**Gendered and Genderless: The mental organization of Chinese personal pronouns**

Personal pronouns across languages differ greatly in various aspects, such as gender, case, person and number, even though they roughly share the same function of making anaphoric reference. In English, "he" denotes a male and "she" denotes a female, and the two have distinct pronunciations. However, in spoken Mandarin, only "ta" is used as a third-person singular pronoun, regardless of its referent's gender and animacy. Written Mandarin, however, distinguishes gender by two characters, "他"(male) and "她"(female)(1), which correspond to "he" and "she" in English, respectively. In Cantonese, a variety of Chinese spoken in Hong Kong, both the written and the spoken forms employ the word "佢 keoi"(2) as the third-person singular pronoun. Thus, in Cantonese, gender is not marked in both modalities, unlike Mandarin. In other words, Cantonese and Mandarin are different from English due to the absence of gender specification in personal pronouns.

It has been observed that native speakers of Mandarin and Cantonese, even those who are proficient in English, often make gender pronoun mistakes in oral English (Dong et al., 2014; Dong & Jia, 2011), i.e., using "he" to refer to females and "she" for males. This error may be due to L1 (Chinese)'s influence on L2 (English)(see Roberts, Gullbery & Indefrey (2008) for the influence of L1 Turkish, a null subject language, on the interpretations of subject pronouns in L2 Dutch, a non-null subject language). However, what causes the gender error in Chinese-English bilingual speakers is not yet clear.

Dong et al. (2014) suggest that this error is a deficiency of biological gender processing in the conceptualizer of Chinese speakers. In a self-paced English reading experiment, native English speakers showed longer reading time on pronouns that mismatched their antecedents' genders than those that matched, i.e., the gender mismatch effect. For instance, consider the sentence "Mark goes to the zoo to watch animals every day after work for a good rest". For English speakers, the reading time is faster if the above is followed by another sentence starting with "he", a matching pronoun (e.g., "He considers it the best way to relax."), rather than "she", a mismatched pronoun (e.g., "She considers it the best way to relax."). Dong et al. (2014) did not observe the same mismatch effect in Chinese native speakers. The gender mismatch effect only appeared when the antecedents' genders were emphasized by the presentation of congruent human pictures. The authors then suggested that the reason for the initial absence of the

mismatch effect was because Chinese speakers do not process gender information in the antecedents. That is, the error occurs on the conceptual level. In line with Dong et al.'s results, Cheung (1994) also suggests that such errors occur because "他" (he) and "她" (she) share the same semantic and phonological access codes. In her study, Cheung (1994) asked 60 children to read aloud sentences with two antecedents, followed by a pronoun that either matched or mismatched the target antecedent's gender. Then, she asked questions that tested the children's ability to make anaphoric reference. Although the children showed that they were aware of the gender distinction between "他" and "她", there was no significant effect of gender cues on accuracy.

However, the conclusions of Dong et al. (2014) and Cheung (1994) do not fare well with ERP results. Recent ERP studies have shown both N400 and P600 effects, indicating that Chinese speakers detect both semantic and syntactic violations in different situations of gender mismatch (Qiu et al., 2012; Xu et al., 2013). For example, when the gender mismatched pronoun occurs in the clause or sentence immediately after the antecedent (e.g, "這位女患者情緒低落，醫生鼓勵他振作起來。This female patient was in low spirits, the doctor encouraged him to cheer up."), Qiu et al. (2012) found the N400 effect, which is associated with semantic violation. Similarly, Xu et al. (2013) found both the N400 and P600 effects, which indicate detection of both semantic and syntactic violations. Thus, the results of Dong et al. (2014) and Cheung (1994) are not consistent with ERP results. Moreover, Dong et al.'s (2014) conclusions imply that Chinese speakers should make fewer errors when the referent is physically present than when they are not, as they are constantly prompted by the gender information from the appearance of their interlocutors, making gender errors easier to detect. However, this does not seem to be true.

In order to understand the nature of the bilingual gender error, the present study aims to first address the question of how Chinese speakers represent and process Chinese pronouns. The current study focuses on the syntactic gender specification in third-person singular pronouns in Chinese. The current work addresses the research question with two aims. The first aim is to call into question the assertion that there is a deficiency in biological gender processing for linguistic purposes in Chinese native speakers, as suggested by Dong et al. (2014) and Cheung (1994). We aim to test whether the absence of the mismatch effect found in English is also observed in Chinese in a self-paced reading study. If Chinese speakers do show the gender mismatch effect, we can reject Dong et al. (2014) and Cheung's (1994) claim that shared semantic entries and a

gender processing deficiency in the conceptualizer of Chinese speakers cause the bilingual gender error. The results will shed light on the mental representation of gender specification in Chinese pronouns.

The second aim is to suggest an alternative account of the previous experimental results under a production model suggested by Bock & Levelt (1994). According to the model, information in the mental lexicon is stratified into three levels of representation—the conceptual level containing semantic information, the lemma level carrying syntactic information, and the lexeme level involving morphological and phonological information. We aim to investigate whether there are shared or distinct entries on the lemma level for Chinese pronouns. Written forms of pronouns in Mandarin and Cantonese are different in terms of pronunciations and orthography. Thus, by testing gendered written Mandarin "他 (he)" (1a) and "她 (she)" (1b) and genderless written Cantonese "佢" (2), we aim to manipulate gender specification at the lemma level. Example (1) below shows the gendered Mandarin pronouns for male (a) and female (b), which share the same pronunciation; (2) shows the genderless Cantonese pronoun, which has a different pronunciation from the examples in (1). The lemma level manipulation will address the question of whether gender specification constitutes multiple entries at the lemma level.

We aim to measure reading times in the Chinese self-paced reading experiment. If Chinese speakers show the gender mismatch effect, the results will support that there are multiple lemma entries for third-person singular pronouns in Chinese. We expect that they will show the gender mismatch effect, that is, Chinese speakers will have longer reading times in the mismatched gendered condition than the matching gendered condition, in line with the results of ERP studies.

1. (a) 小明 到達 後， 他 坐 在 沙發 上。(Written Mandarin)
Siu Ming arrive after 3.M.SG sit at sofa above
"After Siu Ming arrived, he sat on the sofa."

(b) 小麗 到達 後， 她 坐 在 沙發 上。(Written Mandarin)
Siu Lai arrive after 3.F.SG sit at sofa above
"After Siu Lai arrived, she sat on the sofa."

2. (a) 小明 到達 後， 佢 坐 喺 梳化 上。 (Written Cantonese)
Siu Ming arrive after 3.SG sit at sofa above
"After Siu Ming arrived, he/she sat on the sofa."
(b) 小麗 到達 後， 佢 坐 喺 梳化 上。 (Written Cantonese)
Siu Lai arrive after 3.SG sit at sofa above
"After Siu Lai arrived, he/she sat on the sofa."

*For spoken Cantonese, pronouns are always genderless.

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