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# Theories and frameworks in second language processing

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*Analyzing L2 sentence processing in terms of cue-based memory retrieval is promising. But this useful general framework has yet to become a specific theory of L1-L2 differences.*

Cunnings' target article is framed as a head-to-head between two established theories of L2 sentence processing and a new pretender, one based on memory access operations. He offers a framework that could be used to articulate an explicit theory of the representations and processes involved in L2 processing, and where they differ from L1 processing. But Cunnings' article does not yet present a detailed theory of L2 processing. It is hard to derive straightforward predictions for new phenomena from his account, and it currently blurs important distinctions by using similar terms to refer to different claims, especially concerning the role of discourse constraints.

We are unabashed fans of the cue-based memory retrieval framework that Cunnings advocates. We have relied on it extensively in our work on L1 sentence processing in adults and children (e.g., Wagers, Lau & Phillips, 2009; Kush, Lidz & Phillips, 2015). We like it not because it provides clear answers, but because it helps in asking clear questions. Any explicit account of sentence comprehension requires a specification of (i) the representations, which are encodings in memory, (ii) what information is extracted from incoming words, and (iii) how that information is used to combine the incoming item with the existing representation. None of this is controversial. Cue-based memory retrieval is a framework for making these details clear, in a way that is grounded in current memory models (e.g., McElree, 2006) and that can be simulated in implemented computational models (e.g., Lewis & Vasishth, 2005). Within the overall framework, there is plenty of room for theories that make different claims about all of (i)-(iii). In adult L1 processing, we have been involved in productive arguments over theories couched within the same framework, not about the usefulness of the framework itself (Dillon, Mishler, Sloggett & Phillips, 2013). So we see much potential in Cunnings' use of this framework.

Cunnings' two main claims are that L2 speakers are more susceptible to retrieval interference, and that they are more strongly guided by discourse cues. But precise claims are more elusive. In particular, L2 speakers' reliance on discourse cues appears in multiple guises in the target article.

In one instance, it refers to a claimed bias in L2ers to rely more on a [+Topic] cue when retrieving pronoun antecedents, rather than syntactic locality constraints. If indeed L2 processing differs in this regard, this begs the question of why L2 speakers would be over-sensitive to discourse cues, if they have syntactic constraints to fall back on. If the L2 processing difference is due to differences in cue weighting, the reasons for differences in weighting must be specified. Alternatively, perhaps L2ers' difficulty stems from operating within a processing system that is generally noisier. Noise could make cues relevant to the application of grammatical constraints harder to identify in the input, or it could make memory representations relevant to grammatical constraints harder to distinguish, or it could make retrieval operations less reliable due to noise. In all cases, grammatical constraints are harder to act upon in L2 than in L1, but these hypotheses are difficult to tease apart.

Cunnings analyzes another well-known case of L2 mis-interpretation in terms of cue mis-use. Overt pronouns in null subject languages like Italian typically signal a topic shift, but L2ers are reported to fail to shift topic (e.g. Belletti, Bennati & Sorace, 2007). It would be interesting to analyze this phenomenon in terms of memory access cues. Most important here would be to specify how to analyze a topic-shifting pronoun in cue-based terms. The desired effect is to switch attention away from the topic ("Don't think of a topic!"), but Cunnings does not address how this might be implemented in memory. A useful strategy for explaining L2ers' difficulties would be to first spell out how L1ers succeed, and from there,

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motivate an account of how and why L2ers' processing differs.

In another case, similar terminology refers to a bias for discourse-biased interpretations of globally ambiguous NP attachment ambiguities (Pan, Schimke & Felser, 2015), i.e., favor the syntactic attachment that yields an interpretation that better fits the discourse. It is hard to imagine this bias in terms of retrieval cues. It presumably reflects the competition between potential interpretations once they have been generated, but the resolution of that competition likely does not depend on retrieval cues per se.

Thus, the details of a theory of L2 processing in terms of memory retrieval remain to be spelled out. However, the adoption of the cue-based framework is promising. It has many parameters, which allows for lots of analyses of individual phenomena and many possible theories about L1-L2 differences. In fact, the framework could be used to spell out more explicit versions of the hypotheses that Cunnings criticizes (Shallow Structure Hypothesis, Interface Hypothesis). Developing more explicit theories within this framework could lead to fruitful debate and to progress in our understanding of L2 sentence processing.

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