysemous senses of a word have the same degree of interrelationship. In some cases, the senses are highly related (e.g., *walnut* as "tree" and "wood"), to the extent that they might not be easily discernible as distinct meanings by speakers. In other cases, the senses are less semantically interrelated (peripheral senses) and these links might not be apparent even for L1 learners (Klein & Murphy, 2001; 2002), making those senses behave closer to homonyms (or somewhere in between polysemy and homonymy) in practice (Klepousniotou et al., 2012). Thus, the distinction between polysemy and homonymy can be best described as a continuum in practical terms, with homonymy being on one end of the spectrum, and polysemy on the other end, but with some senses being closer to homonymy due to the limited appreciable semantic overlap between them.

Deliberate acquisition of secondary and primary meanings

Research on the L1 acquisition of meaning has been inconsistent, with studies indicating that learning new secondary meanings for already familiar words is both easier (Fang & Perfetti, 2019; Storkel et al., 2013) and more difficult (Fang et al., 2017; Maciejewski et al., 2020; Rodd et al., 2012) than learning the primary meaning for unfamiliar words. The present study found that L2 students deliberately learned the secondary meanings of familiar words and the primary meaning of unknown words equally well, both in meaning recognition (secondary meanings M = 90.12%, primary meanings M = 86.8%) and meaning recall (secondary meanings M = 71.8%, primary meanings M = 70.3%). In addition, participants showed no significant forgetting of the new meanings (secondary and primary) between the immediate and delayed tests. This suggests that form–meaning link gains remain strong after a week, not only for one-to-one mappings, as shown in previous L2 research (Pellicer-Sánchez, 2016) but also for one-to-many mappings (see Hulme et al.'s [2019] findings for L1 retention of familiar homonyms).

These results indicate that familiarity with a target word does not hinder the L2 acquisition of additional meanings of that word. This challenges arguments suggesting that the competition between the old and new meanings makes learning secondary meanings for familiar words more difficult than learning the form–meaning connection for unknown items (Fang et al., 2017; Maciejewski et al., 2020; Rodd et al., 2012). The present study also indicates that knowing the most frequent meaning of L2 multimeaning words may not act as a facilitator for the deliberate acquisition of secondary meanings of those words. This differs from claims that learning secondary meanings for already known words is easier than learning the primary meanings of new words because there is less new information to be retained (Storkel et al., 2013; Storkel & Maekawa, 2005). Based on Verspoor and Lowie's (2003) finding that knowing the core meaning of polysemous words led to better guessing and retention of peripheral senses, a facilitation effect of the secondary meanings over unfamiliar words might have been expected. But the lack of a positive or negative effect of familiarity with a word's main meaning found in the present study seems to indicate that low-to-intermediate L2 learners treat each new meaning as essentially a new lexical item during deliberate learning, at least for secondary meanings with no or little semantic overlap (homonyms and peripheral polysemes, respectively).

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

The results do not mean that L2 learners acquire new meanings in isolation. According to the lexical network approach, new words are learned by establishing connections with already known words, which allow the new items to be integrated within the networks of the mental lexicon (Wilks, 2009). Research supporting an effect (facilitation or competition) of knowing the meaning of a word in the learning of additional meanings represents the influence of the semantic links between and within already known words in the acquisition of new meanings. However, the current study's finding that L2 speakers learn and retain the primary meanings of unknown words as well as secondary meanings of familiar words during deliberate training indicates that these semantic links within familiar words are not automatically established by low-proficiency learners. It is possible that during the initial acquisition of new meanings for learners at lower proficiency levels, there is insufficient knowledge of the primary meanings of familiar words to facilitate gains in knowledge of secondary meanings. The semantic connections among different words as well as among the various meanings of the same words that would permit this facilitation might develop later as learners progress in their proficiency, and begin to establish a more organized and semantically interlinked mental lexicon (Crossley et al. 2010). Semantic priming research seems to support this assumption that different processing effects may be observed when semantic networks are consolidated. Findings show that while semantic priming can be found for newly established semantic representations, this is less robust than that observed for consolidated representations of meaning (Elgort, 2011). Other studies report no semantic priming or semantic inhibition effects (i.e., attempts to access these representations are hindered by stronger/consolidated semantically related competitors) when the semantic representations are not fully acquired/established (Bordag et al. 2017). This indicates that the emergent lexical–semantic representations created in the mental lexicon for new words are not yet fully stable or integrated in the semantic network (Elgort, 2011), which might explain the lack of a polysemy effect in this study. As proficiency increases and these representations become stronger and fully integrated within the existing semantic networks, L2 learners might be able to establish the necessary connections that permit the facilitation of polysemous meanings.

Pedagogical implications

The results of the current study have several implications for teaching practice. First, the study shows that L2 speakers can deliberately learn secondary meanings of familiar words (one-to-many mappings) as successfully as primary meanings of unfamiliar words (one-to-one mappings). Because high-frequency words tend to have multiple meanings, of which several meanings may be high in frequency (e.g., run outside, run a business), teachers and learners should be aware that each new meaning may require the same effort to teach and learn, at least when unrelated (homonymous) or less related (peripheral) secondary meanings are explicitly targeted in the L2 classroom. The present study supports the use of deliberate instruction as an effective approach to teaching the secondary meanings of both polysemous and homonymous words. However, because the learning of secondary meanings may be of similar difficulty to learning primary meanings, teachers should consider whether there would be greater value in their students learning the primary meanings of new words or secondary meanings of high-frequency words, depending on the learners' aims. In addition, the study suggests that when teaching new meanings of familiar words, the polysemous or homonymous nature of these meanings should not be the key concern for teachers and

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

learners, as it does not seem to influence the extent to which the additional meanings are acquired; the etymological distinction between homonymy and polysemy, at least for peripheral senses, may not affect deliberately learning secondary meanings of familiar words in an L2.

Conclusions and future research

The present study is the first attempt to investigate how L2 learners deliberately acquire new meanings of familiar and unfamiliar words, and whether the different types of meanings a word conveys (i.e., polysemous, homonymous, or primary) influence this learning. The findings provide interesting, yet still initial, insights on the L2 acquisition of different types of meanings, and thus further research on the topic is warranted. One issue that deserves further attention is the effect of learners' proficiency level on the acquisition of different types of word meanings. L2 learners' knowledge of multiple meanings develops as proficiency increases (Crossley et al. 2010), and L1 research shows that the advantage of polysemy over homonymy might only be apparent after the word's additional meanings are well consolidated (Rodd et al., 2012). For example, when learning new senses of polysemous words, it is possible that beginner learners initially adjust/modify their prior understanding of the target word's meaning, rather than extending it to incorporate an additional sense. Future research could investigate whether advanced learners' extra experience with the target language equips them to be more aware of the relationships among the polysemous senses of a word, thus benefiting the acquisition of polysemy over homonymy. Studies that directly compare L2 learners and L1 speakers' acquisition of polysemous and homonymous meanings would also allow for a better understanding of the interplay between proficiency and acquisition of various types of word meaning; specifically, research is needed that explores whether the lack of advantage of polysemy over homonymy found for L2 learners in the present study represents a fundamental difference between L1 and L2 meaning acquisition/representation or a gradual distinction influenced by factors such as low/incomplete L2 proficiency.

It would also be useful to explore the influence of meaning similarity level in the acquisition of polysemy. The present study explored peripheral senses of polysemous words to allow for comparability with homonyms. However, there is also a need to investigate the learning of secondary meanings that are more closely related to primary meanings, and how these different levels of meaning similarity affect the comparison of L2 polysemy and homonymy acquisition. It might be that the more that polysemous senses are closely related (e.g., run a machine, run a business), the easier they would be to learn, potentially leading to some distinction between the acquisition of those polysemes and homonyms in L2s. Thus, the results of the present study for secondary meanings must not be generalized to all secondary meanings; the findings apply to peripheral meanings of nouns that are distinct from primary meanings.

Finally, this study focused on the deliberate acquisition of various types of meanings via flashcards and assessed learning through offline, explicit tasks for representativeness in L2 classroom situations. Further research is needed that investigates the L2 learning of secondary and primary meanings employing different deliberate learning techniques (e.g., contextualized instruction), alternative measures of learning (e.g., psycholinguistic tests that tap into automatic meaning connections), or exploring how incidental approaches might influence the learning of polysemy and homonymy. The insights derived from this complementary research would help elucidate the complex process of acquiring multiple meanings in second languages.

https://doi.org/10.1017/S0272263124000317 Published online by Cambridge University Press

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/S0272263124000317.

Acknowledgements. We would like to thank the three anonymous reviewers and the handling editor for their insightful comments and suggestions on earlier versions of this manuscript. We are also grateful to all the learners who saw the value in this study and volunteered to participate in it, and to the teachers who helped us advertise and promote the study. Without their collaboration, this project would not have been possible.

Competing interest. The authors declare none.

References

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2021). *R package lme4* (version 1.1-26) [Computer program].

Baayen, R. H., Piepenbrock, R., & Van Rijn, H. (1993). *The CELEX Lexical Database* [CD-ROM] Philadelphia, PA: Linguistic Data Consortium, University of Pennsylvania.

Bordag, D., Kirschenbaum, A., Rogahn, M., Opitz, A., & Tschirner, E. (2017). Semantic representation of newly learned L2 words and their integration in the L2 lexicon. *Studies in Second Language Acquisition*, *39* (1), 197–212.

Cobb, T. (2023) *Compleat Web VP v.2.6* [Computer program]. Accessed 25 November 2023 at https://www.lextutor.ca/vp/comp/.

Crossley, S., Salsbury, T., & McNamara, D. (2010). The development of polysemy and frequency used in English second language speakers. *Language Learning*, *60*(3), 573–605.

Elgort, I. (2011). Deliberate learning and vocabulary acquisition in a second language. *Language Learning*, *61*, 367–413.

Fang, X., & Perfetti, C. A. (2019). Learning new meanings for known words: Perturbation of original meanings and retention of new meanings. *Memory & Cognition*, *47*(1), 130–144.

Fang, X., Perfetti, C., & Stafura, J. (2017). Learning new meanings for known words: Biphasic effects of prior knowledge. *Language, Cognition and Neuroscience*, *32*(5), 637–649.

Foraker, S., & Murphy, G. L. (2012). Polysemy in sentence comprehension: Effects of meaning dominance. *Journal of Memory and Language*, *67*(4), 407–425.

González-Fernández, B. (2018). *Vocabulary knowledge components: Knowledge, acquisition and conceptualisation* [Doctoral dissertation, University of Nottingham].

González-Fernández, B., & Schmitt, N. (2020). Word knowledge: Exploring the relationships and order of acquisition of vocabulary knowledge components. *Applied Linguistics*, *41*(4), 481–505.

Hoshino, Y., & Shimizu, H. (2018). The organization of the senses of polysemy in Japanese EFL learners' mental lexicon. *Creative Education*, *9*(03), 353.

Hulme, R. C., Barsky, D., & Rodd, J. M. (2019). Incidental learning and long-term retention of new word meanings from stories: The effect of number of exposures. *Language Learning*, *69*(1), 18–43.

Kellerman, E. (1986). An eye for an eye: Crosslinguistic constraints on the development of the L2 lexicon. In E. Kellerman & M. S. Smith (Eds.), *Crosslinguistic influence in second language acquisition* (pp. 35–48). Oxford: Pergamon Press.

Klein, D. E., & Murphy, G. L. (2001). The representation of polysemous words. *Journal of Memory and Language*, *45*(2), 259–282.

Klein, D. E., & Murphy, G. L. (2002). Paper has been my ruin: Conceptual relations of polysemous senses. *Journal of Memory and Language*, *47*(4), 548–570.

Klepousniotou, E. (2002). The processing of lexical ambiguity: Homonymy and polysemy in the mental lexicon. *Brain and Language*, *81*(1–3), 205–223.

Klepousniotou, E., Pike, G. B., Steinhauer, K., & Gracco, V. (2012). Not all ambiguous words are created equal: An EEG investigation of homonymy and polysemy. *Brain and Language*, *123*(1), 11–21.

Klepousniotou, E., Titone, D., & Romero, C. (2008). Making sense of word senses: The comprehension of polysemy depends on sense overlap. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *34*(6), 1534.

Logan, J. K., & Kieffer, M. J. (2021). Investigating the longitudinal and concurrent relationships between polysemous word knowledge and reading comprehension among Spanish-English bilingual middle school students. *Reading and Writing*, *34*(2), 301–335.

Maciejewski, G., Rodd, J. M., Mon-Williams, M., & Klepousniotou, E. (2020). The cost of learning new meanings for familiar words. *Language, Cognition and Neuroscience*, *35*(2), 188–210.

Mouritsen, S. C. (2010). The dictionary is not a fortress: Definitional fallacies and a corpus-based approach to plain meaning. *BYU L. Rev.*, *1915*.

Nakata, T. (2020). Learning words with flash cards and word cards. In S. Webb (Ed.), *The Routledge handbook of vocabulary studies* (pp. 304–319). Routledge.

Pellicer-Sánchez, A. (2016). Incidental L2 vocabulary acquisition from and while reading: An eye-tracking study. *Studies in Second Language Acquisition*, *38*(1), 97–130.

Plonsky, L., & Oswald, F. L. (2014). How big is "big"? Interpreting effect sizes in L2 research. *Language Learning*, *64*(4), 878–912.

Rodd, J. M., Berriman, R., Landau, M., Lee, T., Ho, C., Gaskell, M. G., & Davis, M. H. (2012). Learning new meanings for old words: Effects of semantic relatedness. *Memory & Cognition*, *40*(7), 1095–1108.

Rodd, J. M., Gaskell, G., & Marslen-Wilson, W. (2002). Making sense of semantic ambiguity: Semantic competition in lexical access. *Journal of Memory and Language*, *46*(2), 245–266.

Schmitt, N. (1998). Tracking the incremental acquisition of second language vocabulary: A longitudinal study. *Language Learning*, *48*(2), 281–317.

Stahl, S. A., & Nagy, W. E. (2006). *Teaching word meanings*. Lawrence Erlbaum Associates.

Stoeckel, T., Stewart, J., McLean, S., Ishii, T., Kramer, B., & Matsumoto, Y. (2019). The relationship of four variants of the Vocabulary Size Test to a criterion measure of meaning recall vocabulary knowledge. *System*, *87*, 1–14.

Storkel, H. L., & Maekawa, J. (2005). A comparison of homonym and novel word learning: The role of phonotactic probability and word frequency. *Journal of Child Language*, *32*, 827–853.

Storkel, H. L., Maekawa, J., & Aschenbrenner, A. J. (2013). The effect of homonymy on learning correctly articulated versus misarticulated words. *J Speech Lang Hear Res*, *56*(2): 694–707.

Twilley, L. C., Dixon, P., Taylor, D., & Clark, K. (1994). University of Alberta norms of relative meaning frequency for 566 homographs. *Memory & Cognition*, *22*(1), 111–126.

Verspoor, M., & Lowie, W. (2003). Making sense of polysemous words. *Language Learning*, *53*(3), 547–586.

Vicente, A. (2018). Polysemy and word meaning: an account of lexical meaning for different kinds of content words. *Philosophical Studies*, *175*(4), 947–968.

Webb, S., & Chang, A. C.-S. (2015). Second language vocabulary learning through extensive reading with audio support: How do frequency and distribution of occurrence affect learning? *Language Teaching Research*, *19*(6), 667–686.

Webb, S., Sasao, Y., & Ballance, O. (2017). The updated Vocabulary Levels Test. *ITL-International Journal of Applied Linguistics*, *168*(1), 33–69.

Wilks, C. (2009). Tangled Webs … Complications in the Exploration of L2 Lexical Networks. In T. Fitzpatrick & A. Barfield (Eds.), *Lexical processing in second language learners* (pp. 25–37). Multilingual Matters.

Wolter, B. (2009). Meaning-last vocabulary acquisition and collocational productivity. In T. Fitzpatrick & A. Barfield (Eds.), *Lexical processing in second language learners: Papers and perspectives in honour of Paul Meara* (pp. 111–127). Multilingual Matters.

Zhang, X. (2013). The I don't know option in the vocabulary size test. *TESOL Quarterly*, *47*(4), 790–811.

Cite this article: González-Fernández, B., & Webb, S. (2024). How well are primary and secondary meanings of L2 words acquired? *Studies in Second Language Acquisition,* 46: 818–840. https://doi.org/10.1017/S0272263124000317