The role of lexical tone in bilingual language processing

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In the bilingualism literature, cross-language activation has been demonstrated to support the phenomenon that bilinguals can't simply shut off the language not-in-use when they are processing the other language. Cross-language activation can be driven by two sources of information: phonological overlap or automatic/implicit translation. For instance, when Russian-English bilinguals were listening to the word 'marker' in English only, their Russian word 'marku' was activated as well [1]. This cross-language activation was driven by between-language phonological overlap (i.e., 'marker' in English and 'marku' in Russian are phonologically overlapped to some extent). In addition, automatic/implicit translation was first demonstrated in ERP measures by Thierry and Wu (2007) [2]. In their study, Chinese-English bilinguals showed priming effects between 'ham' and 'train', which was absent in native English speakers. This effect was attributed to the shared Chinese character /huo/ in the translations of 'ham' and 'train'. The current project seeks to understand the role of lexical tones in cross-language activation through both mechanisms: phonological overlap and automatic/implicit translation.

In the literature of Mandarin spoken word recognition, lexical tones are mostly considered as important as segments and share similar time course during lexical activation [3]. However, little is known about the status of lexical tone in bilingual language processing. In a recent effort to investigate the role of lexical tone in automatic/implicit translation, Wang et al. (2017) demonstrated that Mandarin-English bilinguals were able to activate 'feather' when listening to 'rain' in English only, using the visual world paradigm [4]. This cross-language effect was attributed to the activation of the Mandarin translation (e.g., /yu3/) of 'rain', which subsequently activated 'feather' whose Mandarin translation is also /yu3/. Importantly, this effect was absent in 'fish' whose Mandarin translation is /yu2/. This contrast showed that lexical tones were critical in cross-language activation. That is, lexical tones were activated during the implicit access to L1 Mandarin when bilinguals were processing their L2 English only.

What about the role of lexical tone in cross-language activation when the input shares similar segmental information with the non-target language (i.e., phonological overlap)? First, we report results from two auditory lexical decision tasks where we instructed Mandarin-English bilinguals to decide whether the sound they heard was a real word or not in English. We manipulated two conditions: inter-lingual homophones (e.g., 'bay' sounds similar to Mandarin /bei4/) vs. non-inter-lingual homophones, as well as controlling other psycholinguistic lexical variables in Experiment 1. Stimuli were recorded by a native English speaker. We didn't find any difference between these two conditions for Mandarin-English bilingual listeners. This means that Mandarin lexicon was not activated with phonological overlap. In Experiment 2, we superimposed Mandarin tones onto English monosyllabic words, the same stimuli used in Experiment 1, we found significant delay in processing inter-lingual homophones by bilinguals. This suggests that Mandarin words were activated to induce lexical competition and this cross-language effect was driven by phonological overlap only with the presence of lexical tones.

However, tonal superimposition creates unnaturalness in the spoken stimuli and affects the comprehension behaviour of bilingual listeners in an unknown way. In Experiments 3 and 4,

to avoid these methodological caveats, we only employed Mandarin words in Tone 4, which sound equivalent to English words pronounced naturally in a falling pitch. We created naturally produced spoken stimuli in English and Mandarin by natives but also controlled other psycholinguistic variables so that words in English and Mandarin were matched with each other for comparison. Similar to Experiment 1 and 2, we employed two auditory lexical decision tasks to compare the difference between inter-lingual homophones and non-inter-lingual homophones: one exclusively in English (Experiment 3, e.g., 'bay' as the inter-lingual homophone) and the other exclusively in Mandarin (Experiment 4, e.g., '/bei4/ as the inter-lingual homophone). If bilingual listeners were sensitive to the pitch contours associated with syllables that are meaningful in Mandarin, we would observe inhibition for inter-lingual homophones due to lexical competition. However, we didn't observe inhibition on the inter-lingual homophones in the English task. That is, the falling pitch in naturally produced English stimuli was not sufficient to induce lexical competition from Mandarin, even though they sound like Mandarin Tone 4. In the Mandarin task, we observed inhibition on the inter-lingual homophones as what we predicted as a result of lexical competition. That is, Mandarin /bei4/ activated English 'bay', but not the other way around. This asymmetry suggests that bilingual listeners were able to restrict lexical activation to English only in Experiment 3 when the acoustic alignment between tones and segments was not native-like. In Experiment 4, when bilinguals were processing their L1 Mandarin only, phonological overlap activated their L2 at the segmental level. This is consistent with the literature, as a result of cross-language lexical competition. Again, these results support the claim that lexical tones are critical in activating Mandarin lexicon during cross-language activation. We will discuss these results in relevant bilingual models.

References

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