Introduction

There are a number of “emergentist-type” models that hold that experience with language plays an important role in the creation, entrenchment, and processing of linguistic patterns: usage-based approaches, connectionist models, and exemplar models of linguistic knowledge. In these models, frequency effects reflect implicit learning, such that words’ representations are strengthened each time they are encountered (Ellis, 2002). Crucially, this fundamental assumption should apply equally to single words, phrases, and constructions. However, an important question arises from views that maintain that linguistic representation and processing is underpinned by experience with language: what is the impact of learning, knowing and using more than one language?

Firstly, learning, knowing, and using more than one language means that language use is by necessity divided. In other words, second language speakers use both of their languages, including their L1, less frequently than monolinguals use their one language. This gives rise to reduced lexical entrenchment, which can be accounted for in different ways. One explanation holds that the connections between an item’s orthographic form, phonological form, and its meaning are strengthened as a function of exposure. When there is less use, this results in weaker ties between an item’s form (phonology, orthography) and concepts (e.g., Weaker Links Hypothesis: Gollan, Montoya, Cera, & Sandoval, 2008). Another potential explanation is that using more than one language leads to reduced baseline activation for L2 words and potentially for L1 words (e.g., Bilingual Interactive Activation Plus Model, BIA+: Dijkstra & van Heuven, 2002). The consequence of the “weaker links” and/or reduced baseline activation is slower processing. More precisely, single-word and multiword items should be processed more quickly by monolinguals, whose entire language experience is with one language, than by speakers of more than one language, whose language use is divided. Further, for speakers of more than one language, processing generally should be faster in their L1 than L2, as experience with the L1 is usually greater. If, on the other hand, language experience is fairly equivalent in the L1 and L2, processing speed should be correspondingly fast in the two, although slower than for a monolingual whose experience is not divided. Finally, if a speaker has greater exposure to the L2 than the L1, then processing in the L2 should be faster than the L1.
Emergentist and usage-based models predict that the frequency effects outlined earlier should be apparent for both single-word and multiword items. As will be discussed in more detail in the following section, native and non-native speakers by and large have a processing advantage for frequent words over infrequent ones. Native speakers have a well-documented processing advantage for multiword items, while the evidence for non-native speakers is somewhat mixed. One explanation for this is that non-native speakers have not encountered multiword items a sufficient number of times for an advantage to emerge. With increased proficiency, they should show a native-like pattern, presumably due to ample exposure/frequency. An additional possibility is that non-native speakers actually do have a processing advantage—it is simply that they have been tested on the “wrong” items. In other words, the language that learners encounter in textbooks and classrooms does not align well with native-speaker language—or at least not with language that is represented in large corpora which are often used to identify items for a study. Thus, it may be that L2 learners have a processing advantage for multiword items that appear in their textbooks, but not for matched items that are frequent in native-speaker language but that do not occur in their texts. In other words, non-native speakers may exhibit a sensitivity to the frequency of multiword units that they have encountered—it is just that they are not encountering the same ones as native speakers do. Such a finding would underscore the importance of the input textbooks and classrooms provide to learners.

A second consequence of knowing and using more than one language is that knowledge of one language can influence the processing of the other. That is, multiple languages can be activated simultaneously and this cross-language activation influences processing (e.g., Odlin, 1989). In general, effects of cross-language activation are seen where there are instances of cross-language overlap—and non-native speakers will have a repertoire of single- and multiword items that overlap in the L1/L2 in a variety of ways. For example, a French learner of English will have single-word items that overlap in the two languages in different respects: semantics only in dog/chien; orthography and somewhat in phonology but not semantics in coin-‘money’/coin-‘corner’; phonology but not orthography and semantics in pool-‘place for swimming’/poule-‘chicken’; and semantics, phonology, and orthography in piano/piano. Similarly, there will be multiword items that overlap in various ways, some of which are illustrated by the following idioms: throw money out the window/jeter l’argent par les fenêtres, which literally is “to throw money through the windows”; to cost an arm and a leg/coûter les yeux de la tête, which literally is “to costs the eyes in your head”; to feel blue/avoir le cafard, which literally is “to have the cockroach”; and “to have a hangover” has no idiomatic expression in English, but in French is avoir la gueule de bois, which literally is “to have the wooden face”. An important question in the literature has been how these different types of overlap influence processing.

In the following section, we will look at the evidence for frequency effects for single- and multiword items in the L1 and L2. We will then look in more detail at the input that non-native speakers receive from their textbooks and how this might relate to the presence or absence of frequency effects. Finally, we will explore how cross-language overlap influences processing.

**Critical Issues and Topics**

**Frequency Effects**

As Monsell says, frequency of occurrence should be given “its rightful place as a fundamental shaper of a lexical system always dynamically responsive to experience” (1991, p. 150). This should be true for individual words and sequences of words that occur together.
(binomials *bride and groom*; collocations *abject poverty*; phrasal verbs *pick up*; idioms *kick the bucket*; lexical bundles *you know what*, etc.). Accordingly, in emergentist and usage-based theories, the frequency of the input – in both an L1 and L2 – underpins the development of linguistic knowledge and its organization, as well as having a profound effect on processing (e.g., Bybee & Hopper, 2001; Ellis, 2002). Items that are encountered more frequently, be that in an L1 or L2, are processed more quickly. Generally, speakers have more exposure to linguistic input in their L1 than L2, and monolinguals have more input in their single language than non-native speakers do to either language. This situation is depicted in Figure 12.1A, where the number of occurrences (frequency) for single-word and multiword items is greater going from the L2 to L1 and then to the single language of monolinguals. As frequency increases, processing is faster, which means that responses should be faster for monolinguals and then for non-natives in their L1, as well as for non-natives in their L1.

![Figure 12.1](https://example.com/figure12.1.png)

**Figure 12.1** Panel A demonstrates that the number of occurrences (frequency) to linguistic input generally increases from L2 to L1 for bilinguals and then to monolinguals in their single language. Panel B illustrates asymptotic word processing and demonstrates that low frequency items benefit more from additional occurrences ($x$ to $x + 1$) than high frequency items ($x + 7$ to $x + 8$).
compared to their L2. Alongside this, there are limits on how fast the processing system can get, and therefore word processing is thought to be asymptotic. This is illustrated in Figure 12.1B, which shows that with each occurrence of an item, progressively less speed-up occurs. Thus, low frequency words, which are farther to the left on the x-axis, benefit more from repeated exposures (become faster), while repeated exposures to high frequency words provides little gain. More precisely, going from \( x \) to \( x + 1 \) yields more of a processing advantage than going from \( x + 7 \) to \( x + 8 \). This has important consequences in the L2, where items have been encountered less, and therefore, should benefit more from increased exposure. In what follows, we will look at the evidence for these kinds of frequency effects for single-word and multiword items in the L1 and L2.

In the L1, there is plentiful evidence that frequently used words are easier to recognize and are responded to more quickly than less frequently used ones (e.g., *cat* vs. *gnat*), and that speakers are sensitive to fairly subtle frequency differences (for an overview see Harley, 2014). This has been substantiated across a diverse range of tasks that vary in their naturalness. On the less natural end of the spectrum, frequency effects have been found in tasks that present single words on a computer screen and measure decision/response times. For example, in a lexical decision task (deciding whether a string of letters is a word or not), frequent words elicit faster “yes” responses than less frequent ones. In eye tracking, where more natural stimuli such as sentences and longer stretches of text can be presented, a frequency effect has also been found: readers’ eyes fixate less on high-frequency words than low-frequency ones. Taken together, there is robust and converging evidence that frequency influences the amount of processing effort for single-word items in the L1.

As is illustrated in Figure 12.1A, second language speakers generally have less exposure to their L2. In other words, items in the L2 have a reduced frequency. The implication of this is that they should activate words more slowly in the L2 than L1, and both more slowly than monolinguals. While there is a much smaller literature on L2 frequency effects (for a discussion see Diependaele, Lemhöfer, & Brysbaert, 2013), in studies that present single words and measure decision/response times (e.g., lexical decision task), the general finding mirrors what is depicted in Figure 12.1A – higher-frequency words are processed faster. Additionally, it has been found that second language speakers have larger “frequency effects” in their L2 than L1, as well as having larger frequency effects in their L1 than monolinguals do in their single language (see Whitford, Pivneva, & Titone, 2016).

We can understand these kinds of results in terms of Figure 12.1, and more concretely by considering bilinguals (who in this example have L1-English and L2-French) and monolingual English speakers. The bilinguals will have encountered L2/French words (e.g., *chien*) less than L1-English ones (e.g., *dog*), meaning that they are operating more towards the left-hand side of the figure. This is where differences from an additional exposure are greatest, thus yielding larger frequency effects in the L2. Further, the second language speakers will have encountered words in their L1 – because their language use is divided – less than monolinguals. Thus, their L1 is operating more to the left-hand side of the figure than monolinguals, which again means that small changes in frequency lead to larger effects. While eye-tracking findings are somewhat mixed, studies such as those by Diependaele et al. (2013) and Whitford and Titone (2012) largely bear out the patterns depicted in Figure 12.1. Notably, Whitford and Titone observed larger L2 than L1 frequency effects in L1-dominant speakers, and found that this effect was modulated by individual differences in current L2 exposure. Thus, in addition to mirroring what we have discussed thus far, they found that as L2 use increased, or in other words moved rightwards on Figure 12.1, less of a frequency effect was evident. The implication of increased L2 use is that less language use is dedicated
to the L1, thereby pushing it leftwards on the figure, where frequency effects will be greater – which was the case in Whitford and Titone’s study. Crucially, such evidence convincingly demonstrates that L1 and L2 word frequency effects are driven by an individual’s experience with language.

Do multiword items demonstrate frequency effects akin to those that are found for single-word items? If they do, this would suggest that similar to individual words, each and every occurrence of a multiword item contributes to its entrenchment memory. To address this, studies generally compare decision/response times (e.g., responding to whether a string is a phrase or not) or eye tracking of more natural texts containing multiword items and matched novel language. For example, Carrol and Conklin (2014, 2017) compared the processing of the idiom *spill the beans* to a novel phrase *spill the chips* (frequency of 23 vs. 0 in the British National Corpus (BNC)). The processing advantage for the idiom compared to the control phrase was taken as an indication that the former is entrenched in memory. Thus, evidence for a frequency effect can come from comparing the processing of frequent and infrequent (or non-existing) multiwords items. Additionally, many studies look for an explicit effect of frequency, which is generally done by exploring whether frequency (established from a corpus) or a measure of familiarity (generally established in a rating task) can at least partially account for response times, often using mixed-effects or regression analyses.

There is a growing body of work showing that both children and adults in the L1 have a processing advantage for multiword items of various types (binomials, collocations, phrasal verbs, idioms, lexical bundles, etc.), and often such studies explicitly demonstrate frequency effects for multiword items (e.g., Arnon & Snider, 2010; Arnon & Cohen Priva, 2013; Bannard & Matthews, 2008; Carrol & Conklin, 2017; Durrant & Doherty, 2010; Jacobs, Dell, Bannard, & Bannard, 2016; Siyanova-Chanturia, Conklin, & van Heuven, 2011; Tremblay, Derwing, Libben, & Westbury, 2011; Vilkaité, 2016). Taken together, research on the L1 demonstrates that reading, listening, and recognizing multiword items is influenced by frequency. In other words, multiword items are processed more quickly than novel language controls, and more frequent multiword items are processed more quickly than less frequent ones.

In the L2 literature, a similar processing advantage is not always observed for multiword items. In particular, idioms do not seem to exhibit the processing advantage in the L2 that they do in the L1 (e.g., Conklin & Schmitt, 2008; Siyanova-Chanturia, Conklin, & Schmitt, 2011). This has led to the claim that non-native speakers process multiword items more compositionally, which makes the properties of the individual words that make them up, as well as their meanings, more salient than phrase-level features such as frequency and meaning (Cieślicka, Heredia, & Olivares, 2014). In contrast, a usage-based approach would hold that non-natives simply have not encountered the idioms a sufficient number of times in the L2 for a processing advantage to emerge. A set of studies by Carrol and Conklin (2014, 2017) explored this question. They presented English monolinguals and Chinese/L1-English/L2 speakers with English idioms and controls (*spill the beans/chips*) and translated Chinese idioms and controls that did not exist in English, or in other words that had a frequency of zero in English (e.g., *draw a snake and add feet/hair*). In line with previous research, their results demonstrated faster processing of English idioms by monolinguals but not by the non-native speakers. Crucially, the Chinese-L1 speakers had a processing advantage for the translated idioms compared to their controls. This was explained by these multiword items being frequent, albeit in their L1. Thus, when idioms are frequent, they do demonstrate a processing advantage – even in the L2.
Work on more compositional multiword items demonstrates that non-native speakers are sensitive to L2 frequency (e.g., Hernández, Costa, & Arnon, 2016; Jiang & Nekrasova, 2007; Siyanova-Chanturia et al., 2011; Sonbul, 2015; Wolter & Gyllstad, 2013). For example, in an eye-tracking experiment, Siyanova-Chanturia et al. (2011) presented native and non-native speakers with English binomials (sequences of \( x \) and \( y \), where \( x \) and \( y \) are from the same lexical class and often have a preferred word order, e.g., church and state vs. state and church). They found faster reading times for the binomials compared to their corresponding less frequent reversed forms. This was the case for native speakers, as well as for more proficient non-native speakers but not less proficient ones. Thus, non-natives who have higher L2 proficiency, and arguably more exposure to the L2, show the typical frequency advantage for the multiword items. This finding points to the importance of the amount of exposure, and therefore the input that non-native speakers receive.

Another body of research shows that processing time is not only dependent on the frequency of an individual word, but also on its predictability from the previous (and sometimes following) context (McDonald & Shillcock, 2003). In such research, predictability is generally conceived of in two ways. It can be a word-to-word contingency (often referred to as “transitional probability”) that is established using a corpus. For example, the BNC can be used to determine how likely \( on \) is following \( rely \). Alternatively, predictability can be established more subjectively and can be assessed relative to a particular discourse, sentence, or phrase context. This is generally done via a cloze task. For both types of predictability, more predictable words have decreased processing times, and in reading tasks, highly predictable words are often skipped altogether (Ehrlich & Rayner, 1981; McDonald & Shillcock, 2003). This has important implications for the processing of multiword items. For example, the word \( abject \) predicts a very limited set of upcoming words (poverty, failure, misery, horror, terror, apology), some of which could be considered frequent multiword items (e.g., the collocation \( abject poverty \)). Crucially, the predictability of these upcoming words will (largely) be predicated on language exposure – in other words frequency. For a word to become predictable, it will need to have occurred in the same/similar context a sufficient number of times.

Before turning to the next section, it is important to note a caveat about frequency. Frequency measures from corpora are often viewed as an index of linguistic experience. Thus, if word \( y \) is frequent in a large, representative corpus, it is assumed that speakers have encountered it more than word \( z \) that is less frequent in the corpus. Often the corpora that are used provide measures of printed word frequency, which we know intuitively do not provide a metric of all of a speakers’ wide and varied experience with language. As Gernsbacher (1984) notes, corpora only provide an approximation of actual exposure, which may be particularly problematic for low frequency words. For instance, the word \( recasts \) only has a frequency of five in the BNC, making it very low frequency. However, in the SLA community the term is likely fairly familiar. Therefore, if we carried out a processing study on applied linguists, the word \( recasts \) would likely demonstrate faster processing than is predicted by its corpus frequency due to our exposure to the word. As this demonstrates, corpus frequency does not necessarily align with actual experience with a language. This will be particularly true for L2 speakers, especially in foreign language learning contexts. Because of this, subjective familiarity ratings may provide a more reliable measure of exposure to single-word and multiword items. The role of input on frequency effects will be explored in more detail next.
The Actual Input and Multiword Item Processing

What we have seen thus far is that, unlike native speakers, non-native speakers do not always demonstrate a processing advantage for multiword items. In particular, idioms do not seem to elicit a processing advantage. Idioms may be particularly problematic for non-native speakers because computing the meaning of the individual words does not generally yield the figurative meaning (e.g., kick + the + bucket = “die”). If we know that links between an item’s form and meaning are strengthened by exposure, it may simply be the case that non-native speakers have not encountered idioms a sufficient number of times to strengthen the connections between the form (kick the bucket) and meaning (“die”). In fact, amongst the various types of multiword items, idioms tend to be fairly low frequency. Therefore, on an emergentist or usage-based approach, the lack of evidence for a processing advantage for idioms is not very surprising. Other types of multiword items, like binomials, tend to be higher frequency, and consequently we would expect a processing advantage for them. As we saw earlier, Siyanova-Chanturia, Conklin, and van Heuven (2011) found a processing advantage for binomials in more proficient non-natives but not in less proficient ones. This suggests that lower proficiency participants have not encountered the items a sufficient number of times – in other words are lacking in input – for them to be entrenched in memory, and as a result for an advantage to emerge.

One way to more specifically address the roll of input is to ascertain what multiword items are frequent in L2 input and then determine whether these items are processed more quickly than matched items that do not occur in the input. In a recent study, Northbrook and Conklin (2018) extracted three-word lexical bundles from the English textbooks of Japanese junior high school students. They compared the processing of these to matched control phrases that were not present in the textbooks, but which were much more common in a native-speaker reference corpus (e.g., lexical bundle do you play, 16 occurrences in textbooks and 136 in SUBTLEXus vs. control do you hear, 0 occurrences in textbooks and 1,183 in SUBTLEXus). The students performed a yes/no decision on whether a phrase was possible. Responses were more accurate and faster for lexical bundles that appeared in their textbooks. Further, more frequent textbook lexical bundles were responded to more quickly and accurately than less frequent ones.

This study is important because it indicates that not only are EFL learners sensitive to whether or not items occurred in their texts, but also to the frequency of occurrence of a given item in them. These findings support emergentist and usage-based approaches whereby every exposure to an item influences its entrenchment and processing. Crucially, these results underscore the importance of the input given to students. More precisely, their processing advantage was not for items that are frequent in the large native-speaker corpus (do you hear) but for ones that occur repeatedly in their textbook (do you play). It is important to note that the items in the study were not explicitly taught, which highlights the importance of all of the input – even that which is only intended to provide supporting context in demonstrating a particular word, item or grammatical construction. These findings emphasize the need to carefully think through the input students are given. Further we need to consider the possibility that non-native speakers do not demonstrate a processing advantage for multiword items simply because they are not receiving enough of the “right” input and/or they are being tested on the “wrong” items. Finally, the Northbrook and Conklin study demonstrates that even beginning learners in an EFL context show a very native-like formulaic processing benefit for multiword items. More precisely, they are exhibiting a phenomenon that is evident in native speakers and advanced non-natives. Unfortunately, it appears that
this advantage is for genre specific textbook language that is not reflective of actual native-speakere English.

Most of the literature exploring frequency effects in multiword items has focused on speakers who have had a considerable amount of input – even the junior high school learners in the Northbrook and Conklin study had been exposed to English for a few years. This leaves open the question of how much input is needed for a processing advantage to arise. This question is primarily being explored in the L2 literature (Pellicer-Sánchez, 2017; Sonbul & Schmitt, 2013; Szudarski, 2012; Webb, Newton, & Chang, 2013). These studies have either presented non-native speakers with (1) existing multiword items, however, even with pretests to assess knowledge, we cannot be certain that the items had never been encountered before, or (2) non-words, which may unduly draw attention to the items. A recent study by Conklin and Carrol (submitted) addresses these concerns, by monitoring monolingual readers’ eye movements when they were presented with short stories containing existing patterns (*time and money*) and novel ones (*wires and pipes*). In line with the wider literature, they found a processing advantage for the multiword item (*time and money*) compared to a matched control (*money and time*). Crucially, at the beginning of the story there was no processing advantage for the novel item *wires and pipes* over *pipes and wires*. After encountering the former four to five times, an item-specific preference emerged, such that the former was processed more quickly than the latter. Remarkably, this happened during the course of reading a story, demonstrating that sensitivity to lexical patterns arises rapidly in a natural context.

These results support the view that multiword items are learned automatically. It is thought that when a person attends to a particular input that some of its attributes, such as frequency, which require little or no intentional processing, are automatically encoded in memory (Hasher & Zacks, 1984). Thus, when readers attend to a story, the frequency of lexical patterns is encoded. It is exactly this frequency of occurrence that allows for new multiwords items to become entrenched in memory and to elicit a processing advantage. An open question is how long-lasting this effect is: will the processing advantage that emerges after four to five occurrences of a novel pattern be evident a day later, a week later, etc.? Research looking at training on multiword items show that effects are apparent for up to two weeks (Sonbul & Schmitt, 2013) but decline after six (Szudarski & Conklin, 2014).

**The Effect of Cross-Language Activation**

A prominent factor affecting single-word recognition in an L1 is lexical ambiguity, or the number of meanings that a word has (e.g., *bank* “a place where you keep money”, “the side of a river”). The frequency of meanings for an ambiguous word can be balanced (relatively equal) or unbalanced (one meaning is more frequent). The frequency of the two meanings and the strength of the (biasing) context in which the word appears both influence processing patterns and leads to what has been termed the *subordinate-bias effect* (Duffy, Morris, & Rayner, 1988). The basic finding is that when frequency-balanced ambiguous words occur in neutral contexts, readers spend more time processing them than unambiguous control words matched on length and frequency. However, if they occur in a context biased towards one of their meanings, there is no difference in processing times for the frequency-balanced ambiguous words and their matched controls. In contrast, there is no difference in processing for frequency-imbalanced ambiguous and matched control words in a neutral context. If a context biases a less-frequent meaning, processing times are longer for the ambiguous word than the control. The effect on response times resulting from having multiple meanings.
Kathy Conklin

seems to be true of words that share orthography and phonology (bank), share orthography but differ in phonology (tear), and share phonology but differ in orthography (e.g., boar/bore; Folk, 1999). If the ambiguous words have different parts of speech (e.g., duck as a noun verb), and the subordinate meaning is the only syntactically permissible continuation of a sentence, then there appears to be no subordinate meaning “cost” on fixations (Folk & Morris, 2003).

Words can also share lexical properties across languages. Thus, just as bank has two meanings, the word pain has two meanings for someone who speaks English (“hurt”) and French (“bread”). Words like pain are referred to as interlingual homographs, and share orthography (and often have similar phonologies) but have distinct meanings. Interlingual homophones share their phonology, but not their orthography and semantics. These are words like pool/poule in English and French, respectively. Words can also have the same/similar form in terms of phonology and/or orthography, as well as meaning across languages. These are words like table in English, table in French, and テーブル (“teburu”) in Japanese and are referred to as cognates. Interlingual homographs and homophones, as well as cognates, have been used extensively to investigate whether speakers of two languages selectively activate a single language or non-selectively activate both when processing in one language. A large body of evidence demonstrates that word activation occurs in a language non-selective way, even when the social and linguistic context calls for the use of only one language (for a review, see van Hell & Tanner, 2012).

In a study by Chambers and Cooke (2009) English/L1-French/L2 speakers were presented with a computer screen containing static images of a swimming pool, a chicken (la poule is a near homophone of pool) and two distractor objects (a strawberry and a boot). Participants listened to sentences that either biased or not the meaning of the homophone (e.g., Marie va décrire/nourrir la poule “Marie will describe/feed the chicken”). Participants’ eye-movements were monitored time-locked to the noun poule to determine whether they considered both the chicken and swimming pool to be referents of the homophone. In the unbiased context (“describe the chicken”), Chambers and Cooke found increased looks to the picture of the pool that were all but eliminated in the biased context (“feed the chicken”). Thus, much like monolinguals, the non-native speakers activated all the words that corresponded to the auditory input, even when they came from the language that was not currently being used. Similar to native speakers, this activation was mediated by the biasing context.

Most of the research in this area has looked at how cross-language overlap influences processing speed (for an overview see van Hell & Tanner, 2012). In general, cognates are processed more quickly and accurately than matched noncognates across a wide variety of comprehension and production tasks, languages, and non-native-speaker proficiencies. By and large, research demonstrates a processing difference for interlingual homographs and homophones relative to matched control words. However, whether they are processed faster or slower depends on factors such as task demands and stimulus list composition (the proportion of homographs or homophones relative to controls words and filler items) and proficiency. Importantly, effects of cross-language overlap are modulated by the amount of phonological, orthographic, and semantic overlap between the words in the two languages (Allen & Conklin, 2013; Dijkstra, Miwa, Brummelhuis, Sappelli, & Baayen, 2010; although see Allen & Conklin, 2017 for natural text reading in different-script languages) and can be influenced by the biasing strength of the sentence context (Whitford et al., 2016).

As we saw in the Introduction, multiword items can be the same/similar across languages (often referred to as “congruent”), as well as differing in various ways (referred to as “incongruent”). In recent years, a number of studies have investigated how L1-L2 congruency in
multiword items influences processing, although this research has primarily investigated idioms and collocations. Overall the literature in this area points to a cross-language effect, such that L1-L2 overlap aids online processing, or at least some aspects of it (Carrol, Conklin, & Gyllstad, 2016; Titone, Columbus, Whitford, Mercier, & Libben, 2015; Yamashita & Jiang, 2010; Wolter & Gyllstad, 2011, 2013; Wolter & Yamashita, 2015). This is demonstrated in an eye tracking by Carrol, Conklin, and Gyllstad (2016) who presented Swedish/L1-English/L2 speakers with idioms that were congruent in Swedish and English, English only idioms, and Swedish only idioms that were translated into English. Processing of the idioms was compared to that of matched control phrases, both of which were presented in single sentences that were designed such that what preceded the phrase gave no clues as to the intended meaning, but the sentences were completed in such a way that they made sense (e.g., It was hard to break the ice at the party vs. It was hard to crack the ice when the windows froze). English native speakers showed a consistent advantage for idioms that existed in English (English only and congruent idioms). However, translated Swedish items were read much more slowly, indicating that encountering unknown idioms causes disruption for readers. Swedish native speakers showed no real difference in their reading times for English-only idioms and control phrases. In contrast, for the Swedish-only and congruent idioms, there was a clear advantage for idioms over controls. Interestingly, there was no difference between the two item types, meaning that there was no “added” advantage for congruent idioms that are assumed to be represented in both languages.

When looking at congruency, Titone et al. (2015) highlighted the importance of distinguishing between formal, semantic or conceptual, and pragmatic levels of overlap. Thus, congruency at these different levels may influence processing in different ways and/or have a different time course. What we do know from the literature is that while form congruency may benefit processing, when a task requires the activation of a figurative meaning the situation is likely more complex. In the case of idioms, it may be that recognition of their form is in general faster than for literal phrases. However, when participants are required to make explicit semantic judgments, their figurative nature may mean that greater processing effort is required – especially if the link between their form and meaning is not strong (which may be particularly true for low-proficiency non-natives). Further, it is important to point out that the discussion in this section simply highlights the overall pattern of results that can be found in the literature. These generalizations do not always hold, and reconciling differences across studies is challenging for a number of reasons: effects attributable to task differences; differences in the participants (beginner/intermediate/high proficiency, early/late bilinguals, early/late learners, EFL/ESL contexts, etc.); and differences in how terms like congruent/incongruent and collocation/idiom are applied (e.g., thick skin is a collocation that is also idiomatic). Much more research is needed to disentangle the many factors at play and how these interact with cross-language overlap.

**Future Directions**

As we have seen, increased exposure leads to stronger connections between a word’s form (orthographic and/or phonological) and meaning, while less exposure gives rise to weaker connections – which has a profound impact on processing speed. This is a fundamental principle of emergentist and usage-based approaches and underpins the frequency effects that we have discussed. In the L1 literature, a number of other factors have been shown to influence single-word processing: word length; age of acquisition (AoA); and neighborhood size (both number and frequency), as well as the regularity of neighbours’ grapheme-to-phoneme
correspondence (for an overview, see Harley, 2014). The impact of such factors has been well documented in the L1 and some work has been done in the L2; however more research is needed in the L2.

We see clear frequency effects for multiword items, which are most evident in an L1. However, more research is needed to ascertain how findings from single words – such as the ones illustrated by Figure 12.1 – align with multiword items. Low frequency single words benefit more from additional exposures (have more of a speed up) than high frequency items. It is unclear whether this is true of multiword items as well. Further, there is considerable work to be done on the processing of multiword items in the L2, exploring how processing is influenced by a range of item-based factors (e.g., meaning transparency), participant variables, and the linguistic context in which an item appears (clause, sentence, type of discourse).

Questions also remain about the input needed for frequency effects to develop for multiword items. The study by Conklin and Carrol (submitted) showed that a processing advantage emerged for binomials (wires and pipes vs. pipes and wires) after four to five occurrences. However, is this true for other types of multiword items (collocations, phrasal verbs, idioms, lexical bundles, etc.), or might more/less input be needed? Similarly, does the type of input matter? Their study presented a “naturalistic” story. What happens when the context approximates a classroom situation and the input is enhanced and/or explicitly taught? If frequency requires little or no intentional processing and is automatically encoded in memory (Hasher & Zacks, 1984), what is the impact of drawing more attention to it? Enhancement or explicit teaching could add an extra burden to memory and attention, which might actually constrain statistical learning (Kareev, 1995; Turk-Browne, Junge, & Scholl, 2005). Finally, as was pointed out earlier, we know little about how durable such learning is and how it is affected by a range of participant variables such as proficiency.

Lastly, there is considerable evidence that non-native speakers activate input from both of their languages, even when the task, as well as the linguistic and social context only necessitates the use of one language. This cross-language activation is mediated by the immediate linguistic context (e.g., how biasing a sentence is to a particular meaning), as well as the amount of cross-language overlap (e.g., piano/piano are identical cognates vs. vocabulary/vocabulaire are non-identical cognates) and proficiency. However, the full impact of these variables, and crucially how they interact, has only begun to be explored.

As a final thought, proficiency and learning context (EFL/ESL) have been mentioned throughout as a variable that needs further study. However, the issue is much more complex. We need to consider other variables such as age of acquisition (AoA) and language use. For example in a recent study, López and Vaid (2018) investigated idiom processing by “language brokers”, which refers to “informal translators” like children for their parents in immigrant communities. They found that brokers showed greater activation of idioms in both the L1 and L2, compared to non-brokers. This study only highlights one non-native speaking population. Broad group differences and individual speaker variation are important variables that remain to be explored in further detail.

Further Reading


This book provides an excellent overview of processing in the L2 – looking at acquisition, comprehension, and production, as well as the cognitive consequences of learning, knowing, and using more than one language.

The chapter reviews psycholinguistic and neurolinguistic investigations of multiword items across a range of tasks and paradigms and explores key issues like frequency and entrenchment.


This chapter provides a detailed overview of the influence of cross-language overlap (congruency) on the processing of multiword items, in particular on idioms, collocations, and translated formulaic language.


This book explores how non-native speakers acquire, represent, and process figurative language like idioms, irony, and metaphors.


Although the title of this chapter indicates it is about eye tracking (which it is), the authors provide an excellent summary of processing effects arising from cross-language activation and reduced lexical entrenchment in non-native speakers.

Related Topics
Mental lexicon; high-, mid-, and low-frequency words; learning single-word items vs. multiword items; incidental vocabulary learning; key issues in researching multiword items

Notes
1 In linguistic terms, Japanese words like table/テーブル (“teburu”) are in fact “loanwords” because they have been borrowed into the language. However, it is the overlap in form and meaning that underpins the processing advantage for cognates and not their linguistic origins. Because loanwords share form and meaning, they are treated as cognates in the processing literature.

2 In many of the studies what are referred to as collocations could easily be seen to be at least partially figurative or idiomatic (e.g., thick skin is a collocation meaning “ability to ignore verbal attacks and criticism”). This is further problematized by the fact that a literal/figurative distinction is often confounded with the congruent/incongruent classification.

3 Orthographic or phonological neighbors are words that differ from one another by only one letter or sound, respectively. For example, the word “hint” has the neighbors “hilt”, “hind”, “hunt”, “mint”, “tint”, “flint”, “lint”, “pint”, etc.

References


