Development of Sensitivity to Prosodic Phrasal Boundaries in a Second Language

This study explores whether Cantonese-speaking learners of English can develop a native-like mechanism for identifying prosodic phrasal boundaries in English—an essential cue for syntactic processing that aligns with syntactic boundaries in English. Specifically, we investigate whether these second language (L2) speakers can acquire native-like sensitivity to phrasal stress, which appears to be the most reliable prosodic cue to mark phrasal boundaries in English (e.g., Truckenbrodt, 2006; Werner et al., 2022). Since Cantonese does not use phrasal stress as a boundary marker, it remains an open question whether Cantonese speakers can ultimately learn to use phrasal stress to recognize prosodic phrasal boundaries in English.

To address this question, we measured the Closure Positive Shift (CPS)—an ERP component known to reflect sensitivity to prosodic phrasal boundaries (Steinhauer et al., 1999). The CPS has been shown to reflect boundary sensitivity not only in language comprehension, but also in contexts where only prosody is perceivable (and even during music listening), suggesting that CPS reflects a domain-general mechanism for perceptual chunking (e.g., Gilbert et al., 2015). We hypothesized that native English speakers would show CPS in response to phrasal stress cues in both English comprehension and prosody-only contexts. In contrast, we predicted that Cantonese speakers may show CPS only in the prosody-only context. Our rationale is that while Cantonese speakers are likely capable of using phrasal stress for general perceptual chunking, such as in music, they may struggle to apply it during linguistic comprehension, where additional processing demands, such as syntax and semantics, come into play. We further hypothesized that higher proficiency in English might mitigate this challenge.

The study included native English speakers (n = 30), high-proficiency Cantonese learners of English (n = 30), and moderately proficient learners (n = 27). L2 proficiency was classified based on English scores from the Hong Kong college entrance exam, representing approximately the top 10% and top 10–30% of scores. Participants completed a two-session auditory sentence comprehension task on the same day while their EEG waveforms were recorded. In Session 1 (lexical condition), they heard sentences with or without phrasal stress, which was manipulated by changing the level of intensity using Praat. Phrasal stress was superimposed on the rightmost part of each major syntactic phrase as an 8 dB intensity boost. Each word in a sentence was generated individually using Amazon Polly, then combined and normalized for amplitude and length using Praat. As Table 1 shows, the noun in the critical region ended with the plural *-s* in the condition with phrasal stress, while it ended with the possessive *-s* in the condition without phrasal stress. This manipulation made the two types of sentences identical except for the presence of absence of phrasal stress up until the critical region. In Session 2 (muffled condition), they listened to unintelligible, muffled sentences derived by low-pass filtering the sentences from the first session at 800 Hz. This manipulation preserved phrasal stress patterns, while excluding two crucial components for language comprehension: syntax and semantics.

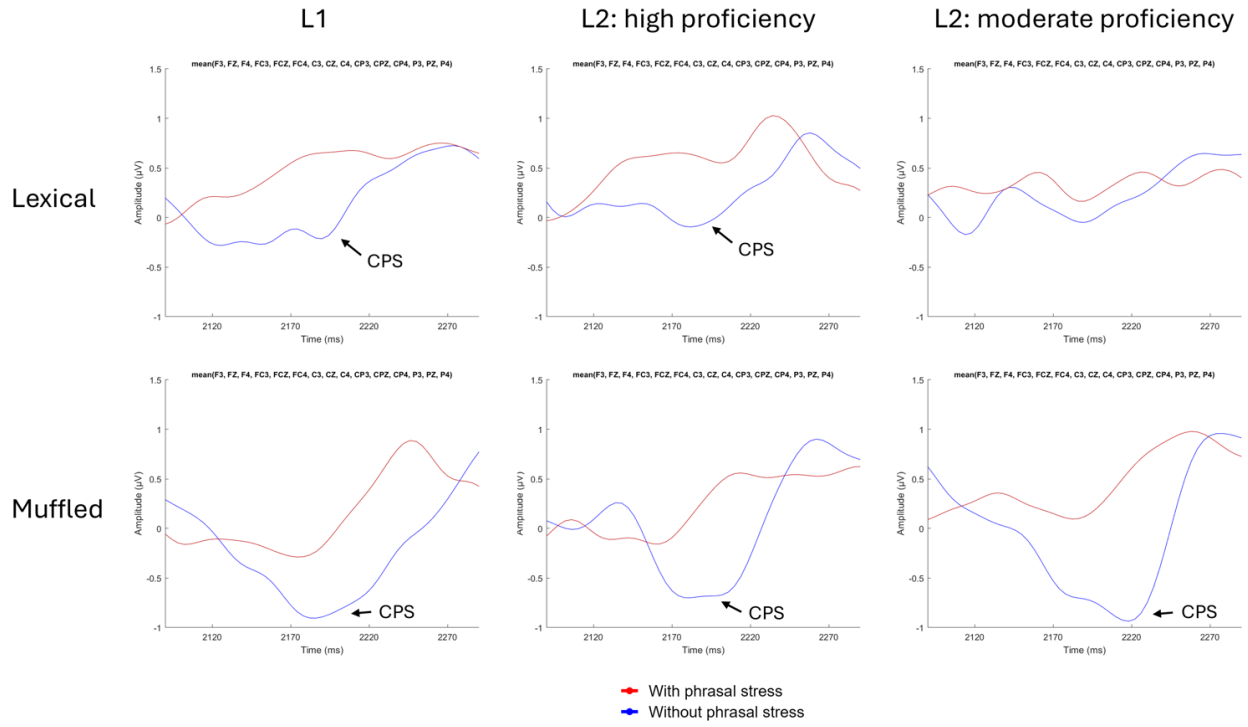
As Figure 1 shows, our analysis revealed a significant increase in positivity in the With-Phrasal-Stress condition compared to the Without-Phrasal-Stress condition (i.e., CPS effects) across both lexical and muffled contexts for the L1 group ($t(1796) = 7.79$, $p < .001$, $d = 0.37$; $t(1796) = 9.13$, $p < .001$, $d = 0.43$) and the advanced L2 groups ($t(1796) = 6.70$, $p < .001$, $d = 0.32$; $t(1796) = 4.76$, $p < .001$, $d = 0.22$). In contrast, the less advanced L2 group exhibited a CPS effect in the muffled condition, $t(1676) = 10.29$, $p < .001$, $d = 0.50$, but not in the lexical condition, $t(1676) = 2.33$, $p = .12$, $d = 0.11$. These findings indicate that the less advanced L2 group has not yet developed native-like sensitivity to phrasal stress boundaries during language comprehension—a sensitivity observed in the L1 and high-proficiency L2 groups—although they are sensitive to phrasal stress boundaries in isolation. these findings suggest that Cantonese speakers face challenges incorporating sensitivity to phrasal stress boundaries into English sentence comprehension, likely due to the absence of this prosodic cue in Cantonese sentence processing. However, the results from the high-proficiency group indicate that this cross-linguistic difference can be overcome with increased L2 proficiency.

Table 1. *Experimental Design*

				With Phrasal Stress Condition						
Lexical Condition	**Kate**	found	that	the	**spies**	fell	on	the	**ground.**	
				Without Phrasal Stress Condition						
	Kate	found	that	the	spy's	**gun**	fell	on	the	**ground.**
				With Phrasal Stress Condition						
Muffled Condition	~~**Kate**~~	~~found~~	~~that~~	~~the~~	~~**spies**~~	~~fell~~	~~on~~	~~the~~	~~**ground**~~	
				Without Phrasal Stress Condition						
	~~**Kate**~~	~~found~~	~~that~~	~~the~~	~~spy's~~	~~**gun**~~	~~fell~~	~~on~~	~~the~~	~~**ground**~~

Note. Words with phrasal stress are in boldface, and critical regions are shaded grey. Words with strikethrough indicate that they are muffled.

Figure 1. *Closure Positive Shift (CPS) Waveforms across Experimental Conditions for Each Language Group*



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