

Phonemic awareness goes hand in hand with phonetic deafness

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Does learning to read merely create meta-linguistic awareness of phonemes, or does it fundamentally restructure speech processing itself [1]? This question—already posed in the classic paper on phonemic awareness based on reading acquisition [2]—has remained contentious. Visual word recognition research has strongly argued that literacy changes pre-lexical representations, making pre-lexical units multi-modal and activated bottom-up during spoken word recognition (e.g., [3]). Here, I challenge this view, proposing instead that phonemic awareness is a post-lexical phenomenon that may actually reduce sensitivity to phonetic reality when it lacks orthographic coding.

It was tested whether orthographic experience affects pre-lexical speech representations by exploiting glottal stops, which have explicit graphemes in Maltese (<q>) and German (the gender-star <*> in gender-fair plurals like *Wissenschaftler*innen* 'scientists'). Crucially, glottal stops also occur without orthographic coding where they mark prosodic boundaries—often leading to meaning differences—as in German *gegen(?)arbeiten* 'to work against' vs. 'to oppose labour' and Maltese *emmen (?)animal* 'he believed the animal' vs. 'believe, animal'. If literacy creates multi-modal pre-lexical units, listeners should identify glottal stops as segments even in uncoded instances, because it is the nature of pre-lexical units that are activated by bottom-up input.

German (n=206) and Maltese (n=135) participants were presented with 6-7 pairs of utterances, asking them to describe auditory differences in an online experiment. The lower sample size for Maltese is due to the difficulty in finding Maltese participants in an online setting. Filler trials involved Segmental Changes (e.g., *small broom* vs. *small room*) or Prosodic Changes (e.g., *she believed Julia* vs. *she believed, Julia*). Participants were presented with practice trials that provided example answers such as “a /b/ is missing” (segmental) and “the words are produced closer together in the first case” (prosodic). Critical trials contrasted presence vs. absence of glottal stops, either orthographically coded or uncoded. Previous research on segments not clearly coded orthographically (e.g., /w/ in *queen*) shows a small reduction in reporting rates [4] (90% vs. 80%). If orthographic knowledge influences pre-lexical representations, we should observe a similar modest reduction as we move from coded to uncoded glottal stops. If orthography does not influence pre-lexical processing, we might expect similar success rates for the uncoded glottal stop as in phoneme-manipulation tasks with illiterate adults (around 10%, see [2]).

Responses were coded automatically and independently via ChatGPT API requests. After excluding participants who failed to engage with the task (>50% inappropriate responses), 194 German and 79 Maltese participants remained. Figure 1 shows the results. Coded glottal stops are reported correctly less often (~80%) than oral stops (~90%), which is not unexpected given earlier results that glottal stop tends to be a weak phoneme [5]. However, only 2 participants per language identified uncoded glottal stops as such—a dramatic drop from ~80% to ~2%. Strikingly, as shown in Figure 1, many participants who reported coded glottal stops responded “no difference” for uncoded ones, despite similar acoustic strength (~60ms glottalization).

These results suggest phonemic awareness is post-lexical rather than based on pre-lexical speech representations. Together with the finding that participants report the presence of deleted segments in spontaneous speech despite their phonetic absence [6], this suggests that literacy creates meta-linguistic knowledge while simultaneously rendering listeners 'deaf' to the phonetic reality.

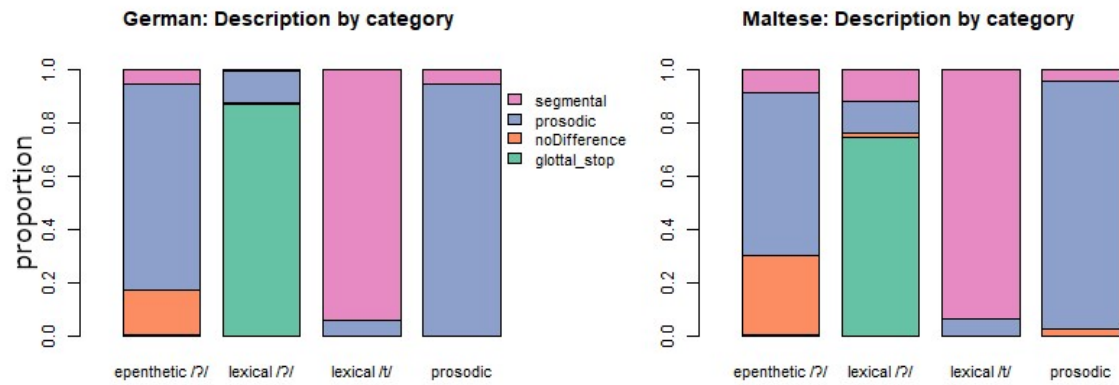


Fig. 1. Proportion of categories of descriptions for the four types of utterance pairs: epenthetic glottal stop (not orthographically coded), glottal stop (orthographically coded) and the two control conditions (segmental versus prosodic difference).

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