Can humans hear morphemes even when they are obscured and variable? Evidence from Tagalog nasal assimilation and nasal substitution

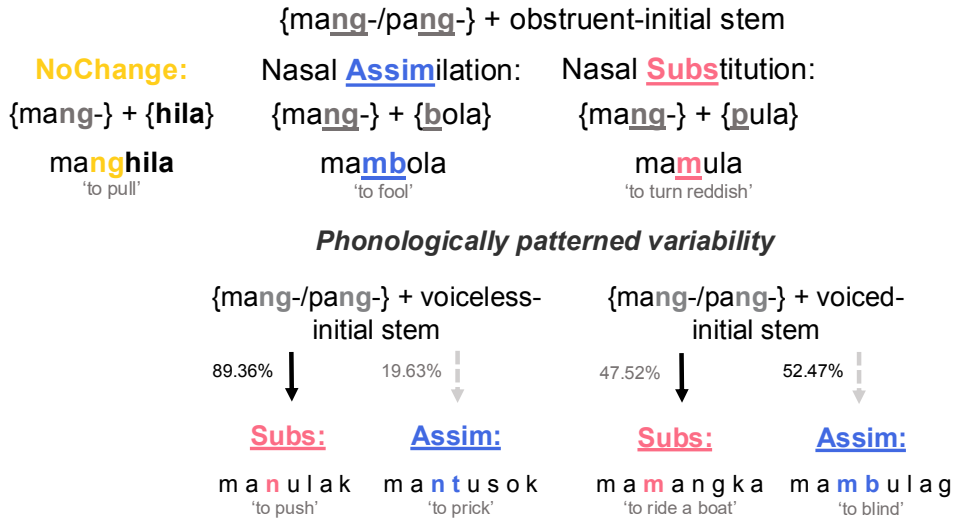
Abstract

There is no shortage of evidence showing that the initial stage of visual word recognition requires an early, form-based decomposition stage, where morphologically complex words are broken down into morphemes (Rastle & Davis, 2008). Such decomposition in the visual domain has also been shown to take place even for words with obscured morphological boundary caused by variable morphophonological alternations, attesting to the robustness of the early, form-based decomposition stage (Cayado et al., *under review*). These findings are not in line with proposals from Optimality Theory (OT), which argues that complex words that exhibit variable morphophonological alternations are stored as whole words in the mental lexicon and are accessed as such during recognition (Zuraw, 2010). Further, majority of the studies supporting decomposition are conducted in the visual domain—whether the same decomposition process takes place during spoken word recognition is relatively less understood. Using Tagalog (Austronesian, Philippines) as a test-case, we investigate whether Tagalog speakers are able to recognize obscured morphemes during early spoken word recognition, despite variable morphophonological alternations (see Language Background for detailed explanations).

We used auditory masked priming to address this question (see Kouider & Dupoux, 2005 for methodological details). There were 5 main conditions: [1] **NOCHANGE**: prefixed words without morphophonological alternation as primes and their stems as targets (eg. prime: manghila | target: hila 'to pull'); [2] Nasal-**ASSIM**ilation: prefixed words with obscured prefix identity as primes and their stems as targets (eg. prime: mambola | target: bola 'to fool'); [3] Nasal-**SUBS**titution: prefixed words with obscured prefix and stem identities and blurred {prefix}+{stem} boundary as primes and their unobscured stems as targets (eg. prime: mamula | target: pula 'to become reddish'); [4] **IDENT**ity: the same monomorphemic words as primes and targets (eg. prime: lubog | target: lubog 'submerged'); and [5] **PHON**ological **CON**trol: monomorphemic words that share the same second syllable as primes and targets (eg. prime: saplot 'cover' | target: dulot 'cause'). Within the SUBS condition, there were two subconditions: [a] **VOICED**: nasal-substituted words with voiced-initial stems as primes (eg. prime: mamangka | target: bangka 'to go boating'); and [b] **VOICELESS**: nasal-substituted words with voiceless-initial stems as primes (eg. prime: mamula | target: pula 'to become reddish'). Unrelated primes were real words with no morphological, phonological, or semantic relationship to the target stems. Sixty-five native Tagalog speakers were asked to judge whether the word they hear is a real word in their language or not. If morphological decomposition did happen despite obscured morphological forms, then we expect significant priming effects for NOCHANGE, ASSIM, SUBS, and IDENT conditions, but not for PHONCON condition. Further, if morphophonological variability does not affect decomposition, then similar magnitude of priming effects should be obtained for VOICED and VOICELESS subconditions.

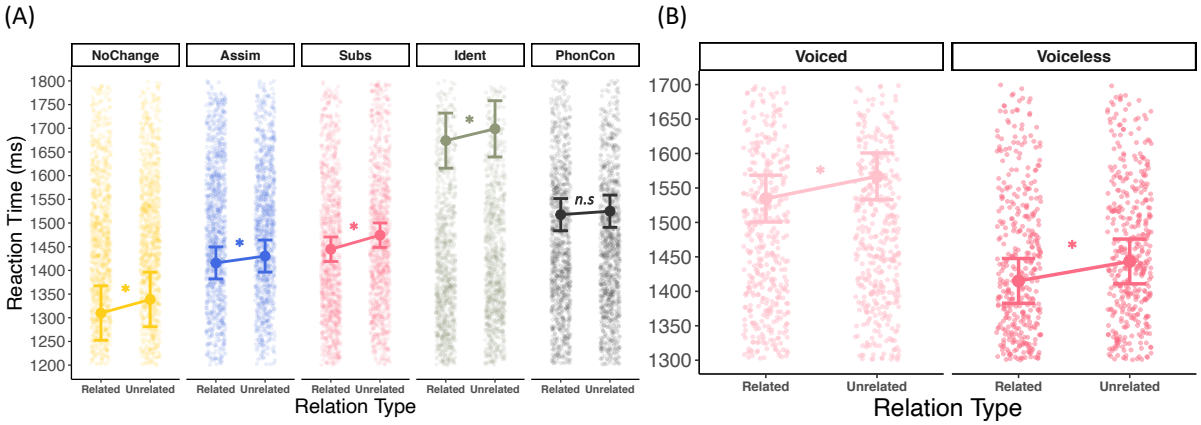
Linear mixed-effects models revealed significant priming effects of similar magnitude for NOCHANGE (p = <.0001), ASSIM (p = 0.0292), SUBS (p = <.0001), and IDENT (p = 0.0003) conditions. No priming effects emerged for the PHONCON (p = 0.2865) condition, suggesting that the priming effects obtained in the critical conditions were morphological in nature. We also found significant priming effects of similar magnitude for VOICED (p = 0.0003) and VOICELESS (p = 0.0012) subconditions. Findings from this experiment suggest that Tagalog speakers decompose morphologically complex words during early spoken word recognition, consistent with previous auditory morphological processing studies in various languages (Kouider & Dupoux, 2005 in French; Ussishkin et al., 2015 in Maltese; Matar & Marantz, 2024 in Arabic). More importantly, for the first time, we unambiguously show that Tagalog speakers are able recognize morphemes despite the obscured {prefix}+{stem} boundary caused by variable morphophonological alternations, contrary to OT-based proposals (Zuraw, 2010). Perhaps, Tagalog speakers are able to initiate decomposition upon hearing *ma-/pa-/na-* followed by a nasal sound, as these phonological sequences are reliable cues to morphological complexity. This ultimately suggests that the early, form-based decomposition stage in spoken word recognition is robust and flexible enough to handle variable occurrences of nasal assimilation and nasal substitution, as well as the significant losses of phonological information that come with them.

Language Background



In Tagalog, when velar-final prefixes are attached to obstruent-initial stems, two morphophonological alternations can surface: nasal **ASSIM**ilation and nasal **SUBS**titution (see above for examples). Critically, whether ASSIM or SUBS will surface when velar-final prefixes are attached to obstruent-initial stems exhibit phonologically patterned variability: ASSIM is more likely than SUBS for voiceless-initial stems, while the opposite holds for voiced-initial stems (Zuraw, 2010).

Figure 1. Reaction time differences (ms) between related and unrelated primes across conditions (* = significant; *n.s* = not significant)



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