

Near merger or complete merger? Evidence from Taiwan Mandarin nasals

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Introduction. The merging of phonological categories does not necessarily proceed in tandem between production and perception within individuals. In particular, cases of *near merger*—in which speakers produce small but consistent acoustic differences while being unable to perceive those distinctions themselves—have been well documented in the literature [1-4]. This study focuses on multiple nasal mergers in Taiwan Mandarin (TM), where syllable-final nasals are variably merged in non-low vowel contexts. A predominant pattern is that in high-vowel contexts, /in/ tends to merge toward /iŋ/ (IN-to-ING), while merging in the opposite direction, though attested, is comparatively limited; in mid-vowel contexts, /əŋ/ has been reported to merge toward /ən/ (ENG-to-EN) [5-6]. Crucially, Chiu et al. (2025) [7] raised the possibility of near merger in TM; even after merger, vowels preceding /ŋ/ exhibit stronger nasalization than those preceding /n/, indicating that nasality-based phonetic contrasts are still maintained. However, nasal mergers in TM exhibit substantial inter-speaker variability, with speakers differing in both the presence and direction of merger [6]. This study therefore aims to elucidate the nature of nasal merging in TM through detailed acoustic analysis that explicitly takes individual-level variation into account.

Method. Thirty young TM speakers participated in a wordlist reading task involving disyllabic words in which the second syllable carried Tone 1 (X⁵⁵) and varied in vowel height (/i ə a/) and following nasal (/n ŋ/) (e.g., /lu⁵¹in⁵⁵/ 錄音 ‘recording’ vs. /ʃi³⁵iŋ⁵⁵/ 石英 ‘quartz’). For each vowel context, 12 words were selected for each nasal, yielding a total of 72 stimuli items, which were presented along with many fillers across two blocks. Based on spectrogram inspection and perceptual judgments, speakers were classified according to their merger patterns; those categorized as *distinct* vs. *merged* for each dominant merger type were included in subsequent analyses. Three acoustic measures were analyzed at five temporal points across the pre-nasal vowel in Praat: (1) vowel nasalization, indexed by standardized A1-P0/A1-P1 values; (2) vowel retraction, indexed by standardized F2; and (3) vowel height, indexed by standardized F1.

Result. Mixed-effects regression analyses revealed vowel-dependent patterns in the realization of pre-nasal vowels. In the /a/ context (Figure 1a), the non-merging environment, F2 values were significantly lower before velar nasals than alveolar nasals for both distinct and merged speakers, with no nasalization or F1 differences between the two nasals. In the /ə/ context (1b), distinct speakers showed significantly greater nasalization and lower F2 before velar than alveolar nasals, whereas no such differences were observed for merged speakers. In the /i/ context (Figure 1c), a small but significant F1 difference emerged only for the distinct group. No other acoustic measures reliably differentiated the two final nasals.

Discussion. The results show that, unlike classic near mergers reported by Labov, our data exhibit no residual acoustic contrast in production. This finding underscores the importance of accounting for intra-speaker variation in the accurate characterization of a merger. Nevertheless, even merged speakers were able to distinguish the two nasals in non-low merging contexts, as well as in the non-merging low vowel context, in a discrimination task in which the stimuli were modeled on distinct speech [6]. Taken together, these findings demonstrate that while merged speakers show complete merger in production, their perceptual representations remain largely intact. This pattern may be attributed to the nature of *conditioned merger*, whereby speakers retain sensitivity to robust contrasts instantiated in the low vowel context. In addition, regular exposure to distinct speech forms within the community, together with substantial inter-speaker variation, may help sustain perceptual sensitivity to the contrast.

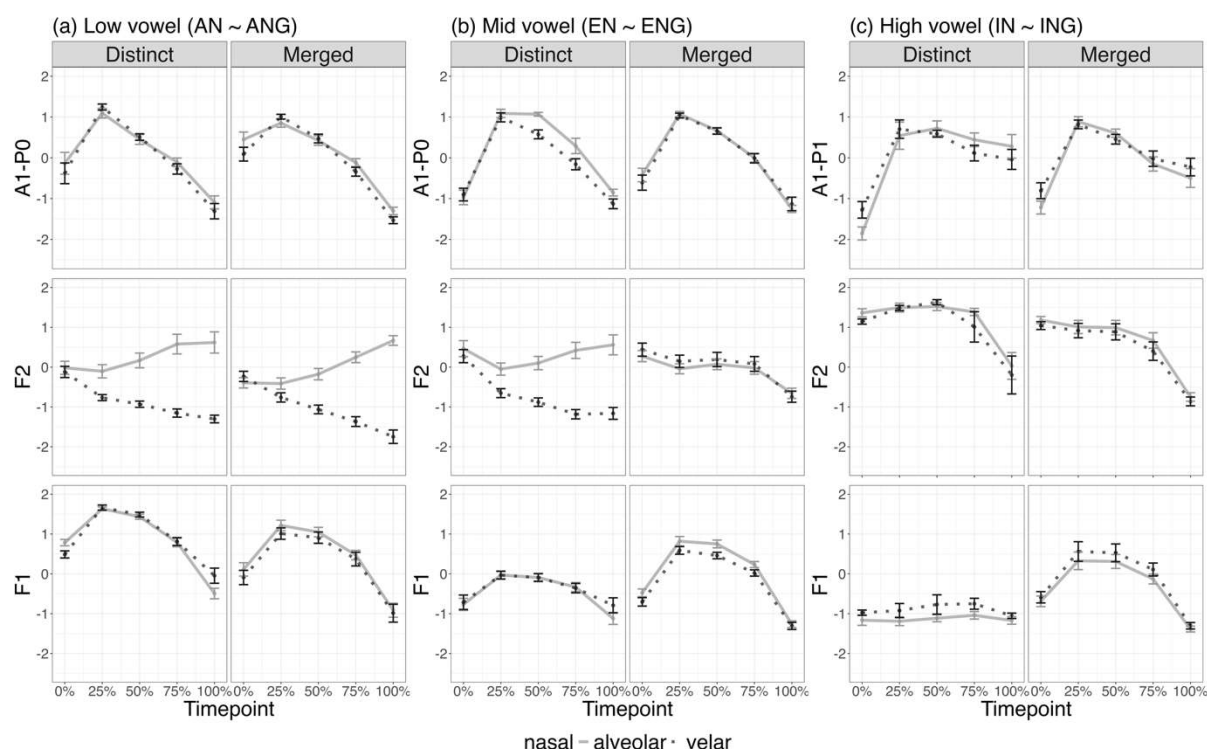


Figure 1. By-subject mean values ($\pm$ SE) of vowel nasalization (top), F2 (middle), and F1 (bottom) preceding alveolar (grey solid) vs. velar (black dotted) nasals, measured at five temporal points across the vowel. Results are shown separately for the two speaker groups (distinct vs. merged) and by vowel contexts.

References

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