Morphology

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Morphology
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[A] Morphological Processing in a Second Language
Second language (L2) learners encounter new words that are further divisible into morphemes, the smallest linguistic units bearing meaning. How do they access such complex words in the mental lexicon? They have two options, for example, a learner of English who hears the word *unreadable* can search for it in memory or can decompose the word and analyze its constituents: *un-read-able*. The first route will be available to the learner only if the word is indeed stored in the mental lexicon. The second decompositional route can be used for both familiar and unfamiliar words. It makes use of the knowledge of the constituents and allows L2 learner to reconstruct the meaning of the word even if it is not part of the mental lexicon. In order to do that, the learner needs to know the meaning of the root *read* and the affixes: *un-* means negation, and *-able* means capable of performing the action expressed by the verb root, therefore, *un-read-able* means ‘impossible to read’.

The discussion below will tackle two main questions: How do L2 learners acquire and process morphologically complex words, and what are the possible gains of focusing on morphology in L2 language instruction? It will address the following set of issues for inflection and derivation, mostly in perception:

- How do L2 learners process morphologically complex words, by decomposing them into morpheme-size units or as whole words?
- What is the direction of the acquisitional trajectory?
- What are the factors that determine the type of processing?
- What are the implications of these findings for L2 classroom?
Words use three main types of morphemes as building blocks. Roots carry the lexical meaning, e.g., the words *listen, listener, listened, and listening* all share the root *listen* that carries the meaning ‘to pay attention to sound’. Derivational morphemes, or affixes, have their own meaning that is combined with the meaning of the root, e.g., the derivational suffix *-er* when combined with a verb has the meaning ‘performer’ of an action expressed by the verb: *listen-er, work-er, teach-er*. Note that *listen* is a verb, and the suffix *-er* turns it into a noun, or changes its word class. Derivational affixes include both suffixes and prefixes, e.g., in the above example *unreadable, un-* is a derivational prefix, and *-able* is a derivational suffix. Inflectional suffixes carry grammatical meanings, such as tense, *listen-ed*, and person, *listen-s*, and do not change the word meaning or class. The stem is the part of the word minus the inflection, and can be equal to the root, e.g., the stem of the English verb *walk-ed, walk*, is equal to its root. The stem of the Russian verb *na-pis-a-t’ ‘write’ includes the prefix *na-, root pis-, and suffix -a-*. This entry will focus on inflection and derivation in L2 and will leave compounding, when two roots are combined to create a word with a new meaning, e.g., *mail+man=mailman ‘person who delivers mail’, outside the discussion.

There are reasons to believe that L2 learners acquire English inflectional morphology before derivational morphology (Schmitt & Meara, 1997; Gardner, 2007). It remains to be seen if the same tendency holds for more inflectionally rich languages. At the same time, it is clear that inflection and derivation are functionally different and are subserved by different brain circuits (Bozic, Tyler, Ives, Randall, & Marslen-Wilson, 2010), with derivation more implicated in lexical processes, and inflection in left-lateralized decompositional processes.

**[A] Inflectional Morphology**

There are several positions with regard to how L2 learners store and access morphologically complex (polymorphemic) words; they are most explicitly formulated and supported by research in inflectional morphology. Since inflections carry
grammatical information, processing of inflected words achieves two goals: lexical access through the stem and interpreting the grammatical meaning of the inflection. Thus, L2 learners need to acquire decompositional skills in order to process both lexical and grammatical information.

Research on L2 processing of inflectional morphology has been informed by the debates surrounding English regular and irregular past-tense inflection, with regular verbs using a systematic and productive -ed past-tense inflection, and irregular verbs using idiosyncratic changes to the stem, e.g., teach-taught, sing-sang, and write-wrote. According to the non-decompositional account (Ullman, 2001; Clahsen, Felser, Neubauer, Sato, & Silva, 2010; Ullman, 2012), L2 learners do not decompose inflected words and store and retrieve them undecomposed, as whole words. This is in contrast to native (L1) speakers who decompose regularly inflected words, but store irregularly inflected words undecomposed. This account expects L2 learners to start decomposing regularly inflected words only when they reach high levels of proficiency, or in other words, the developmental trajectory is from whole-word storage to decomposition. According to the opposite, decompositional account, L2 learners start by decomposing morphologically complex words, and only later develop whole-word representations (Portin, Lehtonen, & Laine, 2007; Portin, Lehtonen, Harrer, Wande, Niemi, & Laine, 2008). A recent proposal regarding L2 acquisition and processing is based on the data from languages with inflectional morphology organized in highly systematic and productive inflectional paradigms, also called inflectional families, such as verb inflection in Romance languages or noun and adjective inflection in most Slavic languages that have a system of cases similar to Latin. It is argued that inflections belonging to such productive paradigms are acquired relatively early after the beginning stage of unanalyzed chunk learning and that inflected words are accessed in the mental lexicon by decomposition (Gor 2010, Gor & Jackson, 2013). However, the other route, access of whole words, also remains available, with the choice of the processing route depending on several factors. These factors include the properties of the inflectional paradigm, input frequency, and the characteristics of the learner—L2 proficiency and L1 background.
[B] Inflectional Paradigm

Inflectional paradigms vary in regularity, or systematicity and productivity of the inflectional patterns that they use, and the complexity, transparency and predictability of stem changes. The more systematic and productive the inflectional paradigms are, the more decomposition becomes an efficient and useful processing strategy (as opposed to memorization of all inflected word forms). For example, in French, verbs have several highly consistent sets of inflections depending on the conjugational class, with the total number of inflections reaching over three dozen. Storage of all inflected verb forms requires memory resources not readily available to L2 learner. Instead of memorizing all the forms of all the familiar verbs, learning (de)composition rules and sets of inflections is more cost-effective.

Decomposition of inflected words aims at accessing the lexical entry through the stem. More often than not, lexical items that belong to developed conjugational paradigms have more than one stem, and L2 learners need to learn how to quickly match different stems to the lexical entry, the lemma. While English verbs are categorically divided into a regular and irregular class, verbs in other languages may show a wide range of regularity, or complexity, transparency, and predictability in stem changes. At the same time, the number of these stem variants (called allomorphs) in a language like Spanish is far less than the total number of all the inflected forms of a given verb. This makes decomposition cost-effective and memorization of bound stem variants a good investment of L2 learner cognitive resources. Given that the second goal of decomposition, in addition to lexical access, is to process the grammatical information carried by the inflections, learning L2 mappings between stems and inflections serves a double function.

[B] Input Frequency

Input frequency influences the speed of processing of inflected words. Importantly, L2 learners receive reduced L2 input, and therefore, corpus-based frequency assessments are rough estimates of highly variable and individualized L2 learner frequencies. With this caveat, high-frequency L2 inflectional patterns (e.g., how many English verbs use -ed to
form their past tense), and word forms (how often minute is used in the plural form, minute-s) are acquired earlier, internalized to a greater extent, and processed faster than low-frequency patterns and forms (Gor & Cook, 2010, Gor & Jackson, 2013).

[B]L2 Proficiency

As noted above, research on L2 lexical access shows that L2 learners of languages with developed inflectional paradigms decompose inflected words in lexical access. This is true for L2 learners beyond the beginning level of proficiency when the predominant processing mode is to treat words and even word phrases as unanalyzed chunks. Decomposition of inflected words is often investigated in lexical decision tasks when participants hear or see inflected words and nonwords and decide whether the letter or sound string is indeed a real word. Reaction times (RTs) in response to morphologically complex words are expected to be longer than to matched monomorphemic words because of decomposition costs. Morphological priming experiments manipulate the relation between two morphologically related words that differ by the inflections, the prime and the target, which are presented in pairs. If the prime facilitates access to the target, i.e., the target is accessed faster compared to the baseline, this is taken as an indication of decomposition. If RT to walk is faster when it is preceded by walked than by played, it is assumed that walked is decomposed, and both walked and walk access the stem at the lemma level. In auditory and visual priming, primes and targets are presented in the same modality, in cross-modal priming, the prime is auditory, and the target visual. In visual masked priming, the prime is presented for a very short time, 50 milliseconds or less, preceded and/or followed by masking hash marks, and is processed without being noticed.

An auditory lexical decision with priming study exploring the role of L2 proficiency in decomposition of Russian verbs ranging in regularity and lemma frequency, showed that all L2 learners in the study, similarly to L1 speakers, decomposed high-frequency inflected verbs. For low-frequency verbs, there was an interaction of the degree of
regularity and L2 proficiency, so that the participants at the lowest level of proficiency out of three included in the study (advanced, advanced high, and superior), were able to take advantage only of the regular primes, the verbs with a high-frequency productive pattern. Advanced high learners decomposed low-frequency regular and semi-regular verbs, while superior learners decomposed irregular verbs as well. Note that, according to the study, decomposition of Russian verbs proceeded in two stages, first decomposition into the stem and inflection used by all L2 participants, and then decomposition of the stem into the root and inflectional suffix that contained the cue to the conjugational pattern of the verb, in other words, to stem changes. The efficiency and success of the second stage depended on how well L2 learners were able to deal with complexity, transparency, productivity, and predictability in stem allomorphs (Gor & Jackson, 2013).

[B] L1 Background
If L2 has a developed inflectional system, as in Spanish verb conjugation, or Slavic nominal inflection, and L1 has a poor inflectional system, decomposition will present increased problems for L2 learners. L1 speakers of Chinese, a language with practically no inflection, and L2 learners of Swedish relied less on decomposition in lexical access than Hungarian and Finnish L1 speakers with comparable proficiency in Swedish (Portin et al., 2007, 2008). L1 speakers of Serbian, a Slavic language with developed inflectional morphology, showed sensitivity to morphological structure of regular English verbs in a masked priming and cross-modal priming task, although their priming patterns were not native-like on irregular verbs (Feldman, Kostić, Basnight-Brown, Filipović Đurđević, & Pastizzo, 2010). The influence of L1 on morphological processing in L2 English was shown in a cross-modal priming study with L1 Serbian and Chinese participants matched for proficiency (Basnight-Brown, Chen, Hue, Kostic, & Feldman, 2007). Other studies using masked priming and targeting English and German verbal inflection as L2 showed lack of priming in L2 learners with regularly inflected verbs (Clahsen et al., 2010). Reduced L2 morphological sensitivity during very short visual exposure in masked priming may be the result of nonnative reading skills.
Based on the findings on L2 decomposition, it is clear that there is a developmental trajectory beyond initial chunk learning that starts with decomposition of words using morphologically transparent and productive inflectional patterns, referred to as regular, and then goes on to less regular patterns. The frequency of the pattern and of the individual inflected words plays a role. Decomposition of inflectional morphology comes with a processing cost, but saves storage space; it is efficient in L2 learners who are under pressure to acquire many new L2 lexical items in an inflectionally rich L2. Teaching efficient strategies of decomposition will achieve faster and more efficient processing on two levels: access of the lexical entry in the mental lexicon through the stem(s), and morphosyntactic processing of inflections.

[A] Derivational Morphology

Derivational morphemes carry general lexical meanings, and derivation is used to create new words. At the same time, derivational morphemes (as derivation in general) may be more or less systematic in their use, e.g., -able, -ation, are frequent, while -age, and -hood are infrequent (Gardner, 2007).

L2 learners are faced with the task of learning productive derivational morphemes and the rules of derivation: which morphemes combine with which stems. Similarly to inflection, this allows L2 learners to expand their vocabulary in a systematic way and ultimately to actively use derivation in their output. For transparent derivations, e.g., hatless ‘not wearing a hat’ knowledge of derivation will help L2 learners to quickly and efficiently compute the meaning of derived words from its constituents.

Derived words and compounds in which the same word (root) appears as a constituent are called morphological families, e.g., hatful, hatless, hatband, hatpin, and hatter is a set of five family members for hat. Morphological family size negatively correlates with decision times in lexical access: the larger the morphological family size, the faster the root word is accessed (Baayen, Wurm, & Aycock, 2007, p. 422). Acquisition of derivational morphology develops the notion of morphological relations among words, and implies the knowledge and application of derivational rules, both in perception and production; it also helps L2 learners to organize words in morphological families, and
overall, increases their vocabulary size and enhances their skills in accessing derived words.

Research on decomposition of derived words in L2 learners using the masked priming technique indicates that L2 processing relies on the same decompositional mechanisms as in L1 (Diependaele, Duñabeitia, Morris, & Keuleers, 2011). L2 learners of English with L1 Spanish and Dutch showed sensitivity to derivational morphology when they processed English words with derivational suffixes. While another study demonstrated reduced masked priming effects in L2 learners of English with L1 German and Chinese backgrounds compared to L1 English speakers (Silva & Clahsen, 2008), there are several reasons for the observed differences. First, the participants in the Silva and Clahsen study had lower L2 proficiency, second, the L1 Chinese group may have had reduced sensitivity to morphological structure due to the lack of derivation in Chinese. Additionally, the study used only two derivational suffixes, and was thus more limited in scope. Overall, the comparison of two studies suggests a developmental trajectory for the acquisition of derivation similar to that of inflection: more reliance on decomposition in lexical access with increase in L2 proficiency.

To summarize, knowledge of L2 derivation enhances lexical knowledge and access in two ways: derivational suffixes have a set of lexical meanings that facilitate the processing of transparent derived words, and learning the word with its morphological family allows the learner to quickly expand vocabulary knowledge and organize the entries in the mental lexicon with connections among family members and words using the same derivational suffix.

[A] Morphological Training
To date, there are no training studies targeting the learning of L2 inflection that use a rigorous psycholinguistic approach and focus on lexical representations rather than the acquisition of the inflectional pattern. The study of past-tense nonce verb learning by native speakers of English that simulates highly proficient L2 acquisition reveals very quick lexical effects of inflected novel verbs, and even stronger lexical effects after one
week of no training (Lindsay et al., 2012). The consolidation phase may be as short as 24 hours, or even 12 hours provided they include night sleep. Thus, the study documents both lexical learning and morphological decomposition in highly proficient language users and indirectly highlights the interrelation of proficiency and decompositional skills.

The training studies that involve the learning of L2 derivational morphology in naïve beginning L2 learners show that derivational morphology is internalized by the learner and used in generalizations to novel words. Thus, novice learners, L1 English speakers, successfully used Russian diminutive suffixes that carry gender information not only for gender categorization of the trained nouns, but also for gender assignment in generalizations to novel nouns (Kempe, Brooks, & Kharkhurin, 2010). Another six-session training study employed Russian case-marked nouns with and without diminutive suffixes in phrases, and subsequently tested the novice L2 learners’ vocabulary recall and their ability to generalize the grammatical patterns to novel nouns. L2 learners showed a diminutive advantage both in vocabulary retention and in extending the grammatical patterns to diminutive items (Brooks, Kempe, & Donachie, 2011).

In conclusion, there is sufficient evidence that L2 learners gradually learn to efficiently process both inflectional and derivational morphology, and that morphological decomposition enhances both lexical knowledge and learning of grammatical patterns, probably, in a bootstrapping fashion. Therefore, teaching both inflection and derivation should improve lexical knowledge in an L2 classroom. Implicit instruction leads to the internalization of morphological patterns, while metalinguistic awareness mediates the effects of individual differences on the learning outcomes (Brooks & Kempe, 2013).

SEE ALSO: Approaches to Second Language Vocabulary Teaching, Brain Imaging Studies and Vocabulary, Models of Lexical and Conceptual Representations in Second Language Acquisition, Psycholinguistic Approaches to Vocabulary, Vocabulary Acquisition in Second Language Acquisition, Vocabulary Size in a Second Language
References


Suggested Readings


