Speaker's Demographic Background Modulates Listener's Neural Correlates of Spoken Word Processing

Introduction

During language comprehension, listeners expect a speaker to be consistent in their word choice for the same concept (Brennan & Clark, 1996). For instance, if a speaker previously refers to a piece of furniture as a *couch*, in subsequent references, listeners would expect the speaker to repeat this label (*label repetition*) instead of switching to an alternative label such as *sofa* (*label switching*, Kronmüller & Barr, 2007). Additionally, it has been found that the demographic background of the speaker influences listeners' neural responses to speech in the context of a sentence (Van Berkum et al., 2008). Therefore, our question is whether the influence of the speaker's demographic background extends to how listeners respond to the speaker's linguistic behaviour, such as label switching, where no sentence context is present.

Method

In this study, we used event-related potentials (ERPs) to investigate whether listeners expect label repetition to a higher degree from a child speaker than from an adult speaker, given the common belief that a child, having a smaller vocabulary, would exhibit less flexibility in label use than an adult. In the experiment, we used 80 pictures with alternative labels in Mandarin Chinese (e.g., *yi₁ sheng₁* vs *dai₄ fu*, "doctor"). Each picture was presented twice over two experimental phases: in the establishment phase, participants listened to an adult/child naming a picture with one of the labels and decided whether the label matched the picture they saw; in the test phase, participants listened to the same speaker naming the same picture either using the original label or switching to an alternative label and, again, decided whether the label matched the picture they saw.

Results

Trial-level linear mixed effect models of ERP revealed that, compared to the repeated label (coded as -0.5), the switched label (coded as 0.5) elicited a larger negative deflection and a larger positive deflection in the time windows of 300-600 ms (β = -0.49, $p < 0.001$) and 600-1000 ms (β = 0.57, $p < 0.001$) respectively after the audio onset, indicating participants' expectation of label repetition. Critically, in the 300-600 ms time window, the deflection was larger when the listeners were exposed to the child (coded as 0.5) speaker than to the adult (coded as -0.5) speaker (β = -0.40, p = 0.004), suggesting that the speaker's demographic background modulated the degree of listeners' expectation of label repetition. No such difference was observed during the 600-1000 ms time window (β = -0.27, p = 0.288).

Conclusion

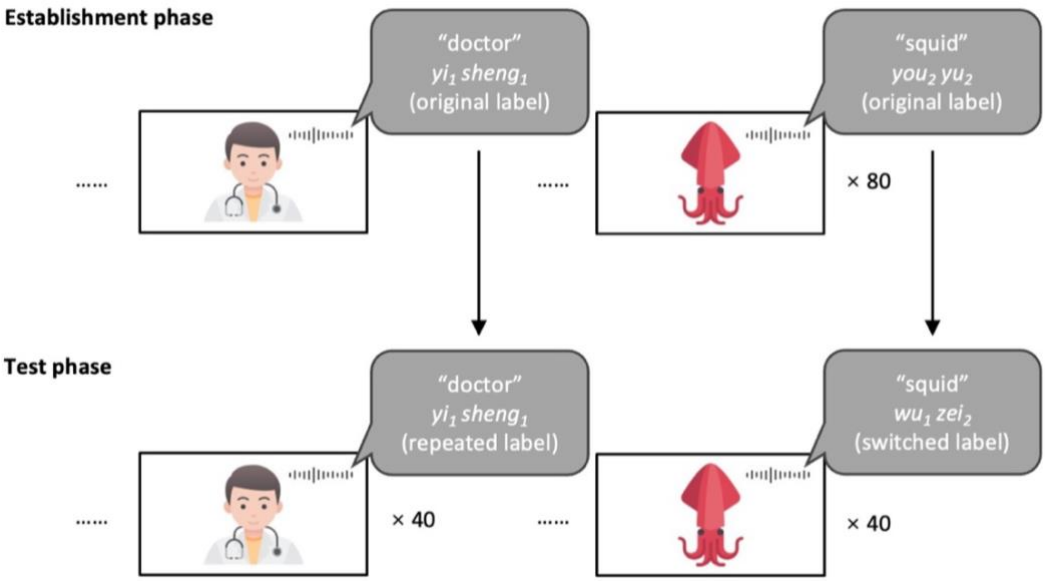
Our study demonstrates that the speaker's demographic background modulates listeners' neural correlates of spoken word processing. Specifically, it influences how listeners expect the speaker's linguistic behaviour of label switching, where isolated object labels are presented without a sentence context. This finding contributes to a broader understanding of the interplay between social cognition and language processing.

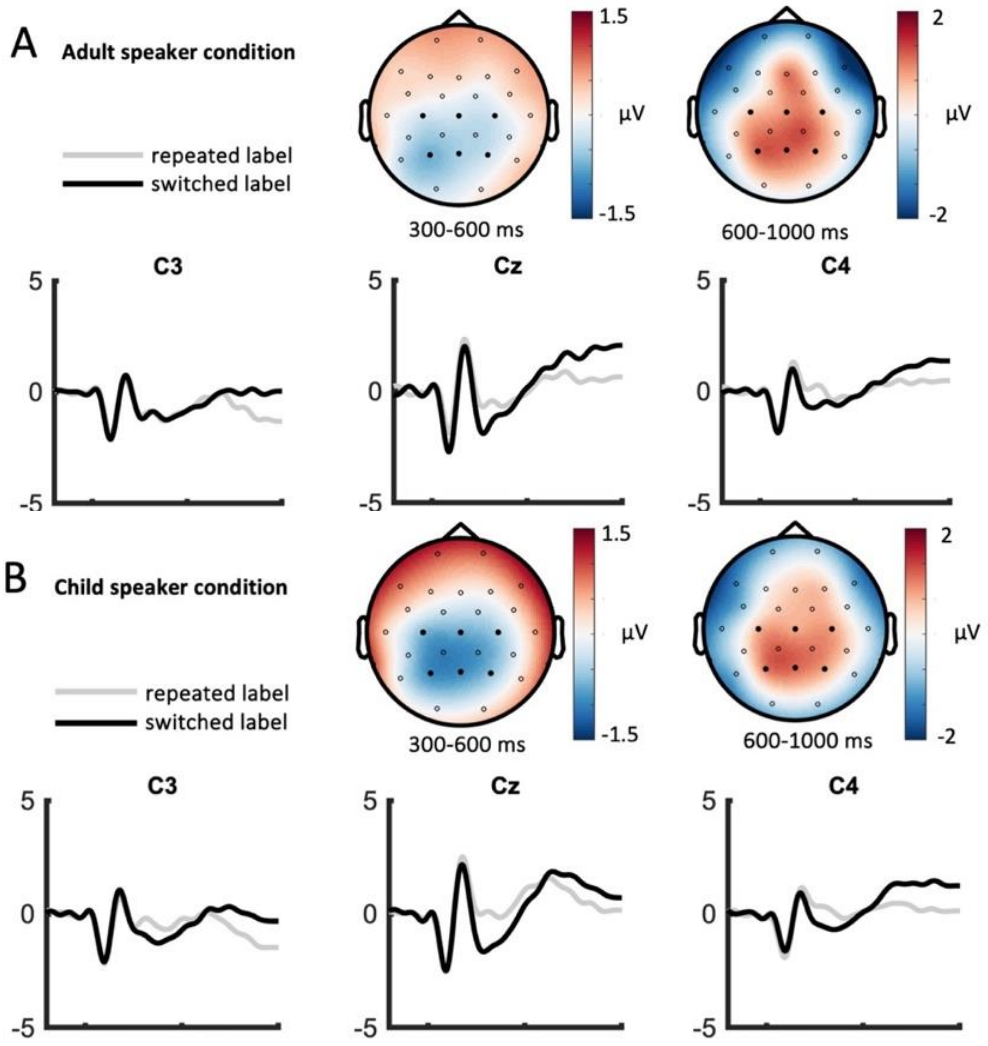
Reference

Brennan, S. E., & Clark, H. H. (1996). Conceptual pacts and lexical choice in conversation. *Journal of Experimental Psychology: Learning Memory and Cognition, 22*(6), 1482–1493.

Kronmüller, E., & Barr, D. J. (2007). Perspective-free pragmatics: Broken precedents and the recovery-from-preemption hypothesis. *Journal of Memory and Language, 56*(3), 436–455.

Van Berkum, J. J. A., Van Den Brink, D., Tesink, C. M. J. Y., Kos, M., & Hagoort, P. (2008). The neural integration of speaker and message. *Journal of Cognitive Neuroscience, 20*(4), 580–591.


Establishment phase
"doctor"
$yi_1\ sheng_1$
(original label)
"squid"
$you_2\ yu_2$
(original label)
× 80
Test phase
"doctor"
$yi_1\ sheng_1$
(repeated label)
"squid"
$wu_1\ zei_2$
(switched label)
× 40
× 40


A Adult speaker condition
repeated label
switched label
300-600 ms
600-1000 ms
1.5
-1.5
2
-2
μV
C3
Cz
C4
5
0
-5
B Child speaker condition
repeated label
switched label
300-600 ms
600-1000 ms
C3
Cz
C4