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Introduction to Part II

Comprehension

The goal for many aspiring bilinguals is successful communication in their second language (L2), including becoming able to comprehend spoken and written messages. Language comprehension is complex from a scientific point of view. For a competent speaker, however, comprehension is "a piece of cake." All the lexical, semantic, syntactic, and textual processes that compete for attention and memory resources (and fill up diagrams in models of comprehension) are executed with ease and without notice. Such may not be the case for the learner of an L2 or perhaps even for the moderately skilled bilingual. On the other hand, for the skilled bilingual, as for the monolingual, the machinery of comprehension may be so skillfully engaged that only the most clever of experimental designs can expose any confusion or difficulty.

For the bilingual, which factors influence the success of L2 comprehension? The chapters in this part provide an overview of the research on some of the levels of bilingual comprehension. To introduce the issues seen in the study of bilingual comprehension, we first outline a general framework for comprehension processes. This framework reflects a body of research largely undertaken without the slightest notice that some comprehenders might be able to engage more than one language. That is, it reflects the consensus view of comprehension from the perspective of research in monolingual contexts. We then describe some of the relevant research conducted on bilinguals for each aspect of comprehension. Our review is far from comprehensive, focusing on only a few major issues in each area and pointing to the chapters of this section for more detailed reviews.

The Processes of Comprehension

The component processes of language comprehension and the ways they are interconnected provide a platform to view problems of bilingual comprehension. Reviews of spoken language comprehension and written language comprehension by Cutler and Clifton (1999) and Perfetti (1999), respectively, provide frameworks for the key component processes of comprehension and their interrelationships. Here, we simply provide an outlined description of some of the key components. Ignoring the physical properties of speech and print, no small matter, simplifies the problem of comprehension so that what we need to account for is merely the following:

1. Word identification: How words are identified such that their context-appropriate meanings are selected.
2. Parsing: How words and morphemes are configured into phrasal units that govern interpretation.
3. Semantic-syntactic representations: How the meanings of words and the grammar of the language combine to provide the meaning of clauses and sentences.
4. Text representation: How the meanings of clauses and sentences are integrated into a coherent representation of an extended discourse.
5. Understanding: How all the above function to yield actual comprehension, a more-or-less veridical representation of a token discourse.

Finally, in all of these processes, there can be individual differences that produce variability in comprehension skill.

These processes can serve as a starting point for the study of bilingual comprehension. Of course, an L2 brings added complexity to an already rather complex problem. This may be part of the reason for an unevenness seen in the extent to which

component processes and their relationships have been addressed in bilingual research. In particular, there is much more to say about bilingual word-level processes than higher-level comprehension processes.

Word Identification

Word identification entails lexical access through phonological and printed inputs. It is axiomatic that these inputs are linguistically specific. One hears a word with Dutch phonology or with French phonology, and a comprehender with the required language skill identifies the word accordingly. From this point, however, the details become interesting. Two of the chapters in this part relate to the study of bilingual word identification. Although it seems intuitively reasonable to skilled bilinguals that they can effectively "turn off" or attenuate one of their languages, the research by now suggests that this seldom happens. Perhaps one language can be "turned down," but not quite turned off. As Dijkstra (chapter 9) demonstrates, bottom-up factors such as stimulus list composition and task demands make a difference for bilingual word recognition. Furthermore, top-down information, such as the knowledge that only one of your languages is needed for a given task is not sufficient and can be overridden by the bottom-up information (see also MacWhinney, chapter 3).

A classic question is whether word form information for the two languages is stored together or separately. Given the above results and others, we may conclude that word form information is most likely stored in a shared way (or at least in a way that allows sufficient cross talk between the two languages; see Francis, chapter 12). As mentioned, task demands will influence whether there appears to be selective or nonselective access of word forms in the two languages.

The critical issue of how words are recognized by bilinguals recently has received much attention because of the precision available in mathematical models. Thomas and Van Heuven (chapter 10) provide a review of the two major types of computational models used in this area, localist and distributed models. Their review includes a summary of the issues that have been tackled with models; these issues include neighborhood effects, priming, and homograph/cognate effects. Although we are far from a complete model of bilingual comprehension, progress in computational modeling comes from models designed for specific problems rather than for general purposes. Bilingual word recognition has made great advances in the recent past as a result of the available models. Thomas and Van Heuven suggest that joining localist and distributed models will further our understanding of bilingual comprehension. Beyond the representational details of models, however, is the value of building competing models that address the same problems. This competition exposes basic assumptions about language processes that can be hidden when each model addresses a different problem.

Parsing

Listeners and readers must do something with the words they hear and see to construct messages. Building phrasal units from strings of words and connecting these units with each other in the way allowed by the grammar of the language is a large part of this process. How to explain parsing in the first language (L1) has proved to be difficult and contentious. How do comprehenders decide, on a word-by-word basis, how to attach a word to the current representation of a sentence? Theories that stress basic principles of simplicity and theories that stress more complex multiple constraints offer rather different solutions to this question. In the case of an L2, the question becomes even more difficult. The grammar of the L2 is not as well represented as that of the L1 in most cases. So, how does a learner of a second language go about deciding how to attach a word to a current sentence representation?

Frenck-Mestre (chapter 13) reviews some of the recent research on bilingual parsing. In particular, she considers the evidence that bilinguals use information from their L1 to process their L2. Thus, a person's L1 can indicate which particular syntactic structures will be difficult to comprehend in L2. A similar conclusion was reached by Fender (2003), who showed that Japanese and Arabic speakers of English as a second language have opposite difficulties in processing English as a result of different native language structures. The dominance of L1 syntactic structures in L2 comprehension was also evident in research by Tokowicz and MacWhinney (2002), who showed that native English speakers learning Spanish had difficulty rejecting Spanish sentences with grammatical errors when the word-by-word translation mapped directly to an acceptable English structure. Also, Tokowicz and MacWhinney (in press) found that these learners showed brain responses (measured by event-related potentials) that indicated more

sensitivity to grammatical violations in their L2 (Spanish) when the constructions were formed similarly, rather than differently, in L1 and L2. This was true despite the participants' inability to distinguish grammatically acceptable and unacceptable sentences overtly. Finally, evidence shows that nonproficient bilinguals initially comprehend L2 through an L1 lens. McDonald (1987) showed that English learners of Dutch declined in their use of word order (a valid English cue) and increased in their use of case inflection (a valid Dutch cue) to comprehend L2 sentences as their Dutch competence increased.

Semantic-Syntactic Representations

Representing meaning is central to comprehension at all levels. Word identification brings access to word meanings and their associated concepts, and parsing builds groupings of words and morphemes into phrasal units that provide both reference and semantic relationships. The result of these word identification and syntactic processes is a representation of meaning at the clausal and sentence levels. This meaning representation, corresponding to a proposition in theories of comprehension (Kinstsch, 1988), can be considered the basic unit of relational meaning in a text, spoken or written.

It is our impression that there is little in bilingual research that corresponds fully to this level of analysis, although several chapters in this section focus on parts of it. For example, how words are represented in the memory of a bilingual has been a major question. Are words from the two languages stored separately in their own language or connected together by their meaning similarity? Do translation equivalents activate identical meaning representations? Are cognate translations stored differently from noncognate translations? Each of these issues is addressed in this section.

The basic answer to the first of these questions is, well, it depends. A single pool of semantic features most likely comprises the meanings of translation equivalents. Whether translation equivalents activate exactly the same meaning may depend on the manner in which L2 was learned (e.g., in the classroom or abroad; see De Groot, 1992). However, as always, there are caveats. Generally, it seems that the differences in meaning are few and far between. For the most part, translations are just that, words that have the same meaning across languages (see Guasch, 2001; Sánchez-Casas, Suárez-Buratti, & Igoa, 1992; Tokowicz, 2000; and Tokowicz, Kroll, De Groot, & Van Hell, 2002, for more information about the consequences of imprecise meaning overlap across languages).

In answer to the question of whether cognates are stored in a special way relative to noncognates, Sánchez-Casas and García-Albea (chapter 11) conclude that there is preliminary evidence to support a special status for cognate representations. They argue that cognates are treated as morphologically related words within a language and demonstrate that they follow the same priming pattern as such words. Interestingly, Francis (chapter 12) provides evidence that translation equivalents in general are not treated as within-language synonyms.

Another factor that has been shown to influence meaning representation is age of acquisition (AoA). Izura and Ellis (2002, 2004) showed that regardless of L1 AoA, L2 words learned earlier are processed more rapidly than L2 words learned later. This pattern has been observed in several tasks, including translation recognition, lexical decision, and object naming. Thus, the age at which an L2 word is learned has an impact on the word form-to-meaning connection that is the foundation of L2 comprehension.

Text Representation and Integration (and Understanding)

Text representation and integration is an area that has received relatively little attention in the psycholinguistic literature on bilingualism and is not represented in the chapters in this part. This is true also for the level of real understanding (fifth in our list of comprehension processes), so we comment on these two together. We suspect that the neglect results from the natural focus on word- and, to a lesser extent, syntactic-level processes that are the building blocks of comprehension. In the long run, we would expect to see increased attention at least to the consequences for text representation of the lexical and syntactic processes that have been studied. Presumably, a parsing problem in reading a sentence in L2 must lead to one of two consequences—a breakdown in comprehension such that both the current sentence and subsequent sentences are misunderstood or a reflective repair that slows the comprehension process, but keeps the representation coherent. Both of these outcomes place comprehension at risk. Similarly, at the word level, does it matter "downstream" in the representation of sentence and clause meaning that a word read in L2 has also activated an L1 word representation for a few

milliseconds? Moreover, does sustained reading or listening to an L2 text build up some protection from this word-level interference?

Beyond these basic questions about how text-level processes might interact with lexical and parsing processes is the application of text comprehension research tools to bilingual processing. For example, computational models of comprehension (e.g., Kintsch, 1988; Van den Broek, Young, Tzeng, & Linderholm, 1999) can be sensitive to limitations in working memory, readers' knowledge and goals, and other factors that would apply to L2 comprehension as well as L1.

Individual Differences

Comprehension processes in L1 show wide-ranging individual differences in adults and children; these differences arise from such components as we reviewed above, plus others (Perfetti, 1999). Similarly, there are many individual difference that are likely to affect how one learns and processes an L2, and some of these appear to lie in L1 abilities. Michael and Gollan (chapter 19), in part III on language production and control, provide an overview of research on the effects of L1 processing skill (e.g., working memory capacity and suppression) on L2 processing. Furthermore, motivational factors can also have an impact on an individual's success in L2 learning and, ultimately, comprehension.

With recent applications of neuroimaging and electrophysiological techniques to the study of language processing, such as functional magnetic resonance imaging, positron emission tomography, and event-related potentials, we have even more methods to study bilingual comprehension. Having these added techniques, along with the advances in mathematical modeling, will undoubtedly enhance the already-rich picture of what happens during bilingual language processing. These advances will allow researchers to pose questions other than those already asked. The converging evidence from this set of increasingly diverse methods is likely to encourage the development of models of bilingual comprehension that are more complete and, at the same time, better capture the implications for general models of language comprehension that in the past have focused on monolingual experience alone.

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