Introduction

Vocabulary size is a dimension of lexical knowledge that has been studied for a long time and has aroused the interest of many researchers, because knowing how many words we know and how our vocabularies grow is essential for different purposes. For example, at a theoretical level, this information can help us to chart native (NS) vs. non-native (NNS) speaker lexical development and see whether there are patterns of vocabulary growth. At a practical level, it can assist in determining how much vocabulary we need to know in order to use another language. Knowing a certain number of words, in either L1 or L2, is crucial for effective communication. Initially, learners’ skill in using the language is heavily dependent on the number of words they know because “without words to express a wide range of meanings, communication in an L2 just cannot happen in a meaningful way” (McCarthy, 1990, p. viii). Nation (1993a, p. 131) has also pointed out that “an emphasis on vocabulary size . . . [is] an essential prerequisite to the development of skill in language use”. Different studies have shown that vocabulary size is closely related to proficiency; the bigger one’s vocabulary is, the more proficient s/he is in a language. In English, for example, there is a close relationship between vocabulary size and how well one understands, reads, writes, and performs on other formal linguistic tasks (Staehr, 2008; Miralpeix & Muñoz, 2018), and size has also been related to academic achievement (Saville-Troike, 1984; Milton & Treffers-Daller, 2013). In brief:

Tests of vocabulary size have been shown to predict success in reading, writing, and general language proficiency as well as academic achievement . . ., whereas other types of vocabulary tests as yet have not.

(Laufer & Goldstein, 2004, pp. 401–402)

Critical Issues and Topics

In this chapter, we mainly address three critical issues in L1 and L2 vocabulary size and growth. First of all, we present similarities and differences between learning words in L1 and L2. Secondly, we summarize what research has found so far in relation to vocabulary size in
L1 and L2. Thirdly, we focus on measuring vocabulary size. Finally, the chapter closes with several suggestions on areas that need further investigation.

**Vocabulary Learning in L1 and L2: Same or Different?**

There are some similarities between L1 and L2 vocabulary learning: both children and L2 learners are faced with the enormous challenge of having to learn thousands of words. They have to isolate meaningful units, retain their forms, and learn and store their meanings (Meara, 1988; Singleton, 1999). All these difficulties are common to both L1 and L2 learners irrespective of the languages they learn or the ages at which they learn them.

We also have some signs that the relationship between L1 vocabulary and L2 vocabulary development might be quite close. For example, Skehan (1989) finds that social class, vocabulary development and parental education have a significant strong relationship with foreign language (FL) achievement, and that L1 vocabulary size in young learners can help to predict FL skills almost ten years later. Furthermore, although there are many individual differences regarding our capacity to learn vocabulary, if a learner is good at learning words in his/her L1, he/she may also be successful doing so in other languages, and vice versa: those who have problems at picking up words will have them in any language (Meara, 1996).

However, L2 lexical development differs from L1 lexical development: the way we learn words in our L1 is different from how we do it in L2, and the differences are basically related to three elements: the learner himself/herself, the context in which the language is learned, and the type of languages involved in the learning process.

First of all, compared to L1 learners, L2 learners are cognitively more mature and probably have already acquired a range of strategies that children do not yet have. In addition, L2 learning takes place in the presence of an already acquired lexicon (Meara, 1988). Exposure also is essential for vocabulary acquisition, and the difference between the amount of exposure learners get when learning the L1 or an L2 in formal settings is quite considerable (e.g., see Nagy & Anderson, 1984). Children tend to learn L1 vocabulary incidentally, as massive oral and written input is readily available to them, although deliberate learning can also enhance the lexical growth of L1 learners during their school years. However, when learning an L2 in formal contexts, incidental learning does not often occur because the amount of input available is very low, and students do not encounter the same words a sufficient number of times to learn them. Consequently, vocabulary is usually learned deliberately, and the percentage of words learned incidentally tends to be very low (e.g., see Waring & Nation, 2004 on the amount of vocabulary learned incidentally from reading). In order to maximize learning, formal instruction is often complemented with additional exposure (e.g., Hannibal, 2017 finds that greater gaming with English input is significantly related to larger vocabulary sizes in young Swedish English learners). Therefore, all of this suggests that “there is not a lot to be gained in trying to find points of contact between studies of early vocabulary acquisition in an L1 and an L2” and that we should focus instead on the points of contact that may exist between L2 vocabulary acquisition and vocabulary acquisition in older L1 speakers, especially adolescents (Meara, 1988). Finally, the type of languages involved in the learning process is also a factor that has an effect on lexical growth rates. For example, learners’ L1 can help determine whether the L2 words are initially easy or difficult, depending on the likelihood of finding them in the mother tongue as well (Nation, 1990).
How Many Words Do We Know in L1 and L2?

When trying to answer the question of how many words we know in a language, either in L1 or at the different stages of learning an L2, there are actually two questions which must first be addressed, namely: “What constitutes a word?” and “What does it mean to know a word?” This will help us make better sense of the studies determining the number of different words we know or need to learn. After all, the count will obviously vary depending on what is taken as a word. Likewise, we should be aware that a word can be “known” in different ways, and that studies on vocabulary size may differ in what they consider a “known word”. Consequently, vocabulary size estimates may also vary depending on the study. Therefore, the following subsections briefly deal with these two issues and how they can affect lexical assessment, so that later we can concentrate on the empirical results provided by research into vocabulary size.

What Is a Word?

It is rather difficult to define what a word is. Some people even disagree with the use of the term “word”. Carter (1987), for instance, states that the variable orthographic, phonological, grammatical, and semantic properties of words are best captured by the use of the term “lexical item”. Likewise, Sinclair (2004, p. 281), who believes that meaning is related to word patterns and not to individual words, uses the term “lexical item” to refer to “one or more words that together make up a unit of meaning”.

Nation (1990) highlights the fact that the criteria used to establish boundaries between words have an important effect on learning to distinguish words. They can be distinguished entirely on their form (e.g., wish and wishes are different words), on their meaning (e.g., the foot of a person and the foot of a bed might be considered one or two words), or with reference to either the learners’ mother tongue or the L2 (e.g., a steamboat is one word in English but barco de vapor may be thought to have three words in Spanish). It can thus be asserted that there are many different kinds of vocabulary items or words, and this is especially true when NNS learners “eye their target language as linguistic outsiders” (Folse, 2004, p. 1).

Although we know that writing imposes word breaks that do not always have much psychological reality (Wray, 2015), a “word” is usually considered to be the linguistic unit which has a space on either side when written. Strictly speaking, this definition would correspond to what is known as a “token”. When counting “words” in a text, the number of tokens or “individual words” is normally related to the number of types (or the number of different words) that the text has. However, in language acquisition, when talking about “words”, we usually mean “lemmas”. A lemma consists of the base (defined as the simplest form of a word) and inflected forms of a word (e.g., waste, wasted, and wasting are one lemma). Another widely used term is “word family”, which is formed by the base word, all of its inflections and its common derivatives (e.g., light, lights, lighting, lighten, and enlightenment constitute a word family). In most studies of vocabulary size, the term “word” usually refers to “word families” or “lemmas”. Additionally, word frequency lists, which are used for estimates, are made of word families or are often lemmatized. Obviously, tallies of vocabulary size using word families are lower than tallies using lemmas.

Studies on vocabulary size have often used word families (Webb & Nation, 2017, p. 44). It should be acknowledged, though, that we cannot always automatically assume that learners knowing the most basic inflections or derivatives of a word will also know all the other
members of the word family (Gardner, 2007; Nagy et al., 2006). There have also been attempts to establish a correspondence between quantities of different units, but this equivalence should just be taken as a very rough indication (e.g., a typical English word family is thought to have seven “closely related members”, and multiplying the number of word families by 1.6 gives an approximation of the number of lemmas).

What Does It Mean to Know a Word?

What we mean by word knowledge is not easy to describe, as vocabulary knowledge is thought to have many facets. One of the most comprehensive frameworks on what knowing a word entails was provided by Nation (2001, p. 27), and it includes knowledge of form, meaning, and use. A well-known distinction between receptive and productive vocabulary knowledge is also often made when talking about learners’ knowledge.

Although Melka (1997) states that it is almost impossible to find a clear and adequate definition of what is meant by reception and production (i.e., passive and active vocabularies), we usually assume that receptive vocabulary involves being able to recognize and understand a word when it is encountered in listening or reading, while productive vocabulary means being able to use it in speech or writing. From the standpoint of receptive knowledge, knowing a word receptively implies knowing what the word means in a particular context, being able to recognize its collocations or being able to identify its written form so that it is recognized when reading. From the standpoint of productive knowledge, knowing a word entails being able to use it in order to adapt the degree of formality to any given situation or being able to pronounce it correctly, among other aspects (Nation, 1990, 2001). Receptive vocabularies are also thought to be bigger than productive vocabularies (as reception precedes production); however, trying to quantify both has been shown to be problematic.

The picture is further complicated by the fact that words can be just partially known (actually, partial knowledge is very common, especially for words that are not very frequent in a language): lexical knowledge is not uniform across the receptive-productive distinction. Moreover, there may be an imbalance between oral and written vocabulary sizes; low-proficiency learners may have more imbalanced vocabularies, while more advanced learners have usually developed written and spoken vocabularies of similar sizes (Schmitt, 2014).

As Meara (1999) states, this widely accepted view of the lexicon, including the distinction between receptive and productive vocabulary, is clearly an “oversimplification”, as pointed out by Ellegard back in 1960. However, even today it is not clear what sort of model could possibly replace it, and estimates of vocabulary size are usually given in terms of receptive or productive knowledge. In the meantime, this perspective (as well as what we take as “a word”) has undoubtedly influenced the way vocabulary size has been tested.

Very often, frequency lists have been taken as the basis for designing tests, as learners are more likely to know the vocabulary which is very frequent in a language, while it is more difficult for them to encounter and learn words that are used less often. Most of the tests available nowadays assess receptive vocabulary and aim to tap learning based on the link between form and meaning; that is, learners are presented with words from different frequency levels and asked if they know the most basic meaning of the word, as in Yes/No tests (Meara & Buxton, 1987), or they are asked to match each word with its correct meaning among those provided, as in the Vocabulary Levels Test (VLT: Nation, 1990; Schmitt, Schmitt, & Clapham, 2001; Webb, Sasao, & Ballance, 2017) or Vocabulary Size Test (VST: Nation & Beglar, 2007; Coxhead, Nation, & Sim, 2014). Productive vocabulary is believed to be more difficult to estimate, and reliable tools to assess it are very scarce. The Lexical
Frequency Profile (LFP, Laufer & Nation, 1995) can give the percentage of words in a text belonging to different frequency bands, although it cannot provide an estimate of vocabulary size. Furthermore, the productive version of the VLT (Laufer & Nation, 1999) is actually considered to measure “controlled productive vocabulary”, as the first letters of a written word are given in a context so the learner can supply the rest of the word. This support calls into question whether it is really tapping into “productive knowledge”.

How Many Words Do We Know in L1?

Bearing in mind the reflections in the previous sections, we will now present what vocabulary studies have found in relation to the number of words known in our first language. There is some normative data on L1 English, mostly from parental diaries and experimental studies. For example, there is a whole range of studies using the monolingually normed standardized *MacArthur-Bates Communicative Development Inventories* (Fenson et al., 2007) to study lexical development in children up to 36 months of age in English and other languages. However, as Meara (1999) highlights, the data so far consists in very general estimates for early infancy and adulthood. It is generally assumed that, as a rule of thumb, children’s vocabulary in English L1 grows at a rate of about 1,000 word families per year (Biemiller & Slonim, 2001; Goulden, Nation, & Read, 1990). Nation and Waring (1997) have offered indications on the size of children’s vocabulary in English as an L1, and they state that a five-year-old knows between 4,000 and 5,000 word families, 2,000 to 3,000 of which are also known productively. This means that children can acquire quite a lot of vocabulary from oral input before they go to school and learn how to read. Incidental learning by reading will become crucial to lexical development in the school years, as children start to engage in contact with written input and may read about a million words per year (Nagy, Herman, & Anderson, 1985). Oral input will also contribute to further lexical development (Webb & Nation, 2017) and, therefore, vocabulary growth will be considerable in this period.

There are also several studies estimating the vocabulary size of adult native speakers. Seashore (1933) posited that a junior college student knows about 15,000 nontechnical English root words, about 52,000 derivatives of roots, and 3,000 special terms, as he found with a four-choice recognition test with words sampled from a dictionary. More recent studies like Goulden et al. (1990) suggest that average-educated native speakers know about 17,000 base words, excluding proper nouns, compound words, abbreviations, and foreign words. These results were obtained using a sample from Webster’s dictionary and were similar to estimates of college students by D’Anna, Zechmeister, and Hall (1991): about 16,785 different words. However, as Brysbaert, Stevens, Mandera, and Keuleers (2016) have shown, there is a great deal of variation. According to their study, an average 20-year-old student knows about 42,000 lemmas and 4,200 multiword expressions, derived from 11,100 word families. They observed that these numbers could range from 27,000 to 52,000 lemmas, depending on factors like how much the person reads and watches media with verbal content. They also highlighted that from ages 20 to 60, vocabulary size can increase by 6,000 lemmas (for a summary of studies estimating the number of English words known by native speakers, see Table 3 in Brysbaert et al., 2016, p. 1116).

It should be noted that although there is quite a lot of research on the early acquisition of L1 vocabulary in children, there is very little research on young L1 learners at school, and “literature in this field is instead dominated by studies of learners of additional languages” (Sealey, 2009, p. 39). This is an area that should deserve more attention because, as stated
earlier, it has been suggested that there may be points of contact between L1 and L2 vocabulary acquisition, especially in adolescents (Meara, 1988).

How Many Words Do We Know in L2?

Studies on L2 vocabulary growth are available, although there is still a lot of research yet to be done. First of all, we do not actually have normative data on vocabulary growth in L2 speakers, which makes comparisons with L1 learners impossible (Meara, 1996). Furthermore, due to the different measures used in the studies and the varying characteristics of the groups studied, it is also often difficult to establish comparisons among L2 learners’ vocabulary sizes. In this area, most research consists of one-off studies that do not track development over long periods of time; different studies make use of different units (lemmas, word families, etc.), and quite often the units used in the counts are not specified.

We know, however, that L2 growth is unlikely to reach the rate of 1,000 word families, as expected with L1 learners (Webb & Nation, 2017). These authors suggest that learning 500 word families per year should be an “attainable target” provided that learners have adequate monitoring and support. If we take into account that West (1953) suggests that a minimally adequate vocabulary must consist of 2,000 words for communication, and that Liu and Nation (1985) consider 3,000 receptive word families a crucial threshold, then with an average of 500 word families learned per year, five to six years should be enough time to master about 3,000 words. Nevertheless, some L2 learners never reach these targets. One of the reasons for this lack of success is the amount of input learners are exposed to.

A distinction is often made in L2 learning between learning the language in a natural setting, an environment in which the target language is encountered outside the classroom, and in a formal setting, where the amount of exposure is limited to the time the language is learned in class.

Vocabulary Size and Growth in Natural Settings

Several studies have been conducted with students learning the language in immersion settings; examples include Qian (2002) and Mochida and Harrington (2006). Qian (2002) used an older version of the VLT to estimate the receptive vocabulary of 217 university students and undergraduates learning English in Canada. As the maximum score of the test was 90 (18 points per each of the five bands he used), he operationalized the estimate as “VS” (“Vocabulary Size” Measure) in percentages, yielding a mean result of 59.99%, which is not straightforward to interpret and compare. In an immersion context as well, Mochida and Harrington (2006) used a Yes/No test and VLT to infer the receptive vocabulary of 36 undergraduate and postgraduate students with different L1s learning English in Australia. The study compares the scores from both tests and addresses issues of reliability. The results are provided not as a general estimate but as words known at different frequency levels (2k, 3k, 5k, 10k words and words from the Academic Word List; Coxhead, 2000). In the US, Zimmerman (2004) investigated whether there was a difference between the vocabulary size scores of newly placed students (new arrivals) and continuing students at three different proficiency levels. Using a productive version of the VLT, it was unexpectedly found that new arrivals at any given level had larger vocabularies than continuing students at the same levels, with a difference of at least 377 word families. However, this might also be caused by the adaptation of the VLT test used in the study.
There is also research comparing the receptive vocabulary sizes of students in two contexts (natural vs. formal). One example is the study by Laufer and Nation (1995), which examines the vocabulary sizes of a group of learners in Israel (formal setting) and New Zealand (immersion). Results from the LFPs cannot be given as general estimates (as one figure, e.g., 6,000 words) but as percentages of words known in each of the frequency bands; thus, a collection of figures is necessary (e.g., 70% at 1k, 40% at 2k . . .). A more recent example is Dóczi and Kormos (2016), who used the VST to compare the vocabulary growth of non-native international students at a British university with those attending an intensive language teaching program in a bilingual secondary school in Hungary over the course of a year: again, results are given in terms of mastery of each frequency band. The findings of these studies are not always easy to relate to others and are often difficult to work with. Some authors have considered the possibility of assembling all the figures coming from a profile or frequency bands into one figure. Laufer (1995) suggested that the results for each band of the profile could be grouped into two figures (bands 1k and 2k on the one hand and 3k and 4k on the other), yielding a condensed profile. The “beyond 2,000” measure she proposes is then the percentage of words belonging to bands 3 and 4, although not many researchers have followed this recommendation.

Finally, Zareva, Schwanenflugel, and Nikolova (2005) examine a group of learners at two proficiency levels in an instructional setting (learning English in Bulgaria) and compared their vocabulary sizes to a group of native speakers in the US, which were taken as a baseline. Significant differences in vocabulary sizes were found among native speakers, L2 advanced, and intermediate learners. The authors used in this case a specific vocabulary size measure derived from a scale devised for their particular study.

Vocabulary Size and Growth in Formal Settings

There are quite a lot of studies on vocabulary size estimations for learners of English in instructional settings. Table 13.1 presents a selection of 20 studies carried out in different countries since the 1980s when the number of publications related to vocabulary learning started to increase. The last column of the table summarizes the results obtained on learners’ vocabulary sizes (information on the proficiency levels and tests used can be found in the previous columns for each study). It should be acknowledged that estimating vocabulary size is not the ultimate or sole aim in some of these studies. For example, Nurweini and Read (1999) have two main objectives, the first being estimating vocabulary size and the second analyzing vocabulary depth. In these cases, only the information on vocabulary size is presented; that is, following the example of Nurweini and Read’s study, we indicate the results of the estimate and not the word association tests and the interview that they conducted to fulfill the second objective, which was related to analyzing vocabulary depth.

Out of the 20 studies included in the table, many involve the use of the VLT, either the receptive or productive version. Nevertheless, only at low levels is it common for some of the sections of the receptive test to be used (as in Jiménez, Ruiz de Zarobe, & Cenoz, 2006), and in some recent studies, learners took the revised versions by Schmitt, Schmitt, & Clapham (2001) instead of the original VLT versions. Other authors adapted this test for their own purposes, such as Fan (2000), who created nine different versions similar to the VLT to assess productive vocabulary at different levels. Webb and Chang (2012) used a bilingual version of the VLT in Taiwan (with high school learners). Apart from the VLT, there are also studies measuring receptive vocabulary size with Yes/No tests. For example, Milton (2009) found out that in private EFL schools in Greece learners gained about 500 words per year.
<table>
<thead>
<tr>
<th>Author and year</th>
<th>Country</th>
<th>Participants</th>
<th>Receptive/ productive</th>
<th>Test</th>
<th>Estimate vocabulary size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gui (1982)</td>
<td>China</td>
<td>Secondary school and university</td>
<td>Receptive</td>
<td>Multiple-choice vocabulary test in Chinese</td>
<td>1,200 words at secondary school and up to 6,000 at university</td>
</tr>
</tbody>
</table>
| Takala (1985)   | Finland | Primary school (450 hours instruction): N = 2,415 | Receptive and productive | Translation test  
- Receptive: L2—L1  
- Productive: L1—L2 | About 1,000 words receptively and productively (range 450–1,500) |
| Jaatinen and Mankkinen (1993) | Finland | Graduate and undergraduate: N = 89 (52 first-year, 37 advanced) | Receptive | Two multiple-choice vocabulary tests | 18,100 words. Advanced students knew 2,400 words more than their peers (19,500 vs. 17,100) |
| Waring (1997)   | Japan   | Elementary to upper intermediate: N = 76 | Receptive and productive | VLT: Receptive and productive versions (1k, 2k, 3k, 5k) | • Receptive: 49.72%–60.84%  
• Productive: 17.04%–31.48% |
| Laufer (1998)   | Israel  | Secondary school: N = 26 (Grade 10) N = 22 (Grade 11) | Receptive and productive | • VLT: Receptive and productive versions (2k, 3k, 5k, AWL)  
• LFP | • Receptive: 1,900–3,500 words  
• Productive: 1,700–2,550 words (controlled), 7% approx. >2k (free) |
| Nurweini and Read (1999) | Indonesia | University (1st year): N = 324 | Receptive | Translation task (based on GSL-first 2,000 words- and AWL) | 1,226 words |
| Cobb and Horst (1999) | China | University: N = 21 (1st year) N = 28 (2nd year) | Receptive | VLT (2k, 3k, 5k, AWL) | • Virtually all 2k  
• 91.7%–91% (3k)  
• 64.4%–73.4% (5k)  
• 72.2%–72% (AWL) |
• Production test: write English words for six semantic contexts | • Receptive: 2,000–2,500 words  
• Productive: scores approx. 30 (out of 80) |
| Fan (2000)      | China   | University (1st year): N = 138 | Receptive and productive | • Receptive: VLT (2k, 3k, AWL)  
• Productive: nine different versions, similar to productive VLT | • Receptive: 62.12% (2k), 48.16% (3k), 45.72% (AWL)  
• Productive: 53%–81.3% words recognized also recalled |
<table>
<thead>
<tr>
<th>Author and year</th>
<th>Country</th>
<th>Participants</th>
<th>Receptive/ productive</th>
<th>Test</th>
<th>Estimate vocabulary size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobb (2000)</td>
<td>Canada</td>
<td>University (after nine years of instruction): N = More than 1,000</td>
<td>Receptive</td>
<td>VLT (2k, AWL)</td>
<td>74% (2k), 68% (AWL)</td>
</tr>
<tr>
<td>Tschirner (2004)</td>
<td>Germany</td>
<td>University (1st year): N = 142</td>
<td>Receptive and productive</td>
<td>VLT: Receptive and productive versions (2k, 3k, 5k, 10k, AWL)</td>
<td>72% of the students do not have a receptive vocabulary of 3,000 words and 79% fail the productive 2,000 level</td>
</tr>
<tr>
<td>Jiménez et al.  (2006)</td>
<td>Spain</td>
<td>Primary education (Grade 6): N = More than 130</td>
<td>Receptive</td>
<td>VLT (1k and 2k)</td>
<td>Estimates lower than 1,000 words</td>
</tr>
<tr>
<td>Miralpeix (2007)</td>
<td>Spain</td>
<td>University: N = 64 (intermediate) N = 93 (advanced)</td>
<td>Receptive</td>
<td>X_Lex and Y_Lex (up to 10k)</td>
<td>• 3,950 words (intermediate) • 5,954 words (advanced)</td>
</tr>
<tr>
<td>Webb (2008)</td>
<td>Japan</td>
<td>University: N = 83</td>
<td>Receptive and productive</td>
<td>Translation test (180 words)</td>
<td>• Receptive: 73.52% • Productive: 68.69%</td>
</tr>
<tr>
<td>Milton (2009)</td>
<td>Greece</td>
<td>Beginner to FCE (Private EFL schools): N = 227</td>
<td>Receptive</td>
<td>X_Lex (up to 5k)</td>
<td>500 words (Junior) to 3,500 (FCE), average gain 500 words/year</td>
</tr>
<tr>
<td>Orosz (2009)</td>
<td>Hungary</td>
<td>Primary-secondary schools (Grades 3 to 12): N = 726</td>
<td>Receptive</td>
<td>X_Lex (up to 5k)</td>
<td>500 words (Grade 3) to 3,500 (Grade 12), average gain 300–400 words/year</td>
</tr>
<tr>
<td>Webb and Chang  (2012)</td>
<td>Taiwan</td>
<td>Secondary school and university (longitudinal): N = 166</td>
<td>Receptive</td>
<td>VLT (bilingual version, 1k and 2k)</td>
<td>47% of students mastered 1k and 16% 2k at university</td>
</tr>
<tr>
<td>Zhang and Lu    (2014)</td>
<td>China</td>
<td>University (1st-2nd year), longitudinal: N = 360</td>
<td>Receptive</td>
<td>VLT (2k, 3k, 5k, AWL, 10k)</td>
<td>Good mastery of 2k, massive improvement in 5k, moderate improvement in other bands</td>
</tr>
</tbody>
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(Continued)
Imma Miralpeix

Table 13.1 (Continued)

<table>
<thead>
<tr>
<th>Author and year</th>
<th>Country</th>
<th>Participants</th>
<th>Receptive/ productive</th>
<th>Test</th>
<th>Estimate vocabulary size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roghani and Milton</td>
<td>Iran</td>
<td>Beginner to</td>
<td>Receptive and</td>
<td>• Receptive: X_Lex (up to 5k)</td>
<td>• Receptive: 3,000 words approx.</td>
</tr>
<tr>
<td>(2017)</td>
<td></td>
<td>advanced (Foreign language teaching institutes):</td>
<td>productive</td>
<td>• Productive: 4 category generation tasks and VLT</td>
<td>• Productive: 1,000 words approx.</td>
</tr>
<tr>
<td>Miralpeix and Muñoz</td>
<td>Spain</td>
<td>University (upper intermediate/advanced):</td>
<td>Receptive</td>
<td>X_Lex and Y_Lex (up to 10k)</td>
<td>5,127 words (range: 2,500–7,200)</td>
</tr>
<tr>
<td>(2018)</td>
<td></td>
<td>N = 92</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Orosz (2009) saw in Hungary that while grade 3 learners had a mean of 500 words, at grade 12 it was of more than 3,000. Miralpeix and Muñoz (2018) also used a Yes/No test (assessing up to 10,000 words) to measure vocabulary sizes of more advanced university EFL learners in Spain, who knew receptively a mean of 5,100 words (although the range varied from 2,500 to 7,200).

In order to create the vocabulary size tests, some of the studies in Table 13.1 use standard frequency counts different from Nation’s lists on which the VLT is based. Examples include Nurweini and Read (1999), who created their tests based on the General Service List (GSL, West, 1953), and Miralpeix (2007) and Miralpeix & Muñoz (2018), who use the JACET list (Ishikawa et al., 2003). Jaatinen and Mankkinen (1993) use 100-word samples from the Collins COBUILD Dictionary to design their multiple-choice tests, and the same procedure is applied by Zareva et al. (2005), who selected words by sampling from a dictionary to test receptive vocabulary knowledge.

Indeed, receptive vocabulary is more commonly estimated in the literature. Of the studies presented here, 12 estimate receptive vocabulary (such as Gui, 1982; Cobb & Horst, 1999; Zhang & Lu, 2014) and eight estimate both receptive and productive vocabularies (such as Laufer, 1998; Tschirner, 2004; and Webb, 2008). Concerning receptive vocabulary, though, estimates made from data obtained when supplying L1 equivalents or synonyms for the words tested (Ishihara, Okada, & Matsui, 1999) can be different from those obtained when matching words with their definitions or synonyms (as in the VLT used in some studies). Likewise, the productive vocabulary estimated in these studies can also be different in nature: firstly, there are instances of what might be called “controlled productive vocabulary”, that is, where the subject has a clue on how to produce the word, such as in the productive version of the VLT, where the first letters of a written word are given in context so the learner can supply the rest of the word. Another example is Takala (1985), who uses translations to estimate productive vocabulary. Ishihara et al. (1999) and Roghani and Milton (2017) estimate what might be called “free productive vocabulary”. In both studies, learners are asked to produce words belonging to a particular semantic field without further support.

There are some studies also worth mentioning that are not included in Table 13.1. For instance, some present tests devised to estimate vocabulary size, either receptive like the Eurocentres Vocabulary Size Test (EVST: Meara & Jones, 1988), productive like Lex30 (Fitzpatrick & Meara, 2004) or both, like the Computer Adaptive Test of Size and Strength.

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Others, like Cameron (2002), compare the results of different receptive vocabulary size tests on the same learners.

**Measuring Vocabulary Size and Growth in L1 and L2**

It is evident that for a long time researchers have been confronted with problems on assessment that still persist nowadays. Although some authors state that the differences between subjective estimates (how many words we think we know) and objective results (in vocabulary size tests) are not considerable (Ringeling, 1984), consistent deviation between subjective and objective data has usually been found. Zechmeister et al. (1993) also suggest that our metacognitive knowledge about how many words we know or how many words we aim at learning in the target language is very limited. This superficial knowledge may also be applied to teachers’ perceptions of students’ vocabulary. Riley and Whistler (2000) report a study where teachers’ subjective estimates were compared with results obtained in a levels test taken by Japanese learners of English; there was noticeable disagreement between teachers’ judgments along with an underestimate of students’ vocabulary.

In addition, as we have seen in the previous sections, widely varying estimates tend to be the norm rather than the exception, and there are a number of aspects that are a hindrance when trying to obtain vocabulary size estimates. Apart from the aforementioned problems defining what a word is and what constitutes word knowledge, the methodology used to test vocabulary size also raises a number of concerns in both L1 and L2 testing. The first has to do with sampling: the words to be tested have often been selected from dictionaries or frequency lists, but not always using suitable criteria (Nation, 1993b). This is one of the reasons why Nation and Webb (2011, p. 196) claim that “well over 100 years of research on the measurement of the VS of NS has resulted in little useful data”. Melka (1997) adds several other linguistic and extra-linguistic factors that can account for the discrepancy in estimates: results are often affected by test context, test grading, the role of cognates and the notion of avoidance. The amount of context can be very important in generating or recognizing a word. Therefore, in tests where linguistic context is provided (e.g., a multiple-choice test with the word embedded in a sentence), learners may earn higher scores than in others where the word appears on its own. Likewise, the way tests are graded (i.e., when an item is considered “correct” or “incorrect”) has a direct effect on the final score: marking a test leniently or strictly will provide different vocabulary size estimates (Webb & Chang, 2012). Furthermore, cognates can initially help recognition, although realizing that equivalences between languages are limited may cause confusion in word recognition at later stages. Finally, testees may voluntarily avoid using certain words (e.g., they may have doubts on their spelling, pronunciation, usage, etc.), so researchers cannot actually be sure of what words are unknown or avoided.

All these methodological issues are compounded by the difficulties in the estimation process itself, that is, how we infer learners’ total vocabulary sizes from a reliable sample of words they know. Receptive vocabulary size tests usually assume that if a high percentage of the words in a sample from a specific frequency band is known, all the words in that frequency band will also be known. This seems a reasonable assumption provided we consider that the frequency of words in learners’ input resembles that of the word lists from which the testing words are extracted. However, it might be problematic when the input to which learners are exposed differs from the type of language used to make corpora and word lists (e.g., low-level learners in formal settings are usually exposed to words that can only be found in lower frequency bands such as *firefly* or *fairy*). A similar problem can be found if we estimate productive vocabulary from oral or written samples produced by students; not only are we
unsure of the words they may be avoiding, it is also difficult to extrapolate a figure unless we use sophisticated mathematical procedures. The other alternative, namely describing the output in terms of the bands to which the most words produced belong, is not very helpful; apart from having a collection of different figures (as many as there are frequency bands), the measure may not be sensitive enough to gauge small increases in vocabulary.

**Future Directions**

Further research on vocabulary size and growth will necessarily have to look for new assessment methods, focus on languages other than English, and concentrate more on the role of individual differences in L1/L2 lexical development.

**New Assessment Methods and Computer Modeling**

Even as we are striving to overcome some of the obstacles to measuring receptive vocabulary size (e.g., using more reliable sampling methods), productive vocabulary size has been largely unexplored. It is difficult to use production to extrapolate how big vocabularies are, and it may be more suitable to compare relative vocabulary sizes, such as the vocabulary someone uses for a particular task compared to what others (e.g., NS or learners at different proficiency levels) use when performing the same tasks. A range of different tasks, such as cartoon storytelling or picture description, may be needed for this purpose, and tools using different estimation methods can help researchers obtain reliable estimates. Two of these tools are V_Capture and V_Size (Meara & Miralpeix, 2017).

V_Capture is based on the idea developed by biologists interested in counting the number of species in a particular area by capturing and then recapturing animals in traps on a number of different occasions. This process is similar to comparing the words produced in a particular task over several performances. Mathematics uses the proportion of animals captured (in the case of vocabulary that would equal words used) on both occasions to estimate the number of animals or species being studied (Meara & Olmos, 2010). Estimates by V_Size are based on the Power Law, a ranked distribution found not just in language but also in other physical and biological phenomena like earthquake size or social network connectivity. The program assumes that certain words in language (in high-frequency bands) are more frequent than others (in low-frequency bands) and that there is a direct relationship between the number of times a word occurs in a corpus and its rank in a frequency list generated by the corpus. Therefore, it allows researchers to go beyond the mere shape of the frequency profile generated by a text and enquires into what the profile tells us about the size of the productive vocabulary of the person who produced the text.

While these two programs are instances of workable solutions to the problems of measuring productive vocabulary size, computer modeling of vocabulary growth is another promising avenue. Simulation work can help us explore this phenomenon by testing different models and seeing if the data generated by the models confirms or refutes our hypotheses. Models usually rely on a number of parameters which can have different values, and running the model with different combinations of parameter values helps us see if we can make sense of the data that the model generates. DevLex and Mezzofanti illustrate this line of research.

Ping, Farkas, and MacWhinney (2004, p. 1357) define DevLex as “a cognitively plausible, linguistically scalable model to account for lexical development in children”. The results obtained from the simulations they performed with this model match up with hypotheses from empirical research on vocabulary development related to category emergence and
reorganization, lexical confusion, and age-of-acquisition effects. Therefore, the model captures a number of important issues occurring in early lexical acquisition. Mezzofanti (Meara & Miralpeix, 2017) is a very basic simulator that tests the predictions of vocabulary growth proposed by Riegel (1968). He argued that a tentative approach to modeling vocabulary acquisition was to assume that it was governed by three basic factors: the number of words available in the learning environment, the rate at which the words are adopted by learners and the amount of time learners spend learning the language. By working with the simulator using these parameter sets, a number of interesting issues appear which are worth studying in detail, such as the effects of L2 immersion on vocabulary size and lexical growth in late bilinguals.

Languages Other Than English

Most research on vocabulary size and development has been conducted with English L1 speakers or L2 learners, although other typologically different languages should be investigated if we want to reach reliable conclusions on how vocabularies grow. There is just some research on vocabulary size estimates in students learning languages other than English (e.g., Eyckmans, 2004, with Dutch, and Batista & Horst, 2016, with French). Furthermore, only a few studies have analyzed learners from different L1s learning the same L2. For example, Milton (2009) measured the English vocabulary sizes of L1 Arabic, Farsi, and Greek learners to check for possible L1 effects in formal L2 learning, and Milton and Alexiou (2009) used vocabulary size tests results in different languages from different L1 learner groups to relate scores with the CEFR levels. There are also no studies comparing lexical growth in learners who share the same L1 but are learning different L2s (or studies assessing vocabulary growth rates in different languages in the same multilingual individuals).

This dearth of studies is also partly due to the need for new assessment methods, as discussed earlier, and the weaknesses of the ones we use. Cobb (2000) shows that standardized tests do not take into account what the learner already knows through his or her L1, and this may give rise to misleading results on L2 vocabulary size tests. In a series of studies he conducted with French learners of English, it was evident that scores on the vocabulary-size tests depended on how well the students answered with cognates. However, a study by Laufer and Levitzky- Aviad (2018) with Hebrew learners of English indicated that, overall, the proportion of loanwords in the vocabulary size test did not significantly affect the results. Still, this may not happen with other languages. Knowing more about how L1 (or any previously learned languages) affects the acquisition of L2 words would be useful not just to test vocabulary size but also to deepen our knowledge of lexical access and organization.

Individual Differences

The role of individual differences in L1 and L2 lexical development should also be brought back on the agenda for future research. As pointed out by Dale and Goodman (2004), if we want to describe growth patterns and assess how prototypical they truly are, the rate and shape of specific individual growth trajectories should be studied, as group means very often mask individual differences.

Suggestions by Takala (1985) encompassed more research on young populations to include lower stages of vocabulary development and end-of-secondary school students with different ability levels. His studies on the English vocabulary of Finnish schoolchildren after seven years of studying the language (about 450 hours of exposure) provide estimates of vocabulary knowledge
ranging from 450 words in slow learners to 1,500 in fast learners. More recently, Webb and Chang (2015) found out that small differences in vocabulary knowledge between learners led to large differences in the amount of words learned through an extensive reading program (even if all participants in the study were Taiwanese learners of English at the same proficiency level, with the same age and with the same amount of exposure to the target language).

Research has shown that there are both genetic and environmental contributions to individual differences. When trying to disentangle these two in L1 lexical acquisition, Dionne, Dale, Boivin, and Plonin (2003) indicate that even if environmental factors outweigh genetic factors in early vocabulary development, the latter can explain up to 20% and 12% of lexical knowledge at age two and three, respectively. Setting aside the debate on whether certain variables are actually predetermined or subject to change, what happens later on in L1 learners at school? As we have pointed out, there is not enough research on that. And if this occurs in L1 lexical development, what happens in L2 or additional language learning? If environmental conditions are similar (i.e., learning context, type of input, amount of exposure, etc.), how does vocabulary growth vary in different language learners?

Data on variation ranges taking into account individual differences such as aptitude, self-confidence or intelligence will undoubtedly be useful to help learners with different profiles expand their vocabularies. As stated at the beginning of the chapter, vocabulary size is a crucial dimension in the development of L2 proficiency, and therefore helping learners expand their lexical repertoires will always be worth the effort.

**Further Reading**


This longitudinal study describes trajectories of development of receptive vocabulary in a group of young Latino/a English language learners from socioeconomically disadvantaged migrant families, it also examines predictors of lexical performance and growth rate.


This article shows how computer modeling can help us study vocabulary growth. By using models with very few parameters, the author explores how lexical networks expand and the possibilities that Boolean networks modeling offers to vocabulary researchers.


This paper investigates the extent to which a capture-recapture method can provide a reliable indication of productive vocabulary size by assessing a group of English/French bilinguals using this new technique, as well as another word-association productive test.

**Related Topics**

Lexical knowledge, vocabulary testing, L1 and L2 learning, word lists, language development

**References**


L1 and L2 Vocabulary Size and Growth


