Introduction

- Leech and Samuel (2007) described two properties of lexical knowledge/representations:
  - Lexical configuration: static ‘factual’ knowledge (e.g., of a word form or referent).
  - Lexical engagement: a dynamic, interactive property occurring between lexical and sub-lexical representations (e.g., ‘unw’ priming ‘doctor’).
- Complementary learning systems (CLS) accounts (e.g., Davis & Gaskell, 2009; Lindsay & Gaskell, 2010): the lexical configuration of a representation is available quickly, but the lexical engagement property emerges slowly and possibly only with sleep (e.g., Dumay & Gaskell, 2007).
- This study adopts the CLS model of memory by Jay McColland and colleagues (1995, 2013, 2020).
- Representations are firstly episodic in nature and then are consolidated slowly to become abstracted and generalised representations.
- But when are newly learnt words capable of lexical engagement, and thus truly ‘word-like’ (i.e., lexicalised), in accordance with predictions of speech perception models (e.g., Gaskell & Marden-Wilson, 1997)?
- Lexical competition is one way of measuring lexical engagement.
  - How is processing of a known word disrupted by the processing of a similar-sounding new word?
  - Typical finding: responses to ‘a-lern’ are only slowed (e.g., on a lexical decision task) after sleep, explained theoretically by the sleep-based consolidation of ‘alient’ into the lexicon, resulting in it acting as a competitor to ‘a-lern’ during word recognition.
- Newer data suggests that time and sleep are neither necessary nor sufficient conditions of lexicalisation (e.g., see McMurray et al., 2017).
- There is the suggestion in these papers that experimental methodology may be a reason for such findings not being reported earlier.
- Mouse tracking is a novel and under-used methodology with particular advantages for psycholinguistics (e.g., Bartolotti & Marian, 2012; Spivey et al., 2005).
- The present study: conceptually replicates an eye tracking paper (Weighall et al., 2017) reporting pre-sleep lexical engagement effects, and extends it to mouse tracking.

Methods

- Study design: within-subjects, over two days, using Weighall et al. (2017) stimuli and design; N = 59; 24 words (familiar and refersents) learnt per day; 12 exposures per word.
- Two day design to study pre- and post-sleep novel word representations. Study had three phases:
  1. Training:
     (a) repetition of a heard novel label; novel referent held on-screen for 2s;
     (b) phoneme segmentation of a heard novel label; novel referent held on-screen for 2s;
     (c) 2-AFC task, with feedback. Participants see two referents they had learnt (target & false), and heard the word for the target referent, which they had to select. Regardless of response accuracy, participants would after 2s see only the target referent centred on-screen and hear its label.

2. Lexical engagement task (mouse tracking). Participants had to click on a referent for which they heard a label. All word types (familiar, post-sleep, pre-sleep) appeared, with trials interleaved. There were three main trial types:
  (a) Competing trials (designed to evoke lexical competition): Novel and familiar referents with overlapping labels appeared (e.g., BAKER - BACON - BISCUIT).
  (b) Non-competiting trials (designed to act as control trials). Novel and familiar objects with labels different from the first phoneme appeared (e.g., KITTEN - LOLLY - BALCONY - ALIENT).
  (c) Super-novel target trials. Included as participants otherwise did not click on novel objects. These objects were untrained.

3. Lexical configuration tasks (cued recall). Participants had to say aloud the novel word when cued either with its stem, or its referent.
  - First day: training of novel words only. Note: new words were learnt each day.
  - Second day: further training, interleaved lexical engagement task, interleaved lexical configuration tasks.

Results

- Response accuracy in the 2-AFC training task was high (M = 95.7%, SD = 4.56%).
- Lexical engagement analysed with two repeated-measures ANOVAs:
  - The first ANOVA compared pre- and post-sleep novel words by competition, and found a main effect of Competition (p < 0.001), but no consolidation effect, or an interaction (all ps > 0.239). Pre- and post-sleep representations were thus collapsed for subsequent analyses across familiar words.
  - The second ANOVA compared familiar and novel words by competition. Competition and word type effects, and an interaction, were observed (all ps < 0.001; see Fig. 2).

Discussion and summary

- In contrary to previous theoretical accounts (Davis & Gaskell, 2009; Lindsay & Gaskell, 2010), novel words are capable of immediate lexical engagement (see McMurray et al., 2017);
- Mouse tracking is well suited to word learning research;
- There is limited evidence for consolidation (present in some of the LC, but not LE data), consistent with other findings (e.g., Kapnoula & Samuel, 2019, Weighall et al., 2017);
- Taken at face value, the data would suggest support for episodic accounts of the lexicon (e.g., Goldinger, 1998; Kapnoula & Samuel, 2019).

Future work

- What role does semantics play in these competing novel word representations?
  - Is the competition effect driven purely by ‘alien’ evoking its similar-sounding lexical competition ‘alient’; or is competition mediated by the on-screen referent?
  - Our lab currently have an experiment underway to address this (delayed by CoViD-19).
- Tension exists between abstractionist and episodic accounts of the lexicon – especially in the light of the present research and other recent papers (e.g., Kapnoula & Samuel, 2019). This should be addressed.
- Further specification of the conditions under which consolidation does and does not occur is required.
- Why is there no consolidation evident in the cued-recall picture naming data, or the engagement data – despite its presence in the cued-recall stem completion data? Also, cf., Kapnoula & Samuel, 2019, Dumay & Gaskell, 2007.

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Note: The image contains a table and a figure, which are not translated into text in this response. The table includes data and statistics, and the figure illustrates the results of the study, showing lexical engagement and consolidation across different conditions.