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The Counts of *Dracula* and *Monte Cristo:* Homonym Frequencies in Graded Readers

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Abstract

Graded readers are a great asset to learners acquiring the vocabulary of another language. Homonyms, on the other hand, are a recognized source of trouble for students with that same goal. Publishers of graded readers control the presentation of old and new words, but does this control extend to homonyms? Are only the word forms controlled for—in which case, the unrelated meanings of *match* (*a pairing* and *a stick for starting fire*) would together constitute two uses of the word? Or would these tally as separate words which, semantically and etymologically, they are? A comparison of a 4.2 million-word corpus of graded readers with previous research on the distributions of homonymic meanings in general English reveals that the meanings presented to learners are frequently quite different to those in general-purpose texts.

Keywords: homonymy, polysemy, L2 reading, extensive reading, graded readers, L2 vocabulary acquisition, lexical development

One issue facing language learners as they acquire large numbers of vocabulary items in the target language is that of homonyms. When encountering homonyms in reading, learners may not know the word at all, or they may know the word and the meaning employed, or they may know the word but only be familiar with a different meaning. Those unfamiliar with the word may consult the dictionary, find a list of candidate meanings, and then scan the texts for clues to help determine which meaning to apply; the choice is sometimes obvious but other times

hampered by their still-incomplete understanding of the text. Learners who already know only a different meaning, however, tend to apply it even when doing so fails to produce a logical sentence (Laufer, 1997); thus, partial knowledge is a potential source of interference. Though frequently acknowledged as a source of trouble, homonyms clearly present a learning challenge seldom addressed explicitly.

Graded readers are a primary source of new vocabulary for many second language learners (Nation & Waring, 2020) as they provide repeated exposure to new words of the appropriate level. But how do such books treat homonymy? Do they use only the most frequent meaning, assisting in that meaning's acquisition but providing an unbalanced presentation? Or are they careful to use each of the meanings, and if so, do the relative frequencies of these correspond roughly to what we might find in texts written for native speakers? In other words, graded readers are known for their control of vocabulary presentation, but to what level does this control extend? At a substantial level meanings would be accorded due attention from the publishing staff. At a superficial level, however, only the word form would be controlled for, so a word like *rest,* used once to indicate taking a break and used again to denote the remainder (*and the rest*), would count as two instances of the same word. This would be problematic because, etymologically, these are two different words, and if learners are not aware of their shared form, a haphazard presentation complicates its acquisition. By tallying and comparing the uses of homonyms in graded readers with the same words used by native speakers, we find, in fact, that homonyms in graded readers are not controlled for meaning. Discrete meanings are used indiscriminately, posing difficulty for learners who, instead of being exposed to target words, are encountering words whose previous encounters may be incompatible with the current one. Cobb (2013) writes of the importance of observing such distinctions. As texts such as graded readers are classified by their word level, it could take only a few misanalyzed words for shorter texts to be bumped out of a more accurate classification. Seemingly small differences, such as those between a 95% coverage level and a 98% level, can be very robust in their effect.

Background

Homonyms are words with unrelated meanings, or, more accurately, two or more completely different words that happen to have identical forms. Sometimes they come from different languages, such as *match* (*they're a good match*), of Germanic origin, and *match* (for starting fire), from Old French and ultimately Latin. Other homonyms may come from the same language background but trace back to different words such as *case* (*in my case* and *put it in its case*) which stem from the Latin words *casus* (*fall*) and *capsa* (*box*) respectively.

There is often confusion over terms *homonyms, homographs, homophones* and *polysemes* among language users, teachers and researchers alike. (Such is the confusion that *Newsweek* reports one extreme case in which a teacher in the US was fired for blogging about homophones for fear that the school would be "associated with homosexuality" (Schonfeld, 2014, July).) *Homographs* are words with identical written forms whose spoken forms remain distinct, such as *lead* which is read differently in *lead singer* and *lead poisoning* or *close* (adjective) and *close* (verb). Homophones reverse this: same pronunciation but different written forms, such as *some* and *sum,* or *for*, *four* and *fore*. Together, homonyms, homographs and homophones are called homoforms (Cobb, 2013; Nation & Parent, 2016; Parent, 2012).

When the senses are related, we call such words polysemes, and we speak of *senses* (with *meanings* reserved for unrelated cases). However, it sometimes happens that what began as senses have, over time, drifted so far apart that any relatedness is obscured. These we call "cognitive homonyms" (Nation & Parent, 2016, p. 47) and include such lexemes as *chest* (a person's torso and treasure chest) and *organ* (the musical instrument and an internal body part). These can be thought of as single-word idioms as knowledge of one meaning provides no meaningful clue to the other.

The term *monoseme* denotes words with only one meaning. Ruhl (1989) argues that all words should be considered monosemic until polysemy or homonymy has been clearly established, and that we may too easily accept the notion of multiple meanings. This stance has not been universally adopted (Cruse, 1992).

In certain contexts, these are academic distinctions. There may be effectively no difference between homonyms and homographs for the second language reader, just as in listening tasks, the distinction between homonyms and homophones is of equally questionable usefulness. The difference between (pure) homonyms and cognitive homonyms is essentially a diachronic distinction.

How are homonyms distributed in English?

Few studies have focused on how homoforms are distributed in English. We examine this question here from a pedagogical perspective, where words are taught by frequency and in bands of 1,000 items, so that the 1,000 most frequent words are learnt before the second 1,000, etc.

Parent (2012) used the *British National Corpus* (BNC) to answer the question of how many homonyms occurred in West's (1953) *General Service List* (GSL). The GSL contains about 2,000 words, determined largely by frequency and has served as the *de facto* list for educational materials though it is not without problems. Cobb (2010, p. 192) found it contained about 500 "fairly infrequent" items. Parent used etymology to determine homonymy, and 500 instances of each word, including inflections, were randomly chosen from the BNC and tagged for meaning. For the word *file,* for example, each line of data included an instance of the forms *file, files, filed* or *filing* and was tagged for which homonymic meaning was employed. References to a physical file in a filing cabinet, computer data, or a direction to file under "miscellaneous"' would receive one tag, while references to the tool (i.e., for *fingernails*) and the related verb were assigned a different tag.

The study found that 10% of the GSL were homoforms. Of the 75 homonyms found[1], seven were shown to use only one meaning in the samples. About 66% had one meaning accounting for 90% or more of the uses. Only one homonym had a 50-50 split. The list of homonyms and relative frequencies in the GSL are included as part of the Appendix.

Wang and Nation (2004) investigated homoforms in Coxhead's 570-item *Academic Word List* (2000), finding that about 10% of the words were actually homographs and therefore belonged to

[1] The current study recognises 74 homonyms, omitting *right*, which, on re-examination, is not a homonym based on the original criteria.

different word families, with only 21 of these occurring with sufficient frequency to justify their inclusion on the list. Three word forms, once split into separate words, no longer met the criteria for inclusion in the AWL.

Homoforms, thus, may seem to account for a relatively small percentage of words, but, it must be remembered, that this is not 10% of English, but rather, 10% of the most frequent words of English. Tallying words like *match*[1] and *match*[2] as the separate entities they are, then, could potentially not only decimate the list if the decoupled items no longer meet the criteria for inclusion, but promote other words in their stead that had previously just missed the cutoff. Cobb (2013) used Parent's tallies to show, tentatively, the extent of the decoupling effect.

How do we process homonyms in our first language?

A brief survey of homonym processing in our first language provides context for an overview of second language homonyms; the two, as shall be seen, take very different methodological approaches.

As young as four, children are aware that words and meanings do not always have 1:1 mappings (Peters & Zaidel, 1980); nonetheless, Mazzocco (1997) and Doherty (2003) have shown that the familiar meaning of a homonym can interfere with children's lexical acquisition process until at least the age of 10, a phenomenon dubbed "word rigidity" by Johnson and Pearson (1978, as cited in Kang, 1993; see, though, Storkel, Maekawa, & Aschenbrenner, 2013).

In adult lexical processing, early studies examining polysemy (Forster & Bednall, 1976, p. 56; Jastrzembski, 1981) found that words with many meanings were accessed quicker than words with few, leading to the term "ambiguity advantage" and arguments for multiple entries in the mental lexicon. Later studies, however, significantly refined these results. Rodd, Gaskell & Marslen-Wilson (2002), measuring reaction times in lexical decision tasks, found that only polysemes were responded to faster, and that the response rate for homonyms was significantly slower.

Around the same time, Beretta, Fiorentino and Poeppel (2005) found similar results using magnetoencephalography to measure the timings and locations of neural activity. Adults were measured for their neural reaction to stimuli of words with one sense or few senses (*ant*), words with one meaning but several senses (*mask*), homonyms with few additional meanings (*calf)*, and homonyms with many meanings (*bark*), based on entries in the *Wordsmyth* dictionary[2]. Like Rodd, Gaskell and Marslen-Wilson (2002), they found significantly longer reaction times for homonyms than for words with one meaning, and that polysemes were accessed faster than all. A clear implication is that the various meanings of homonymous words compete with each other, strongly suggesting separate mental entries, while polysemes have a single, unified entry with

[2] Although also employed in the Rodd, Gaskell and Marslen-Wilson study, the use of dictionaries for determining the number of senses is questionable practice. Jorgensen (1990a, 1990b) found that dictionaries tend to conflate words with more, and sometimes far more, meanings than language users distinguish. Dictionaries are not models of the mental lexicon.

multiple paths to access them. Thus there is a sense advantage for polysemes over monosemes and an ambiguity disadvantage for homonyms, so in terms of access times, polysemes < monosemes < homonyms.

Reaction time experiments, however, do not show what happens between stimulus and response. EEG studies provide glimpses into brain activity during this period. One pattern, the N400, is associated with semantic processing. Discovered in 1980 by Kutas and Hillyard (see Luck, 2014), the N400 pattern appears when semantic expectations are violated. In hearing, "We enjoyed a nice dinner of spaghetti and garlic shoes," an N400 pattern would be expected, as it would also would be with mismatched word pairs; *lemon:sour* would not produce a strong N400 effect but *car:holy* presumably would. N400 effects vary in size such that those words more irreconcilable with their context will exhibit bigger effects when the EEG data is analyzed. Klepousniotou, Pike, Steinhauer and Gracco (2012) exploited this for their work on polysemy and homonymy. The polysemes of their study were of two types, metaphoric (*lip*) and metonymic (*rabbit*, denoting the animal or the meat), and the homonyms were balanced (both meanings frequent) and unbalanced (one considerably rarer than the other, as in *coach*). Regardless of relative frequency, both meanings are activated and competing to some degree, but there is a definite preference for the dominant meaning, even when the relative frequencies are close. Their findings on polysemes again strongly suggest a single representation and show reduced N400 effects across both hemispheres. Differences between dominant and subordinate senses were found only in cases of metaphor, demonstrating that the neural generators underlying the processing of homonymy and polysemy are clearly different.

Homonyms continue to provide a rich avenue for researchers. Employing functional magnetic resonance imaging, Musz and Thompson-Schill (2017) examined the competition between the dominant and subordinate meanings of homonyms, especially in cases where the subordinate meanings is primed, confirming previous findings with eye-tracking (Duffy, Morris & Rayner, 1988; Sereno, O'Donnell & Rayner, 2006) that cognitive competition remains an active process even after one meaning has been selected, suggesting that one meaning is raised to "candidate" (rather than "definite") status. Using semantic priming (*tree*:*bark*, *dog*:*bark*) and various fMRI analyses, Hoffman and Tamm (2020) identified two different regions of the brain involved in homonym decoding, with a third interfacing the two.

These studies highlight the topics of lexical storage and retrieval, offering insight into how the brain organizes its lexicon. The issue of the L2 lexicon throws in further complications if it is, in early stages at least, layered over the brain's L1 lexicon.

How do second-language learners acquire homonyms?

As we have just seen, native speakers, do not process all words equally; homonyms take longer while polysemes are accessed quicker. Second-language learners are, by definition, not operating with fully developed mental lexicons in the target language. We can assume that a word known to be a homonym may take some extra time to process, while a homonym with only one meaning studied may be accessed more quickly but misinterpreted. Research in L2 lexical processing usually lacks the technology employed in the studies above, focusing instead on how homonyms are interpreted.

In a qualitative study, Kang (1993), like Laufer (1997), shows that learners familiar with one sense of polysemes applied that one meaning to each encounter with the word, with effects that could influence their understanding of sentences and sometimes even their interpretations of entire texts. Despite the processing differences, the differences between homonyms and polysemes may be an academic distinction with pedagogical implications relevant only after learners have developed some semantic flexibility with their mental lexicons and can connect related senses to each other.

Mashhady, Lotfi and Noura (2010) found a speed advantage in presenting L2 homonymic meanings together, but only in comparison to learning synonyms, and only short-term recall was tested. This may indicate a benefit in presenting homonymic meanings together; however, the effects of both absolute and relative frequency (a very common meaning coupled with an extremely rare one) remain unexplored.

Ushiro, Hoshino, Shimizu, Kai, Nakagawa, Watanabe, and Takaki (2010) examined the interpretation of homonyms by Japanese university students divided into two proficiency groups. No difference was found in the ability to correctly interpret the homonyms: in both groups, a quarter of the participants applied the wrong meaning even when doing so did not fit the context. There were, however, differences in the types of errors made. Successful homonym interpretation may depend on flexibility at least as much as understanding the context. When context was understood, the advanced students were better able to change their interpretations of the homonym to fit the context than were the less advanced learners, who, even when the context was understood, again tended to cling to the familiar meaning. Contextual flexibility, then, would appear to be a factor that increases with overall proficiency.

While L2 studies of homonym processing lack the hard science found in L1 research, they nonetheless highlight that L2 homonym processing also entails Johnson and Pearson's (1978) word rigidity. Further, we may assume that if L1 speakers take longer to access homonyms because of the ambiguity disadvantage, L2 learners must have, at minimum, the same delay. The problem of homonyms for learners, then, is twofold: first, during early stages, learners possess incomplete knowledge (knowing one meaning and not knowing that there may be others), and second, when additional meanings are acquired, it may now take longer to process the word.

Extensive reading and graded readers

As the current study examines homonyms in graded readers, we shall review some of the relevant studies. In an influential paper, Elley and Mangubhai (1983) reported significant results in a study of 600 learners over eight months in Fiji. The students in the experimental group exhibited highly significant improvements in their fluency and writing accuracy and, further, these were long-term gains not found in appreciable quantities among the control group.

Other studies have focused on the learning gains of reading a single text, showing that while vocabulary learning does occur, a learner's vocabulary enrichment may be so slender from reading one book that the case is made for more—indeed "extensive"—reading. Waring and Takaki (2003) examined vocabulary gains based on reading only one graded reader, one adapted so that 25 words occurring at certain frequencies within the text were substituted with English-

like non-words. Using various assessment instruments, each administered immediately, one week later and three months later, the study found that students did not learn the majority of the targeted words, and most words remembered at one assessment point were forgotten by the next. While seemingly pessimistic, these results bolster the need for extensive reading as the meager gains from reading a single text do show that words can be learned from context and that frequency of encounters affects acquisition. It is therefore important that repeated encounters occur within a few days (Nation & Waring, 2020), hence a need for extensive reading. Similar findings are seen in Brown, Waring and Donkaewbua (2008), which employed similar methodology and different methods of assessment.

This informs the basis of the current study. One method of vocabulary acquisition entails the word being encountered, in context, a sufficient number of times, but when a word form is homonymic, the number of encounters is divided among what are essentially different words, complicating their acquisition. Secondary meanings—that is, meanings other than the most frequent one such as the "combined resources" meaning of *pool*—would likely cause trouble for the learner still learning the more common meaning (in this case, *swimming pool*). This raises research questions we aim to address in this report.

Research Questions

This paper partially replicates Parent (2012), but rather than examining homonyms in the BNC, it examines them in a specially constructed graded reader corpus, revealing the meanings learners are most likely to meet. This research answers the following questions:

1. Are the distribution of relative frequencies of homonymic meanings approximately the same in a corpus of graded readers (GR) as in the *British National Corpus* (BNC)?
2. If not, are learners being exposed to the secondary meanings through graded readers?
3. For words that do have multiple meanings in the graded reader (GR) corpus, how do the proportions between first and secondary meanings differ compared to in the BNC?

Methodology

The GR (graded reader) corpus constructed for this study is significantly larger and more representative than any used in previous studies (e.g., Allan, 2016), as seen in Table 1. To be sufficiently representative, texts were collected from a large number of publishers, a wide range of reading levels (Extensive Reading Foundation levels 2-16) and a mix of genres (535 fiction, 25 non-fiction). The corpus contains 560 texts, comprising 4,212,706 running words.

Table 1
Distribution of Texts in the Graded Reader (GR) Corpus

		Extensive Reading Foundation Grading Scale											
Book Title	**Total Books**	1	2	3	4	5	6	7	8	9	10	11	12
Cambridge	11				4			3			3		
Cengage	167	0	12	15	9	15	3	16	16	2	17	17	12
Compass	151			12	12	12	49	7	27	5	13	4	10
MacMillan	24				10		2			5		5	
MPI	60		18	12	6	12	6	6					
Oxford	71				4	15		7	26		9	10	
Penguin	76			3	5		6			23		17	
Total	**560**		**30**	**42**	**50**	**54**	**66**	**39**	**69**	**35**	**42**	**53**	**22**

Each book was manually scanned using a high quality DSLR camera and custom-made cradle. The images were batch edited using Adobe *Lightroom* (v. 4.4) to crop everything but the targeted pages, reduce the image to black and white, etc. The images were organized and subjected to optical character recognition (OCR) using ABBYY *FineReader* (v. 12.0), producing a text file for each book. The resulting corpus was manually cleaned of OCR errors, broken words, and construct-irrelevant text such as captions, comprehension questions, page numbers, etc.

The target words used in this study were the 74 homonyms[3] within West's *General Service Word List* (GSL) (1954) identified by Parent (2012). A quick look at their distribution in general use is warranted. The results of a short R script referencing them against Nation's British National Corpus and Corpus of Contemporary American English lists (2017d) are shown in Table 2. A full two-thirds of them are found in the most frequent 1000 words of English (Nation, 2017a), while a further quarter are found in the second (Nation, 2017b), yielding a total of 92% of these homonyms occurring in the first two thousand words. Five more are found in the third (2017c) 1000-word band (*host*, *net*, *pupil*, *rail*, *weave*), with the remaining one (*steep*) occurring the fourth. Recall, though, that any homonym is at least two words, and lumping them into one count is the very practice this research warns against.

Table 2
Distribution of Homonyms in Nation's BNC and COCA Lists

BNC, COCA k-band	Number of Homonyms	Ratio	Cumulative Ratio
First	49	66.22%	66.22%
Second	19	25.68%	91.89%
Third	5	6.76%	98.65%
Fourth	1	1.35%	100%

[3] Technically, there are 157 homonyms as each of the 74 words is two or more separate words. These are included in the Appendix.

Using *AntConc* (Anthony, 2018), files were created from the GR corpus which presented the target word in red, embedded in a 16-word context taken from the GR corpus (Figure 1). The meanings of homoforms were tagged by the second and fourth authors; where either author was unsure of the meaning of a homoform, they conferred with each other, referring back to the corpus when further context was necessary.

them there some time. Stupidly, I told the	Count	about them. There was no mirror in my
Vicomte de Chagny, of course!" "No, with the	count	!" "Ah, here's Carlotta! Carlotta did the trick!"
window. She wanted to see what Johnsy was	counting	. All she could see was a sad, empty

Figure 1
Example of a KWIC File Used in this Study

The original study drew 500 random samples for each word, sometimes minus a few manual deletions (in the sample for *page*, references to Jimmy Page, for example, were removed) while in the current study, all relevant instances were examined. In some cases, the number of words examined is considerably greater (*go*: 25,872), while in others, it is very small (*tend* occurs only 16 times in the GR corpus). In addition to the relative ratios, this tells us how often learners are exposed to the secondary and sometimes-rare meanings of homonyms.

Fisher's Exact was applied to test the significance of differences between the current results and the original study. Because a few homonyms have a third and fourth meaning, the test examined the ratio of first meaning to non-first meanings. A note on the use of this test may be in order as there are several statistics that could be used. The chi-square goodness-of-fit test is based on assumptions not relevant to word lists. Treating the homonyms as keywords, other methods are available such as the difference coefficient (Leech & Fallon, 1992), the relative frequency ratio (Damerau, 1993), the log-likelihood (Dunning, 1993, p. 71) or even the chi-squared test (Oakes & Farrow, 2006). In his paper on the use of log-likelihood as a measure of surprise in text analysis, Dunning (1993) writes: “Measures based on Fischer’s [*sic*] exact method may prove even more satisfactory than the likelihood ratio measures described in this paper.” Fisher's exact test, a conservative measure, is chosen here because the *p*-values it generates provide a clear threshold in relation to a chosen alpha; our interest is in which words cross that boundary.

Results

How are homonymic meanings distributed in graded readers?

The first research question asked if the relative frequencies of homonymic meanings in the graded reader (GR) corpus are comparable to those in Parent (2012). Looking at the results of Fisher's Exact Test, even at the level of $p < 0.001$, we find 29 homonyms (29%) significantly different than in the BNC texts. Table 3 summarizes this at various levels of significance, but no matter where the line is drawn, a large percentage of homonyms, around half, differ significantly between the two studies in terms of their distributions of first and non-first meanings.

Table 3
Number of Homonyms Differing from Original Study, at Different Levels of Significance

	$p < .05$	$p < .01$	$p < .001$
# of Homonyms	41	33	29
% of Total Homonyms	55.40%	44.59%	39.18%

Table 4 gives an overview of the results. Of the 74 homonyms, 33 do not differ significantly between the GR and BNC corpora. These include instances in which the secondary meanings are present in both corpora, but also cases where the secondary meaning is not present in the GR but occurred with such low frequency in the BNC that its absence is not considered significant. In these cases, the secondary meaning may be the same as in the BNC, or more frequent or less frequent but not to appreciable degrees.

Table 4
Summary of Homonymic Differences Between the GR and BNC Corpora ($p < 0.01$)

GR Meaning 2 Relative to BNC	N	%	Examples
Not significantly different	41	55%	*box, even, last, shoot*
GR Meaning 2 significantly less frequent	18	24%	*arm(s), hide, race, spell*
GR Meaning 2 significantly more frequent	10	14%	*bill, deal, like, rest*
BNC Meaning 2 becomes GR Meaning 1	5	7%	*count, deal, match, policy, rest*
TOTAL	74	100%	

However, there are eighteen homonyms in which the secondary meanings, while present in the GR, appears so rarely that their distributions are flagged as significantly different, including *arm(s)* where the “weapon” meaning can be found in the graded readers but at a considerably smaller ratio than it is in the BNC. This meaning of *arm* accounts for 1% of the word's usage in the GR as opposed to the BNC's 17%. An additional five homonyms have no secondary meanings present in the GR despite being well represented in the BNC, such as the “brief period” meaning of *spell* which accounts for a quarter of all uses in the BNC. Conversely, in 17 homonyms the meaning deemed secondary by the BNC tallies is used significantly more often in the graded readers.

If a clear majority of meaning distributions corresponded to the original findings, we might have cause to say an effort of matching the meaning distributions was being made, while a clear minority might lead us to believe that secondary meanings were being deliberately avoided so as to assist learners with the primary meaning. But the some-do-some-don’t results we find here suggests some care may be given to the use of the word form but not to the meanings employed.

There are clear implications for learnability. First, the principle of spaced repeated retrieval presumes unrelated meanings are not being used each time the form is encountered (Macalister & Nation, 2020, pp. 50-53). A correctly guessed meaning is a hypothesis that may be incorrectly rejected when the same word form is encountered again with a drastically different meaning.

Second, since some word forms do have unrelated meanings, explicit attention that a different and less frequent meaning of a known word would be beneficial here given the research (Kang, 1993; Laufer, 1997) highlighting the tendency of learners to adhere to the one known meaning. Knowledge of one meaning, that is, provides a false confidence in a word's semantic contribution which is not easily overturned by contextual clues to the contrary; even when the interpretation of the whole is odd or bizarre (a solider loading a *magazine* into a gun), the familiarity of that one meaning prevents that word from being targeted as the source of any confusion. If learners are unaware that a given word has additional, unrelated meanings (despite an awareness that words sometimes do), and the ability to see when a known word uses an unknown meaning is undeveloped, then such instances, if used, should be explicitly glossed or otherwise have attention drawn to them.

Which meanings are learners not exposed to?

The second research question inquired about homonymic meanings that did not occur in the GR corpus but did in the BNC study. Among the 74 homonymic forms, 23 (31%) occur among the graded readers with exactly one meaning, although three of these did not have secondary meanings in the random BNC samples either (these are asterisked). The words appearing with only one meaning in the GR corpus are *bite* (with teeth), *boil* (cooking), *camp* (camping), *down* (not *up*), *ear* (organ of hearing), *egg* (noun), *fast* (adjective), *file* (storage), *fold* (paper), *go** (verb), *page* (book leaf), *pan* (cooking), *pen* (writing utensil), *pot* (cooking), *pupil* (student), *repair* (to fix), *roll* (to spin), *school** (education), *shoot* (a gun), *slip** (misstep), *sock* (foot garment), *spell* (letter-by-letter, including incantation) and *wake* (awaken). This may be misleading though as eleven of the meanings have secondary meanings of 1% or less in the BNC. Three words, however, have significant secondary uses, between 15% to 24%, which are not found in the GR corpus. These are *pan*, *spell* and *wake*.

One meaning of *pan* is, of course, the instrument used for cooking, which includes, by extension, instances of panning for gold. Etymologically, the use referring to criticism (as in 'The movie was widely panned', stemming from 'to give the movie a pan') is related to this though the connection is not synchronically obvious. More clearly unconnected, however, is the use referring to moving ('panning') a camera, which is clipped from the word *panorama*. This usage accounted for 15% of the group *pan-pans-panned-panning* but is completely absent in the GR corpus, as shown in Table 5.

Table 5
Relative Frequencies for pan *in BNC and GR Corpora*

pan	Meaning 1: *cooking utensil,* also to *criticise*	Meaning 2: *to move a camera* (panorama)
BNC	84.84%	15.16%
Graded Readers (GR)	100%	0%

One meaning of *spell* unites the "letter-by-letter" use (i.e., spelling) with the magical incantation use, which is unrelated to the uses clustering around the *period of time* meaning. The latter meaning is often used with weather (*cold spell*, *dry spell*) but also includes other instances regarding employment (*his recent spell as guest conductor*, *a spell at the* Chicago Tribune) and other uses (*dizzy spells*). In 500 random samples from the BNC (Table 6), we can expect this meaning to occur around 120 times, or about one out of every four instances (24%), so this is not an insignificant use, making its absence in graded readers conspicuous.

Table 6
Relative Frequencies for spell *in BNC and GR Corpora*

spell	Meaning 1: *letters, incantation*	Meaning 2: *short time interval*
BNC	75.95%	24.05%
Graded Readers (GR)	100%	0%

The form *wake* likewise exhibits a missing semantic cluster (Table 7). Here there are three clusters: those related to the verb ("to wake up"), those related to the track of a boat, and those related to the funereal vigil. The latter does not occur in the GR corpus but was also infrequent in the original study at 1.2% so we shall ignore it here. Of greater interest is the nautical meaning and its metaphorical extensions. A water-faring vessel of sufficient speed leaves a trail of disturbance in the water which will soon normalize, but until it does, another boat crossing over it will be in for a short spell of choppy riding. This meaning has been extended metaphorically to include the aftermath of major, frequently negative, events: *in the wake of the killings*, *leaving a trail of controversy in her wake*, etc. This use almost always occurs in prepositional phrases headed by the word *in*. Similar to *spell*, this has a distribution of about one-quarter of all uses in the original study but is completely missing in the GR corpus.

Table 7
Relative Frequencies for wake *in BNC and GR Corpora*

wake	Meaning 1: *awaken*, etc.	Meaning 2: *a track* (in water, etc.)	Meaning 3: *funereal vigil*
BNC	75.8%	23%	1.2%
Graded Readers (GR)	100%	0%	0%

We can take this analysis a step further. The original data was conducted at the lemma-level, so as both the nautical and funereal reading of *wake* can only occur as *wake* and *wakes* (and not as *waked*, *woke* or *woken*), these instances automatically appear rarely. Here we briefly examine all

instances of uninflected *wake* in the BNC, not a random sample but all occurrences trimmed to one-instance-per-text (since if a funeral wake figures in a text, the word may appear many times). The ratio changes rather drastically, with the *wake* up usage occurring only 49.96% of the time and the metaphoric reading only slightly below this at 47.73% as opposed to the 71% and 25% figures in the original study including inflections (the funereal vigil usage rises from 1.2% to 2.31%).

Like all items examined, these three words are high frequency items. *Wake* is in the first of Nation's 1000-word band, while *pan* and *spell* are in the second, the latter likely occurring even more frequently for learners. Nation's lists are not based purely on frequency but on range as well, and the first two 1000-level word lists were prepared with a different corpus composition than the remainder, but they also were not consistently split into homonymic uses. Based on our observations of these three words in the GR corpus, the less-frequent-but-not-infrequent meanings appear "blocked" by the more dominant meaning. Perhaps it is felt that the less-frequent uses of these high-frequency words would confuse readers and are therefore avoided, but if so, this is an assumption in need of airing out.

Are secondary meanings in graded readers used with frequencies comparable in texts for native speakers?

Our first research question found that about half the homonyms exhibited distributions quite different to those in the original study. The second question found that nearly a third (31%, or 23 homonyms) did not have secondary meanings at all, even when some of these are clearly important. Our third research question, then, focuses on the remaining cases deemed significantly different but in which a secondary meaning is present. How does the distribution of these secondary meanings differ between the GR corpus and the BNC?

There is no single, unified answer to the question. We might expect they are significant because the secondary meanings are present, just less prevalent, but of the 26 homonyms in this category, this is true of only eleven, these being *arm, die, hide, lay, leave, miss, net, pool, race, sound* and *yard*. In some cases, detailed below, the secondary meaning is far more frequent in the GR corpus, in some instances even outnumbering the primary meaning.

The word *miss*, for example, is drastically different. In the 2012 study, the three meanings (*fail to hit, want to see*, and the title for unmarried women) had a 50-50 distribution, while the current study finds the title usage accounting for over 91% of the occurrences. Parent (2009), containing a pilot study for the 2012 work based on a smaller corpus, found a 25% distribution of the title meaning. The 91% distribution of the title in graded readers is surprising but is attributable to certain texts like *Little Women* and *Pride and Prejudice* in which characters are frequently referred to by their titles and family names. This is known as a "whelks problem" after Kilgarriff (1997), where a surprisingly high frequency score was assigned to the lexeme *whelk* because a corpus included a book specifically about sea snails. This issue has given rise to dispersion statistics, a score measuring spread, not unlike standard deviation in function, that factors in the number of texts or other corpus parts an item occurs in. Dispersion measures have been around since at least Juilland and Chang-Rodriguez (1964) and the introduction of Juilland's *D* (see Brezina, 2018). More recent developments include Gries's (2008) Deviation of Proportions.

Nine homonyms in this study, however, see the secondary meaning appear significantly more frequently than it had in the BNC analysis. These are *ball* (social function), *bank* (embankment), *bear* (animal), *brush* (undergrowth), *case* (container), *lie* (falsehood), *like* (admire), *mean* (cruel) and *tend* (attend). The social function meaning of *ball* is central to the telling of *Cinderella*, while bears are more frequently characters in stories written for children. That this meaning of *ball* is not blocked by the more common meaning (as suggested for *wake*, etc., above) even when it is easily replaced by *party* suggests that frequency alone fails to account for the absence of secondary meanings in graded readers, and that another factor—perhaps imageability or cognitive keyness (the word *ball* being strongly associated with the narrative of *Cinderella*) may be present.

Tend, however, is an interesting anomaly. The first of its etymologically distinct uses is the catenative verb (*I tend to exaggerate*), from which the word *tendency* is derived. The second is a clipped form of *attend* as found in *bartender* and is often followed by the preposition *to* (*I should tend to my garden*). Thus, both homonymic forms of *tend* are frequently followed by a homonymic *to*. The GR corpus illuminates two points of interest regarding this word. First, the distribution is markedly different from Parent (2012). While the original study found the *tendency* meaning to account for 97% of the uses of the form, that meaning appears in the GR corpus only 69% of the time. Second, and more surprisingly, however, than the relative frequency is the total frequency. This is a high frequency lexical item, appearing in the first 1,000-frequency band in Nation's *BNC-COCA* word lists as well as in the *New General Service List* (Browne, Culligan and Phillips, 2013), but it appears only 16 times total in the GR corpus. It occurs this many times in the first five *BNC* files (about 1% of the corpus), and 148 individual *BNC* files each have 16 or more occurrences of the word form. With so few instances in graded readers, the word form itself is unlikely to be present enough in graded readers for homonymic awareness to spark[4].

Among the homonyms in which the second meaning differed from the original study, five saw the 'secondary' meaning present in such numbers that it became the primary meaning among the GR corpus, these being *count, deal, match, policy* and *rest.* The primary meaning of *policy*, as in *foreign policy*, may be primed to occur in newspapers (12% of the *BNC* texts) more than in texts produced for learners. This meaning accounts for only four of 28 usages in the graded readers. However, 20 occurrences of the *insurance policy* meaning were from a single book. The rise in the royalty-related meaning of *count* is also easily accounted for. It occurs in only 15 of the 560 books, including *Dracula, The Count of Monte Cristo*, *The Three Musketeers,* etc., some of which are present in the corpus in multiple versions; 69% of the occurrences of this meaning appear in just three books.

This leaves one final homonym to account for, and that word is *bill.* The *beak of a fowl* reading did not occur at all among the *BNC* samples, but ten uses of this meaning are present in the GR corpus. However, all ten of these came from a single text about birds.

It is worthwhile, however, to examine not just the ratio of secondary meanings to the primary, but also the actual frequencies. Given the situation where a learner knows only one meaning, we would expect a threshold effect, where *x* number of occurrences of an unknown meaning is

[4] Two other homonyms appear fewer than 30 times total: *policy* and *boil*.

necessary for the learner to begin to suspect another meaning may be at play. We make no attempt here to define *x*, but it is surely not a matter of simple frequency as proximity of encounters is likely an issue (i.e., that reading five instances of the *period of time* meaning of *spell* over the course of a week is more informative than the same five encounters spread over a year) and, at least for learners of a certain level, that shifts in word class is another (i.e., that the unknown meaning of *pan* is a verb rather than the expected concrete noun).

Although we cannot yet calculate that threshold level, it does not seem controversial that ten instances of a secondary meaning spread over the 560 corpus texts is an insufficient amount if acquisition of the secondary meaning is the goal. Table 8 summarizes how many homonymic word forms are present with ten or fewer instances of a secondary meaning.

In the Appendix we present the combined results of a past study, that of Parent (2012) and the current study. In Parent (2012) the BNC corpus was examined. In the current study, a specially constructed graded reader (GR) corpus was examined. To accommodate the constraints of the printed page, the eight word forms with third and fourth meanings are given after the words with only two homonymic meanings.

Table 8
Distributions of Homonyms with Ten or Fewer Instances of Secondary Meanings in the GR Corpus

Instances of secondary meaning	Number of words	Cumulative ratio of homonyms
0	23	31.08%
1	9	43.24%
2	5	50.00%
3	1	51.35%
4	2	54.05%
5	3	58.11%
6	1	59.46%
7	0	59.46%
8	2	62.16%
9	1	63.51%
10	1	64.86%
TOTAL	48	

Discussion and Implications

Homonymy is not something the producers of graded readers are particularly concerned with given that the uses of homonyms correspond to what we find in the native-speaker market around half the time while differing significantly, and in various ways, the other half. Common

and useful meanings are sometimes missing, and less common meanings are sometimes elevated to the status of most frequent.

Nonetheless, this study is not without its limitations. By necessity, we were locked into comparing the graded reader (GR) corpus to results from a slightly older, closed corpus rather than having the freedom of choice. Future research would also need to examine dispersion measures which, as not part of the original study, were not considered here.

The classroom instructor would benefit from familiarity with the homonym list, as a reminder of words potentially taken for granted that cause problems for learners and to help pinpoint the source of misunderstandings. This is especially true if teaching materials are not explicitly highlighting that some words have the same form.

There are further implications for the publishers of graded readers. First, while homonymy is a frequent occurrence in the language, for learners it can be minimized, if not outright avoided, at elementary and even intermediate levels since, in many cases, they would not need the rarer meaning (the *shoal* meaning of *school*, for example).

Second, an editorial policy should be explicit for any publishers of materials for language learners. This means that any use of a homonym or its inflected form should be flagged by the software. It is also recommended that the word lists used by publishers split homonyms into separate entries, for example *fast*[1] denoting *quickness* and *fast*[2] denoting *abstinence*. If a homonym is flagged and the rare meaning is employed, then it should be paraphrased just as a rare word would be. An exception is if the rare meaning is employed but it occurs repeatedly throughout the text (*count* in texts regarding royalty), then the secondary meaning should be made explicit, perhaps in the form of a footnoted gloss. This is especially important in instances where the common meaning is likely to be known (a reader of *Monte Cristo* would probably be familiar with the *enumeration* meaning of *count*); however, in the case of *Cinderella* prepared for elementary readers, little is gained by retaining *ball* over *party.* It is further suggested that a glossary at the back include both meaning, even presumably-known ones, so as to draw attention to the homonymy. This is especially true in cases when the homonymic meanings are different parts-of-speech and the less common meaning may therefore employ inflections unavailable to the more frequent usage; the forms *steeped* and *steeping*, for example, clearly signal the use of the verb rather than the more common adjective *steep.*

Third, homonymy plays a crucial role in later stages of word consciousness activities, or expanding the depth (rather than breadth) of one's lexical knowledge. This may occur with collocation activities, underlying meaning activities (Visser, 1989), etc. Graded readers can contribute greatly to this phase. They can include appendices on the homonyms contained in each volume, explaining the contrasting etymologies and introducing still other meanings or senses. These special chapters might also include activities giving learners the chance to practice meaning selection ('Which meaning is used in this sentence?')

The main finding of this comparison is not that publishers of graded readers present homonyms to learners carelessly but, rather, that they do not have a policy regarding homonyms. This is strongly suggested by a large proportion of the GSL homonyms being statistically similar to the

GR homonyms while another chunk of homonyms is statistically different. Exposing the learners to the level-appropriate words is a major selling point of graded readers, but in the case of homonyms, a more refined strategy is clearly warranted for the learners to acquire these multi-faceted words. Publishers can make use of the previous research on homonymic meaning distribution or create their own to make informed decisions on which words require special attention and when, and how, such information can be presented.

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Appendix A

Comparisons of Relative Frequencies of Homonyms in ER Corpus and BNC

	First Meaning				Second Meaning			
	This Study			Parent (2012)	This Study			Parent (2012)
Word	**Gloss**	**Freq**	**%**	**%**	**Gloss**	**Freq**	**%**	**%**
ARM	body part	2238	99.16%	83.00%	weapon	19	0.84%	17.00%
BALL	round object	330	71.58%	96.00%	social event	131	28.20%	4.00%
BAND	group of people	250	85.32%	79.00%	ring	43	14.68%	21.00%
BANK	finance	415	76.15%	90.00%	embankment	130	23.85%	10.00%
BEAR	(verb)	495	59.28%	96.00%	animal	340	40.72%	4.00%
BILL	official written statement	139	93.29%	100.00%	(of a duck)	10	6.71%	0%
BITE	(verb)	177	100.00%	99.00%	binary digit	0	0.00%	1.00%
BOIL	(verb)	25	100.00%	96.00%	swelling	0	0.00%	4.00%
BOWL	dish	101	94.39%	96.00%	game	6	5.61%	4.00%
BOX	container	1408	99.02%	99.00%	sport	14	0.98%	1.00%
BRIDGE	to span	470	99.16%	97.00%	card game	4	0.84%	3.00%
BRUSH	for hair	109	93.16%	99.80%	undergrowth	8	6.84%	0.20%
CAMP	Encampment	399	100.00%	99.60%	corny	0	0.00%	0.40%
CAN	(modal verb)	14424	99.99%	99.80%	tin	1	0.01%	0.20%
CASE	Situation	532	74.93%	97.40%	container	178	25.07%	2.60%

CHECK	(various polysemous uses)	441	99.77%	100.00%	pattern of crossed lines	1	0.23%	0.00%
COUNT	(verb)	184	35.02%	92.80%	royalty rank	350	64.98%	7.20%
DATE	related to calendar	219	98.65%	99.20%	fruit	3	1.35%	0.80%
DEAL	an amount	73	30.93%	84.00%	to distribute	163	69.07%	16.00%
DIE	to cease living	1681	99.94%	98.40%	singular of noun 'dice'	1	0.06%	1.60%
EAR	organ of hearing	458	100.00%	98.80%	unit of corn	0	0.00%	0.20%
EGG	produced by females	217	100.00%	99.20%	to egg on	0	0.00%	0.80%
EVEN	still, yet	2469	99.92%	99.60%	(denoting)	2	0.08%	0.40%
FAST	quick	1012	100.00%	97.38%	to abstain	0	0.00%	2.62%
FILE	Folder	207	100.00%	99.38%	tool for smoothing	0	0.00%	0.62%
FINE	good/small	683	97.71%	95.37%	penalty	16	2.29%	4.63%
FIRM	Business	133	80.12%	80.12%	solid, strong	33	19.88%	19.88%
FOLD	to bend	48	100.00%	97.80%	flock	0	0.00%	2.20%
GO	to depart	25872	100.00%	100.00%	East Asian game	0	0.00%	0.00%
HIDE	to conceal	1344	99.93%	98.60%	skin	1	0.07%	1.40%
LAST	previous/final	3376	95.96%	94.60%	to continue	142	4.04%	5.40%
LAY	to place	977	99.90%	92.59%	non-clergy	1	0.10%	7.41%

LEAVE	to depart/bequeath	6127	93.47%	78.96%	direction (left)	308	4.70%	17.03%
LIE	to be prostrate	811	60.21%	93.40%	falsehood	536	39.79%	6.60%
LIGHT	opposite of dark	2267	95.73%	93.75%	opposite of 'heavy'	101	4.27%	6.25%
LIKE	to resemble	6177	58.46%	76.20%	opposite of dislike	4390	41.54%	23.80%
LINE	geometric figure	545	98.38%	95.93%	to apply lining	9	1.62%	4.07%
LOCK	to use a key	869	99.43%	97.36%	(of hair)	5	0.57%	2.64%
MATCH	sporting game/to be paired with	96	48.48%	92.51%	small wooden stick	102	51.52%	7.49%
MISS	title	2191	91.22%	50.00%	fail to hit	211	8.78	50.00%
NET	Web	58	98.31%	59.36%	total	1	1.69	40.64%
PAGE	leaf of a book, internet	966	100.00%	99.58%	to call out		0	0.42%
PAN	cooking (including to 'criticize')	46	100.00%	84.84%	to move a camera 'panorama’	0	0	15.16%
PEN	writing utensil	135	100.00%	99.58%	animal enclosure	0	0	0.42%
POLICY	(as in 'foreign policy')	4	14.29%	95.60%	(as in 'insurance policy')	24	85.71	4.40%
POOL	Water	173	98.86%	78.62%	combined resources, billiards	2	1.14	21.38%
POT	Cookware	186	100.00%	99.60%	marijuana	0	0	0.40%

PUPIL	Students	37	100.00%	99.00%	eye	0	0	1.00%
RACE	competition of speed	783	98.99%	92.00%	species	8	1.01	8.00%
RAIL	horizontal beam	28	93.33%	99.00%	to rail against	2	6.67	1.00%
REPAIR	to fix	98	100.00%	99.40%	to return to	0	0	0.60%
REST	the remainder	517	45.79%	62.20%	to recuperate	612	54.21	37.80%
RING	sound of bell	679	58.89%	67.47%	circle	474	41.11%	41.11%
ROLL	to spin	180	100.00%	96.20%	a list	0	0%	3.80%
SCHOOL	educational setting	1635	100.00%	100.00%	group of fish	0	0%	0%
SET	to place/to be firm	398	78.68%	80.40%	collection	58	21.32%	19.60%
SHOOT	to spout, etc	1156	100.00%	99.80%	interjection	0	0%	0.20%
SLIP	to misstep	97	100.00%	100.00%	undergarment	0	0%	0%
SOCK	garment	40	100.00%	98.59%	to punch	0	0%	1.14%
SPELL	Letter-by-letter / incantation	43	100.00%	75.95%	time interval	0	0%	24.05%
STEEP	(adjective)	85	98.00%	91.94%	verb	2	2%	8.06%
STEP	(verb)	1211	99.00%	100.00%	mother	13	1%	0.00%
SWALLOW	to gulp	58	98.00%	96.77%	bird	1	2%	3.23%
TEND	habitual actions	11	69.00%	96.60%	to take care of	5	31%	3.40%
WEAVE	interlaced thread	53	98.00%	87.80%	to move from side to side	1	2%	12.20%

WELL	good / interjection	5387	99.00%	100.00%	spring	57	1%	0.00%
YARD	land	176	73.00%	56.60%	36 inches	66	27%	43.40%

Appendix B

Comparisons of Relative Frequencies of Homonyms in ER Corpus and BNC: Words with Third and Fourth Meanings

	First Meaning				Second Meaning				Third Meaning				Fourth Meaning			
	This Study			Parent (2012)	This Study			Parent (2012)	This Study			Parent (2012)	This Study			Parent (2012)
Word	Gloss	Freq.	%	%	Gloss	Freq.	%	%	Gloss	Freq.	%	%	Gloss	Freq.	%	%
DOWN	(opposite of up)	8288	100.00%	99.80%	feathers	0	0.00%	0.20%	dow nland	0	0.00%	0.00%				
HOST	of a party, etc.	54	96.43%	85.28%	multitude	2	3.57%	13.91%	sacrificial victim	0	0.00%	0.81%				
LEAVE	to depart/bequeath	6127	93.47%	78.96%	direction (left)	308	4.70%	17.03%	permission	0	0.00%	0.80%	plural of leaf	120	2%	1.83%
MEAN	to have meaning	2202	96.12%	99.60%	cruel	89	3.88%	0.40%	average	0	0%	0%				
POUND	Monetary unit/w eight	639	99.38	97.63%	to crush	4	0.62	2.07%	dog pound	0	0%	0%				
SCALE	measurement/ w eight	35	97.22%	90.22%	to climb	0	0%	7.86%	reptile skin	1	2.78%	3.02%				
SOUND	audio phenomenon	1979	100%	93.19%	sturdy	3	0%	6.41%	to inquire sound out	0	0.00%	0.40%	sea inlet	2	0.11%	0.00%

About the Authors

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