CHAPTER 11

Expanding the scope of priming research

Kim McDonough and Pavel Trofimovich
Concordia University, Montreal

Introduction

We undertook this book in an effort to bridge the gap between experimental psychology and L2 learning and teaching research. We hoped that assembling a collection of empirical priming studies would provide graduate students and novice researchers with examples of research that directly test theoretical and practical issues of interest to L2 researchers and teachers. By illustrating the use of priming techniques within these areas, our goal was to encourage researchers to consider ways of applying psycholinguistic research methods to the study of L2 processing and acquisition. In other words, we hope that researchers will use priming techniques in studies that are not necessarily tailored for the community of priming researchers, but have been designed for a more general L2 audience. In light of that goal, this conclusion synthesizes the avenues for future research that were highlighted in the preceding chapters, and provides suggestions for broadening the empirical basis of priming research.

Future directions for L2 priming research

Priming and L2 phonological form

Trofimovich and John (this volume) have shown that L2 speakers are often unable to extract and store precise phonological information about spoken words in their L2 lexicons. Nevertheless, they may be able to correctly pronounce these sounds. Their findings raise interesting questions about the nature of L2 pronunciation and about the types of pedagogical interventions that might be useful for helping learners develop both perception and production abilities. Although Trofimovich and John used an auditory priming task as a means to assess learners' perceptions

of L2 sounds, these tasks could also be used to promote L2 phonological and lexical development. For example, teachers could use auditory priming tasks to promote encoding of phonological information in the mental lexicon, or to encourage the acquisition of novel lexical items. And teachers could explore the task features of auditory priming activities in order to identify whether their effectiveness is influenced by the number of times words are spoken or the use of the same voice or different voices.

Auditory priming tasks might also be designed to present target forms in larger discourse contexts, rather than as individual spoken words. Normal everyday speech, typical of what L2 learners might encounter in and outside the classroom, requires the encoding and decoding of complex messages. It would be useful to assess whether learners are sensitive to phonological information when auditory priming tasks present meaningful content through sentences or lectures. Such studies could contribute to on-going debate about L2 learners' ability to process form and meaning during aural tasks. Auditory priming tasks that present forms in larger discourse units may be a useful tool for L2 pronunciation training, particularly for forms that are highly variable. Since variation in pitch, accent, and intonation are often context specific, auditory priming tasks that reflect this variation may be an effective way to help learners generalize across multiple, non-identical spoken words. Such studies would help clarify whether L2 learners benefit from varied aural input, and whether their previous experiences with language (i.e., proficiency level and exposure) impact their ability to extract phonological information from spoken input.

Priming and L2 lexicon

A great deal of priming research involving the lexicon explores how speakers access word meaning and retrieve word forms from memory when presented with individual words. However, in non-experimental contexts, language users activate semantic and phonological information for several words near-simultaneously in order to encode and decode sentences in production and comprehension. Future priming research might investigate how speakers access and use the semantic and phonological information when comprehending or producing phrases, sentences, or even longer units of discourse. Hu and Jiang (this volume), for example, explored L2 learners' processing of sentences, rather than words, and found that integrating a new word in a sentential context was faster when this word appeared in a congruent (predictable) context rather than in a neutral context. However, presenting the words in an incongruent sentential context did not slow word processing. Their findings highlight the importance of investigating word processing

in sentential contexts, as opposed to in individual word lists, and future studies could target even more diverse discourse contexts.

Another important avenue for L2 priming studies involves further clarification of which kinds of semantic relationships are associated with L2 words. As Williams and Cheung (this volume) pointed out, different types of semantic information may be associated with L2 words for learners at varying proficiency levels. Much of the L2 semantic priming research has operationalized semantic relationships as word associations (*doctor-nurse*) or translation equivalents (*rouge-red* in French and English). Their study highlighted the role of context-dependence in L2 word learning, suggesting that L2 learners may learn through the language-specific associations between lexical form and meaning that are created through experiences with language. Besides targeting words in sentential contexts, future semantic priming studies should also consider testing words that have been embedded in contexts that provide rich associations between lexical form and the meanings that are most relevant for the L2.

Another important issue for L2 researchers and teachers is to identify effective techniques for promoting the acquisition of L2 words. Barcroft, Sommers and Sunderman (this volume) highlighted the need to evaluate vocabulary learning techniques in terms of their impact on L2 learners' developing lexicon, and used priming as a methodological tool to assess the quality of L2 learners' lexical representations. Their comparative study revealed that the keyword method (using a similar sounding word in the learners' first language [L1] to help them retrieve the L2 word) produced L2 lexical representations that were qualitatively different from the representations developed through rote rehearsal, which does not involve L2-to-L1 recoding. Altarriba and Knickerbocker (this volume) also used priming as a methodological tool to compare the effectiveness of three vocabulary learning techniques: using L1 translations, black-and-white pictures, or color pictures to present the meanings of new L2 words. They reported an advantage for word-word translations, which they attributed to the matching format of the learning and test tasks. As the authors of these chapters highlight, classroom research that investigates the effectiveness of these and other tasks for promoting L2 vocabulary learning in diverse learning environments is needed.

Priming and L2 constructions

Current L2 syntactic priming research has focused on the occurrence of priming by testing alternation between equally-acceptable constructions (e.g., actives versus passives) or between targetlike and interlanguage constructions. However, to date few syntactic priming studies have investigated the role of the L1

in the acquisition of L2 constructions (for an overview of priming and bilingual sentence production, see Hartsuiker & Pickering 2008). Cross-linguistic priming research typically explores the occurrence of priming when a construction is similar in the L1 and L2 (e.g., Hartsuiker, Pickering & Veltkamp 2004), but has not systematically investigated constructions that are realized differently in the L1 and L2. For example, the wh-questions targeted in McDonough (this volume) occur in English as [wh-word + auxiliary verb + subject + lexical verb] but occur in Thai as [subject + lexical verb + wh-word] or [wh-word + subject + lexical verb]. It would be interesting to explore whether Thai learners who are primed with Thai wh-constructions are able to subsequently generate appropriate questions in English. Their ability to switch between the L1 and L2 constructions during cross-linguistic syntactic priming tasks may provide insight into their reliance on the L1 during L2 speech production.

The use of syntactic priming tasks in L2 classrooms has the potential to build upon the existing task literature that has compared effectiveness of communicative tasks at eliciting interactional feedback, modified output, and attention to form. Communicative syntactic priming tasks may also be useful for L2 learning because they encourage learners to model target structures for their peers and to generate new structures. Because they provide model constructions, syntactic priming tasks may help allay concerns that learners will "pick up" interlanguage (i.e., non-targetlike) forms during peer interaction particularly in large classes where teachers may have more difficulty monitoring and providing feedback. And because the lexical features of syntactic priming materials, such as the lexical boost and type frequency, have been shown to impact learners' production of the target structures, research that identifies which combinations of task features are most effective at eliciting target structures in the short term, as well as over a longer time period, is needed.

Previous classroom research has investigated L2 teachers' provision of interactional feedback to learners, and future studies could extend this line of research by exploring how L2 teachers in a variety of instructional settings generate opportunities for primed production. Although syntactic priming activities have been designed for use during peer interaction, they have not been created for use during teacher-learner interaction in a whole-class setting. For example, priming tasks could be designed so that a teacher provides primes to the entire class, but then each learner individually generates new utterances from prompts. These types of tasks might be particularly useful in contexts where peer interaction is difficult to implement, such as in L2 classes with large enrollments.

Innovative priming techniques

Priming research typically has investigated how language users process language form (phonological, morphological, or syntactic) or meaning (word associations, translation equivalents) during language comprehension and production. Many of the chapters in this volume illustrate the use of priming techniques to explore how L2 users encode and retrieve language form and meaning. However, when the phenomenon of priming is interpreted broadly as the impact of previous experience on subsequent processing, then additional avenues for research become available. Leeser, Brandl, and Weissglass (this volume), for example, explored whether L2 learners' performance during a self-paced reading task was influenced by the secondary task they were asked to complete (comprehension questions or grammaticality judgments), which was used to ensure that they were processing the sentences correctly. They found that learners who answered comprehension questions were less sensitive to grammatical violations with noun-adjective agreement during the self-paced reading task than learners who made grammaticality judgments. While their study did not explore priming involving form or meanings, it did demonstrate that experiences with language through task performance can also influence subsequent processing.

Further innovations were illustrated by chapters in this volume that explored the theories about lexical encoding and retrieval that have been examined previously through traditional semantic priming studies. As mentioned previously, Hu and Jiang (this volume) adapted a cross-modal priming task by embedding target words in congruent, incongruent, or neutral sentential contexts in order to explore issues in L2 listening comprehension. Sunderman (this volume) tested claims about the availability of conceptual mediation in early L2 acquisition by using the false memory paradigm based on the Deese-Roediger-McDermott (DRM) task. Whereas priming research typically measures the impact of a prime on subsequent processing, the DRM task assesses whether semantically-related words lead learners to recall a word that was not initially present. Segalowitz, Lacroix, and Job (this volume) also adopted a novel technique to investigate the nature of word processing, the semantic attentional blink task. Priming research often measures the facilitating effect of a prime on subsequent processing, such as faster speed or greater accuracy, but the attentional blink task explores whether presenting semantically-related words inhibits subsequent processing. These novel approaches have great potential to inform on-going debates about the nature of lexical encoding and retrieval in L2 speech processing.

Broadening the empirical basis of priming research

As we have highlighted in the previous section, priming research typically involves individual speakers who carry out language comprehension or production tasks while seated at a computer that has been programmed with carefully-designed experimental materials. For example, priming research that investigates the mental lexicon often uses lexical decision tasks (e.g., Altarriba & Knickerbocker; Trofimovich & John; Williams & Cheung, this volume). In this task, words are presented individually, and speakers decide whether each string is a real word or a nonce word. Their speed and accuracy at judging each string is then analyzed. This experimental task contrasts with real-world language use in which speech stimuli occur in linguistically- and situationally-embedded contexts, and speakers are expected to understand message content and respond accordingly.

This focus on individual speakers persists even though several researchers have pointed out that dialogue is the most natural and basic form of language use (Garnham, Garrod & Sanford 2006; Pickering & Garrod 2004). Certainly, not all experimental tasks used in priming research can be used during conversation, but they can be adapted for situated language use. For example, communicative tasks that have been manipulated to contain semantically or phonologically related distracters or to present pictures which either facilitate or inhibit task performance can be used when testing claims about language processing during pair or small group conversation. Although doing so may reduce the amount of experimental control that researchers have during data collection, the resulting increase in ecological validity may be a positive outcome.

In addition to its overwhelming focus on individual speakers, priming research also relies heavily on adult speakers to test claims about language processing, particularly young adults enrolled in university courses. Using such a narrow database to test global claims about language processing may skew a field's understanding of basic processes (Sears 1986). In order to identify general principles of language organization and processing, priming research should include a wide variety of language users, which includes developing and stable bilinguals, multilinguals (see Williams & Cheung, this volume, for a rare exception), individuals with language impairments, developing L1 and L2 speakers, and stable L1 and L2 speakers from various age, gender, socioeconomic, and educational groups. And since language processing can vary based on the linguistic features of a particular language, clearly priming research should involve speakers who represent diverse languages, both as first and second languages.

Because priming research often diverges from authentic language use in context, some researchers have questioned whether experimental conditions that do not reflect real-world language use should be used to draw conclusions about language processing (Libben & Jarema 2002, 2004). We certainly do not advocate the abandonment of priming tasks because they lack real-world correspondence, but we would welcome the use of tasks that approximate language use in context in psycholinguistically-oriented L2 processing and acquisition research. The inclusion of more diverse measures would also positively contribute to the generalizability of priming research. The most commonly used measure in priming research is reaction time, or response latency, which is used to determine whether prior exposure to phonological, morphological, or syntactic form, or semantically-related words, results in faster subsequent processing. Continued reliance on reaction times alone may not fully reveal the complexity of language processing, especially for speakers who have not fully acquired the language.

And while researchers may regard reaction times as useful for providing insight into language processing, language users and teachers might appreciate measures that reflect change or improvement in language use, which could range from more accurate comprehension or production to more versatile, pragmatically and socially appropriate uses of language. For example, McDonough (this volume) measured L2 learners' production of targetlike wh-questions. Producing targetlike constructions is likely to be perceived as a desirable outcome by both L2 teachers and learners, particularly if it corresponds with a decreased reliance on interlanguage forms. Studies that include multiple measures, such as the use of a lexical decision task to elicit reaction times along with a production task (Trofimovich & John, this volume), may provide greater insight into L2 processing. For example, these researchers found that L1 French speakers could produce L2 English sounds even though they did not distinguish them in their mental lexicons. Both of these studies illustrate that the inclusion of additional measures besides reaction times may help the results of priming research reach a broader audience, particularly for L2 teachers or learners who are interested in observable changes in their language skills.

Designing experimental tasks that do not require sophisticated software programs would also help broaden the empirical basis of priming research. As mentioned previously, priming research is often carried out by individual speakers seated at computers which have been equipped with experimental psychology software such as DMDX, E-Prime or PsyScope. As a result, novice researchers and L2 teachers may regard priming research as something that requires specialized training and equipment, and is not appropriate for classroom-based research. However, several chapters used more low-tech priming tasks that were implemented in classroom contexts. Sunderman (this volume), for example, tested groups of students in intact L2 Spanish classrooms during their regularly-scheduled classes. The experimental materials consisted of a PowerPoint presentation along with a paper booklet distributed to individual students. Although

other chapters relied on individual testing, they could easily be adapted for use in a classroom context. For example, in the acquisition phase of their experiment, Altarriba and Knickerbocker (this volume) presented Spanish vocabulary items using PowerPoint and assessed learning of those words through pen-and-paper definition and matching quizzes. Their testing phase, however, was based on a lexical decision task that elicited reaction times. While it would be difficult to obtain reaction time measures in a classroom context, it would certainly be possible to devise other classroom-friendly tasks. This could be accomplished, for example, by asking learners to provide definitions or sentences with target words or to perform other tasks typically used in a classroom to access learners' knowledge of previously targeted words. When adapting priming tasks for use in L2 classrooms, though, it may be necessary to integrate the experimental activities into the course curriculum because teachers and learners typically expect that in-class activities will complement the learning objectives and content focus of the course materials.

Concluding remarks

As we highlighted in the introduction, one main challenge for psycholinguists has been to identify the cognitive, psychological "losses" and "gains" associated with the learning and using of an L2. We believe that the chapters in this volume demonstrate that L2 researchers are as enthusiastic about these endeavors as James Cattell was over 120 years ago. Perhaps more importantly, the chapters featured in this volume illustrate that practical issues of L2 learning and teaching can be informed by insights from cognitive science, and that psycholinguistic research techniques can be used to answer questions of interest to both L2 researchers and teachers.

References

Garnham, A., Garrod, S., & Sanford, A. (2006). Observations on the past and future of psycholinguistics. In M. Traxler & M. Gernsbacher (Eds.), *Handbook of psycholinguistics* (2nd ed., pp. 1–18). Amsterdam: Elsevier.

Hartsuiker, R., & Pickering, M. (2008). Language integration in bilingual sentence production. *Acta Psychologica, 128,* 479–489.

Hartsuiker, R., Pickering, M., & Veltkamp, E. (2004). Is syntax separate or shared between languages? Cross-linguistic syntactic priming in Spanish/English bilinguals. *Psychological Science, 15,* 409–414.

Libben, G., & Jarema, G. (2002). Mental lexicon research in the new millennium. *Brain and Language*, *81*, 2–11.

Libben, G., & Jarema, G. (2004). Conceptions and questions concerning morphological processing. *Brain and Language*, *90*, 2–8.

Pickering, M., & Garrod, S. (2004). Toward a mechanistic psychology of dialogue. *Behavioral and Brain Sciences*, *27*, 169–190.

Sears, D. (1986). College sophomores in the laboratory: Influences of a narrow data base on psychology's view of human nature. *Journal of Personality and Social Psychology, 51,* 513–530.