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COMMENTARY

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Reasons to doubt the generalizability, reliability, and diagnosticity of fast mapping (FM) for rapid lexical integration

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ABSTRACT

The possibility of fast mapping (FM) promoting rapid lexical integration challenges complementary systems accounts of word learning. Here, we first question the diagnosticity of orthographic lexical competition prior to sleep as an indicator of lexical integration, given emerging evidence that the same pre-sleep effect can be found with explicit learning paradigms. Second, we describe a study that showed no evidence of accelerated lexical integration for spoken-word learning. This study also found no FM advantage when written materials were used . Taken together, the evidence does not convincingly demonstrate that FM can accelerate lexical integration in healthy adults.

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Fast mapping; consolidation; lexical integration; word learning

The potential for fast mapping (FM) to accelerate lexical integration of novel words for healthy adults is of immense interest to us because it provides an opportunity – if correct – to inform our model of word learning (Davis & Gaskell, 2009; Lindsay & Gaskell, 2010). By this complementary systems account, word learning initially relies on the hippocampus to link together cortical areas that are involved in the representation of word form and meaning, providing a pattern-separated representation of the new word. This initial representation is then consolidated over a longer period, facilitating the formation of direct connections between the cortical areas. As well as explaining fMRI data on word learning (Davis, Di Betta, Macdonald, & Gaskell, 2009) this model has provided an explanation for a large body of evidence that suggests that novel spoken words become better integrated with their form neighbors over an extended period of time, often including sleep (e.g., Dumay & Gaskell, 2007; Tamminen et al., 2010). If FM allowed the bypass of the hippocampus and led to immediate integration then this would represent a significant challenge to the complementary systems account. However, we are largely in agreement with Cooper, Greve, and Henson (this issue) that the evidence for FM exploiting hippocampally independent learning mechanisms in the brain is weak. Here we focus on recent evidence relating to the generalizability, reliability, and diagnosticity of tests of accelerated lexical integration for FM.

Do immediate competition effects imply fast integration?

Coutanche and Thompson-Schill (2014) found that FM but not explicit encoding (EE) of new neighbors (e.g., *ganaxy*) of existing 'hermit' words (e.g., *galaxy*) led to immediate interference in the semantic categorization of the existing words. This result has been taken as a clear indicator that FM contributes to the immediate lexical integration of those words, bypassing the need for consolidation. It is certainly intriguing that this difference between those two training conditions was found (although we note the concerns raised by Cooper et al., this issue, about this result). But is it really the case that explicit encoding cannot lead to competition effects prior to a consolidation period? Put another way, is the observation of a competition effect soon after learning diagnostic of fast integration? We think not. Although Wang et al. (2017) found the emergence of competition in explicit learning after but not before sleep, data from our own lab (also using explicit orthographic word learning) indicated significant competition effects immediately after learning in two experiments (Walker et al., in press). It is unclear to us what dictates the presence or absence of competition effects in this paradigm soon after learning, but the general pattern seems to be that of an *enhancement* of competition following sleep rather than an *emergence*. This finding is likely also true for spoken-word learning (e.g., Lindsay & Gaskell, 2013), and can be

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explained by a complementary systems account (McMurray, Kapnoula, & Gaskell, 2016). This observation casts doubt on the inference that FM is special in promoting integration of novel words.

Does fast integration generalize to spoken word learning?

If FM really does accelerate the time-course of lexical integration then this result should generalize to other tests of lexical integration. Using a spoken-word learning paradigm, we examined whether FM would accelerate the engagement of novel words in lexical competition (Lindsay & Gaskell, in preparation). Here, like Coutanche and Thompson-Schill (2014), our key test exploited lexical competition, assessing the extent to which learning a novel word influenced the processing of an existing neighbor. However, in this case, the novel spoken form and its existing neighbor had a common initial sequence (e.g., *cathedruke* and *cathedral*), and the participant's task was to detect a short silent pause inserted into the existing word (e.g., 'cathedr_al'). This task has proved sensitive to the overall level of lexical activity at the point of perception of the pause (Gaskell & Dumay, 2003; Mattys & Clark, 2002). Hence, lexical integration of the novel word should lead to slower detection of a pause in the existing word.

There are several advantages to testing the potential benefits of FM for swift integration effects using this spoken-word paradigm rather than the visual alternative. First, the paradigm is better linked to the original literature on FM in development, which used spoken materials. Second, the test is more clearly related to lexical integration of the novel word as it does not involve the semantic processing of the novel word or its neighbor. Finally, there is a larger and more established literature on engagement of novel spoken words in competition (e.g., Dumay & Gaskell, 2007; Gaskell & Dumay, 2003), including several studies of development (e.g., Henderson, Weighall, Brown, & Gaskell, 2012).

Using FM training for the novel spoken words comparable to Coutanche and Thompson-Schill (2014), we found no evidence for immediate lexical competition as assessed via pause detection. Instead, consistent with other work showing the importance (but not necessity) of sleep, lexical competition effects in both FM and EE conditions only emerged a day after encoding. These effects remained a week later, with again no difference between FM and EE conditions.

In order to facilitate comparison between the two measures of lexical integration, and to examine the reliability of the previous findings of Coutanche and Thompson-Schill (2014), we also ran a more direct replication of their study using their orthographic stimuli and task. Again, we found no immediate effects of lexical competition in either condition (FM or EE). Along with an apparent failure to replicate the original findings (Coutanche & Koch, 2017), and the failure to replicate described by Cooper et al. (this issue) these findings give further reasons to remain cautious on the possibility of FM providing a shortcut to lexical integration.

Disclosure statement

No potential conflict of interest was reported by the authors.

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