At What Cost? Comprehension of Habitual Code-Switching Modulated by Language Experience and Cultural Identity

Introduction. The present study examined how language context impacts the processing of code-switching. Traditional psycholinguistic research (Costa & Santesteban, 2004; Meuter & Allport, 1999) suggested that language switching is cognitively demanding. However, recent experimental evidence (Adamou & Shen, 2019; Hui et al., 2022) indicates that code-switching does not impose substantial cognitive demands within a habitual language context. Moreover, individual differences, such as interactional context (Beatty-Martínez et al., 2020) and cultural identity (Treffers-Daller et al., 2020), have been found to modulate processing costs. The current study asks if code-switching is cognitively demanding in a habitual language context and examines how the modulation of cognitive demand varies as a function of cultural identity and language experience.

Method. 126 adult Cantonese-English bilinguals (72 female, age_{mean}= 27.63 years) with diverse language experience participated in the experiment, categorized into three groups: Heritage speakers of Cantonese (*n* = 40), born and raised in the U.S; homeland bilinguals (*n* = 39), born and raised in Hong Kong; and immersed bilinguals (*n* = 47), born and raised in Hong Kong but relocated to the U.S as adult immigrants or international students.

Bilinguals participated in an auditory code-switching sentence judgment experiment on FindingFive (FindingFive Team, 2019), wherein they listened to sentences, judged the naturalness of the sentences, and subsequently answered a comprehension question. Auditory stimuli were manipulated based on two variables: *Habit* and *Code-Switch*. *Habit* had two conditions: The *Habitual* condition (1a & 1b) presented a target word in the expected language, determined through a separate norming task (Hui et al., 2022). The *Non-Habitual* condition (2a & 2b) presented the target word in an unexpected language. *Code-Switch* also had two conditions: The *Code-Switched* (CS) condition (1b & 2b) involved a code-switched English word in a Cantonese matrix sentence, and the *Non-Code-Switched (Non-CS)* (1a & 2a) condition referred to the context with no code-switching. Response times to the naturalness judgment were measured. In addition to the main experiment, participants completed questionnaires on identity, code-switching, and language use, a verbal fluency task to assess language dominance, and an AX-continuous performance task (AX-CPT) to assess proactive and reactive cognitive control.

Results. Linear Mixed-Effects Modeling (Bates et al., 2015) indicates that response times (RT) (ms) varied as a function of Code-Switch (β = -3.03, *SE* = 0.04, *t* = -7.48, *p* < .001) and Habit (β = -1.04, *SE* = 0.04, *t* = 2.57, p < .05), with an interaction between the two variables. Participants were quicker in habitual and code-switched conditions, and the difference between non-habitual and habitual conditions was more pronounced in the non-CS context (Fig.1). Language experience modulated RT in code-switched contexts, with immersed bilinguals exhibiting the slowest responses (Fig 2). Cultural identity also modulated RT in code-switched contexts**,** as bilinguals with more integrated identities demonstrated faster responses (Fig. 3). Cognitive control did not modulate RT.

Discussion and Conclusion. The findings indicate that code-switching is not cognitively more demanding than not switching, particularly within an ecologically valid habitual language context. In contrast to what previous studies suggest (e.g., Beatty-Martínez et al., 2020), the results did not find a modulation effect of cognitive control on processing. Importantly, both cultural identity and language experience modulated processing, highlighting the significance of considering sociocultural context in bilingualism research.

Table 1. Example sentences for the four experimental conditions

	Habit	Code-Switch	Stimuli
(1a)	Habitual	Non-CodeSwitch	聽日要早起身，就早少少瞓覺休息下啦。 'Since you need to wake up early tomorrow, you should sleep earlier.'
(1b)	Habitual	CodeSwitch	佢下星期生日，不如開個 party 幫佢慶祝？ 'It is their birthday next week. How about we throw a party for him?'
(2a)	Non-Habitual	Non-CodeSwitch	佢下星期生日，不如開個派對幫佢慶祝？ 'It is their birthday next week. How about we throw a party for him?'
(2b)	Non-Habitual	CodeSwitch	聽日要早起身，就早少少 sleep 休息下啦。 'Since you need to wake up early tomorrow, you should sleep earlier.

Fig. 1 Interaction between Code-Switch and Habit

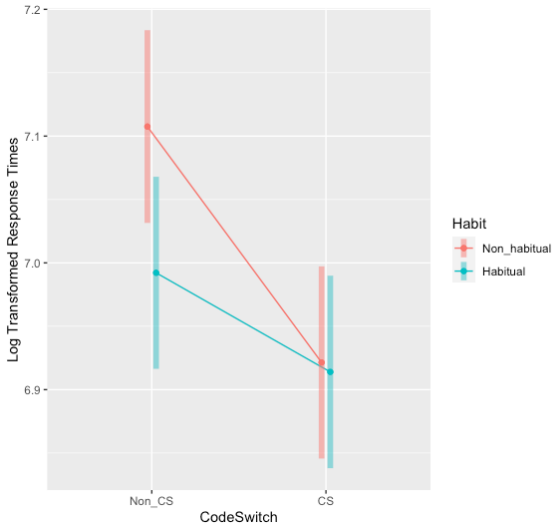


Fig 2. Mean Response Times (ms) in Code-Switched and Non-Code-Switched Conditions by Bilingual Group

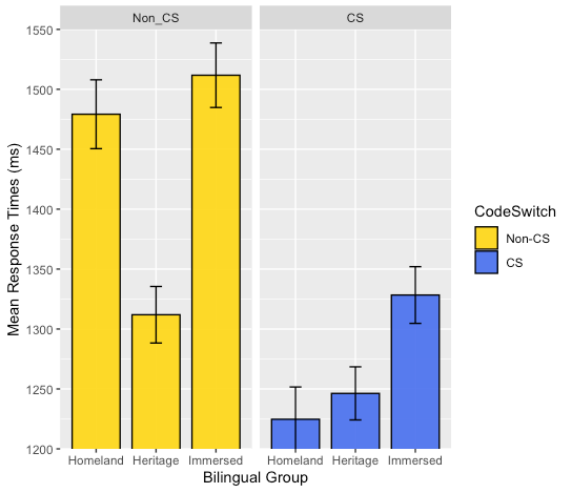
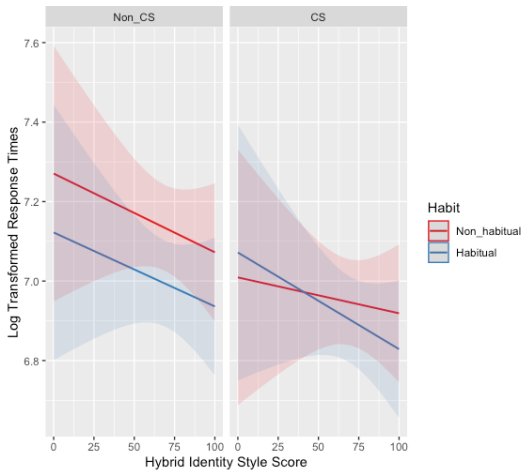


Fig 3. Prediction of Response Times (log transformed) with the Interaction between the Hybrid Identity Style Score, Habit, and Code-Switch



Selected references:

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