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What is fuzziness, and how much does it explain?

Kristin Lemhöfer

Radboud University Donders Institute for Brain, Cognition and Behaviour, Nijmegen, The Netherlands

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Address for correspondence: Kristin Lemhöfer,
E-mail: kristin.lemhofer@donders.ru.nl

In their OM model, Bordag and colleagues present a comprehensive perspective that aims to accommodate an impressive multitude of bilingual processing and learning studies, two strands of the literature that are indeed rarely considered together. Many promising ideas that have so far led a somewhat isolated life in the literature – like the LEXICAL QUALITY HYPOTHESIS (Perfetti, 2007), the WEAKER LINKS HYPOTHESIS (Gollan, Montoya, Cera & Sandoval, 2008) or the LEXICAL ENTRENCHMENT ACCOUNT (Diependaele, Lemhöfer & Brysbaert, 2013), as well as existing models of bilingual processing – are considered. The attempt to integrate L2 word acquisition and processing research into one model is timely, and the central idea of fuzziness deserves close consideration. However, its exact nature still needs to be determined.

Fuzzy Fuzziness

I surely sympathize with the idea of representational fuzziness in L2. When analyzing the translation task for the validation of LexTALE (Lemhöfer & Broersma, 2012), I noticed many responses that pointed to an association of obviously unknown words (e.g., *heathen*) to similar, more familiar neighbors (*heaten*). This again reminded me of my kids when they were just starting to speak and heard a word for the first time. "*Dit is sneeuw*" ('this is snow'), my Dutch husband said once when the child experienced her first snow. "*Leeuw?*" ('Lion?') she asked with fearful eyes. As she did not know the word *sneeuw*, she linked it to the most similar (here, rhyming) word she knew – a phenomenon that Hall (2002), in his *Parasitic Hypothesis of Vocabulary Development,* claims exists also in L2 speakers. Thus, obviously, in both children and L2 speakers, fuzziness is an issue, at least when encountering unfamiliar words.

However, what exactly is FUZZINESS? As someone who grew up in the (conceptual, but also physical) vicinity of the computational BIA model (Dijkstra & van Heuven, 1998) and its successors, I have difficulties grasping the concept as it is presented. Representations and mappings are stated to be fuzzy when their "degree of acquisition" is "below the optimum", but these terms are also not exactly specified. Does an "approximate phonological representation in the mental lexicon", for instance, mean that it has weak mappings to its constituting phonemes (a level not included in the OM)? And how can it be harmonized with the fact that L2 speakers PRODUCE most words perfectly accurately? If the representation is only approximate, one would expect many mispronunciations. Also, what does it mean in concrete terms for a (not fuzzy) semantic representation to be "both precise and flexible"? The problem is that unless the central concept of fuzziness (and its opposite, degree of acquisition) is sharply defined – as in computational models –, it can explain everything and nothing. Imagine, for instance, a simple new study in which L1 and L2 speakers are compared in how quickly they match pictures with words. If L2 speakers were found to be SLOWER than native speakers, the OM could be said to be supported, because the fuzzier L2 representations need longer to be (unambiguously) accessed. On the other hand, if L2 speakers were FASTER, one may just as well say that the quick-and-dirty, imprecise character of L2 lexical access allows for faster processing, as no time is spent on competitor resolution. For the OM to become a major player in the field of bilingual models, it needs to be able to make clear and testable experimental predictions.

Imprecision is not the same as incorrectness

It is also stated that fuzziness "means that the encoded pronunciation/spelling is incomplete with some segments not fully specified *or that it contains one or more incorrect phonemes/graphemes*" (my emphasis, p.5). However, in my view, IMPRECISE and INCORRECT representations are fundamentally different things conceptually. Imprecise representations have a PROBABILISTIC CHARACTER – sometimes the correct, sometimes the incorrect form will surface –, while incorrect representations are DETERMINISTIC, i.e., invariable. As an example from my own research, albeit from the morphosyntactic domain (but transferable to word knowledge), German learners of Dutch often make systematic errors on Dutch gender due to incorrect L1 transfer (Lemhöfer, Spalek & Schriefers, 2008). However, they sometimes fluctuate in these

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errors: they produced more than 20% of 'gender-difficult' nouns inconsistently across two production moments (Lemhöfer, Schriefers & Hanique, 2010). The same study also showed that, at least numerically, 'stable' (or 'certain') incorrect gender representations were learned BETTER after feedback than unstable ones. Finally, we found that (stable) incorrect gender representations behave like native correct ones in terms of eliciting a ('reversed') P600 when the incorrect syntactic expectation is violated by correct input (Lemhöfer, Schriefers & Indefrey, 2014). In contrast, imprecise representations should elicit no strong expectations and thus no measurable violation response. Thus, whether and when L2 representations are characterized by imprecision or stable incorrectness remains an unresolved issue.

A purely acquisitional perspective

In contrast to the L2 processing literature, the OM attributes L2 performance phenomena to non-optimal acquisition, not to online processing mechanisms. For example, the LEXICAL CONFUSION effects referred to (Cook, Pandža, Lancaster & Gor, 2016) would traditionally be explained by co-activation of the prime neighbor /malatok/ that receives an additional boost from the target, its translation 'hammer'. Similar semantic interference effects from form neighbors have, by the way, been observed in L1 (Pecher, de Rooij & Zeelenberg, 2009). Thus, fuzzy representations due to non-optimal L2 acquisition are not the only possible explanation here.

The predominantly acquisitional perspective is especially salient in the absence of a role for (online) L1 effects in the OM, a daring choice that stands in contrast to their central place in the L2 processing literature (e.g., Santesteban & Schwieter, 2020). While this is undoubtedly a highly controversial point, I am somewhat sympathetic to it, as I have repeatedly argued against the exaggeration of L1 effects on L2 word processing myself (Diependaele et al., 2013; Lemhöfer, Dijkstra, Schriefers, Baayen, Grainger,& Zwitserlood, 2008).

Altogether, the OM is a good starting point to open a discussion on representational (or acquisition-based) vs. processing origins of L2 phenomena, and to foster more cross-talk between the so far separate respective research traditions.

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