To epenthesize or not? Adaptations of English coda [m] in Standard Mandarin loanwords

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This paper examines when and why English [m] is or is not adapted with an epenthetic vowel in Standard Mandarin (SM) loanwords (e.g. *Beckham* → *[pei.kʰɤ:.han.mu:]*, *Walmsley* → [wei.*mu*:.sɤ:.li:] vs. *Columbia* → *[ke.lun.pi:.ja:]*). [m] is illicit in coda position in SM, but in order to to fulfill the SM phonotactic constraints, SM speakers have three possible repair strategies: [m]→[n]/[ŋ] place of articulation alternation (POA), [m] deletion, and vowel epenthesis. We propose an analysis based on SM speakers' perception and their native phonology to account for the following three cases of SM loanword adaptation of English [m] in different phonological environments: a) when the English [m] is adapted with vowel epenthesis, b) when it is adapted with [m] POA, and c) when it is variable. We identify the conditioning factors are based on the syllable position and phonological environment of [m] in English.

Data & Generalizations By looking at English [m] in two corpora (an English-Chinese dictionary and Google Maps) consisting of more than 4500 proper nouns, including American and British given names, surnames, and place names, we identify that vowel epenthesis appears in SM loanwords when [m] is in word-medial and word-final coda positions or in monosyllabic words in English (in (1)). However, there are exceptions. When English coda [m] is in a homorganic environment such as [m.b] or [m.p] vowel epenthesis never occurs. Instead, [m] POA occurs. This happens to word-medial codas and syllable final consonant clusters (in (2)). In addition, when the pre-[m] vowel is long or a diphthong, even in a homorganic environment, [m] is adapted with vowel epenthesis (in (3)). Variable adaptation occurs when [m] is adjacent to other stops (in (4)).

(1) Vowel epenthesis: word-medial, word-final coda, and monosyllabic words.
Camrose → *[kʰa:.mu:.lʷo:.sɤ:]*
Plimsoll → *[pʰi:.li:mu:.sʷo:.ər]*
Tom → *[tʰaŋ.mu:]*

(2) [m] POA: [m] in a homorganic environment.
Columbia → *[ke.lun.pi:.ja:]* (word-medial coda)
Olympia → *[ao.lin.pʰi:.ja:]* (word-medial coda)
Camp → *[kʰan.pu:]* (word-final consonant cluster)

(3) Vowel epenthesis: [m] in a homorganic environment when the previous vowel is long.
Shaumberg →*[ʂau.mu:.pau]*
Bloomfield → *[pu:.lu:mu:fei.ər.tə]*

(4) Variable adaptation: [m] in non-homorganic environment.
Camden → *[kʰa:.mu:.təŋ]~[kʰən.tun]*
Binghamton → *[pin.han.mu:.tun]~[pin.han.tun]*

In the corpora, we also find that when [m] in English is ambisyllabic, nasal insertion occurs, e.g. *Sammy* → *[ʂan.mi:], sauna* → *[saŋ.na:]* and the place of the inserted nasal, in most cases, agrees on the backness with its preceding vowel in English (cf. Hsieh, Kenstowicz & Mou 2009). Moreover, the epenthetic vowels are all [+round], [u] in most cases, and [o] in only two words.

Proposed Analysis Vowel epenthesis after [m] in SM loanwords is motivated by SM phonology to fix the illicit [m] in coda position in SM. In addition, vowel epenthesis improves the perceptual similarity between the English inputs and the SM loanword outputs. We proposed that among the three possible repair strategies, deletion is not chosen due to the need for segment preservation (Paradis and LaCharité 1997). The reason [m] POA change is not adopted in most

coda positions is that the produced outputs are less phonetically similar to forms repaired with vowel epenthesis. We argue that vowel epenthesis after [m] is used to match the perceived consonant release (Kang 2003, Peperkamp, Vendelin & Nakamura 2008) in word-medial and word-final positions, given the fact that they are acoustically similar. In English, a sequence of stops is produced with a gestural overlap (i.e. [m.p]/[m.b]), such that there is no audible release for the first stop (Henderson & Repp 1982, Browman & Goldstein 1990). Hence, vowel epenthesis never occurs in a homorganic environment when the preceding vowel is not long.

However, when the pre-[m] vowel is long or a diphthong, epenthesis still occurs, despite satisfying the homorganic condition. We propose that SM speakers tend to keep the vowel duration to fulfill the μμ-syllable constraint (Duanmu 2007) and resyllabify the English coda [m] with an epenthetic vowel. In these cases, vowel epenthesis does not fix the illicit coda but fixes the illicit onset clusters or illicit consonant sequences in SM.

Variable adaptations occur due to the weak release or no audible release after the coda consonant in consonant sequences. Coda consonants may or may not be released (Malécot 1958, Selkirk 1982, Crystal & House 1988), or depending on the following consonant, have various degree of release in English (Davidson 2011). Hence, speakers are indeterminate with the release cue. When the input is perceived with different degrees of consonant release, the SM loanwords are produced in two ways—with and/or without vowel epenthesis ([m] POA).

We have also run three experiments, online adaptation, rating, and ABX tasks, on monolingual Mandarin speakers to verify the proposed analysis. With a full analysis pending, the preliminary findings suggest the trend in the right direction.

Conclusion The proposed analysis captures the important generalizations from the current corpora. Vowel epenthesis is adopted for syllable repair/phonological reasons. However, we also propose that the appearance of the epenthetic vowel is due to the fine phonetic cue in English and speakers' perception, i.e. the vocalic-like release after English coda [m] is perceived as a vowel. To promote the perceptual similarity between the English input and the SM loanword output, vowel epenthesis is adopted as a syllable repair. [m] POA in homorganic cases is also motivated to improve perceptual similarity as well as repairing the illicit syllables.

This study provides additional evidence that loanword adaptations originate in perceptual assimilation that maps the non-native sounds and structures at the perceptual level onto the phonetically closest native sounds while involving speakers' native phonological knowledge.

Selected References

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