Language Co-activation Influences the Development of New Implicit Linguistic Knowledge in Bilinguals

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Psycholinguistic studies have demonstrated that bilinguals are unable to completely 'switch off' their non-current language(s) in real-time processing, but whether the activation of non-current language affects the *development of new implicit linguistic knowledge* remains an empirical question. This contribution reports two artificial language learning experiments adapted from Leung and Williams (2014) to address this research gap.

In experiment 1, participants were incidentally exposed to novel mappings between artificial articles (*gi*, *ro*, *ul*, *ne*) and fire/water semantic categories (e.g. *gi* and *ul* went with water-related words; *ro* and *ne* went with fire-related words), which was unbeknownst to participants. Two groups of participants were recruited: [1] thirty Cantonese-English bilinguals, whose L1 writing explicitly encodes fire/water semantic categories in phono-semantic compounds (e.g. the semantic radical 氵 in 河 (*river*) denotes 'water', whereas 火 in 炸彈 (*bomb*) denotes 'fire'), and [2] thirty native English speakers, whose L1 writing rarely encodes fire/water semantic categories explicitly (*waterfall* and *fireball*). In each trial of the experiment which was entirely in English, participants were presented with an article + noun/verb phrase (e.g. *gi shower)*. They first had to decide if the noun/verb was water- or fire-related, and then whether the article indicated a near or far object/action. They were asked to make their decisions as quickly and accurately as possible. As inspired by the serial reaction time task, learning of the target form-meaning mappings was assessed by the differences in accuracy and reaction time for control trials (where the hidden rules were followed) vs. violation trials (where the hidden rules were violated). Due to the difference on how fire/water semantic categories are marked in Cantonese and English, we hypothesized that only the Cantonese-English bilinguals would show implicit learning effects (i.e. significantly higher reaction time and lower accuracy in violation trials than in control trials) due to the covert activation of their non-current L1. However, mixed-effects regression models revealed that both language groups developed implicit knowledge of the target form-meaning connections, providing no conclusive results for our initial hypothesis.

Experiment 2 was conducted to test whether the learning effects obtained in the bilingual group were facilitated by the activation level of their L1 Cantonese. Three new groups of Cantonese-English bilinguals (n=30 in each group) watched different 30-minute videos (in English, Cantonese, or a silent video) before completing the same experimental procedures as in Experiment 1. The aim of presenting a video before the experiment was to manipulate the language activation level of the bilingual participants (Elson-Guttler et al., 2005). Specifically, we expected that the English video would suppress their Cantonese activation, the Cantonese video would increase the activation level of their Cantonese, and the silent video served as a control group. Mixed-effects regression models showed that the learning effects could no longer be found in the English video group, while significant learning effects were found in the silent video and Cantonese video groups.

Results from both experiments demonstrate that activation level of bilinguals' non-current L1 could influence the development of new implicit linguistic knowledge. The findings not only extend current research on semantic implicit learning (Leung & Williams, 2011, 2014), but also suggest that the constant activation of non-current language(s) in bi/multilinguals contributes to the construction of new linguistic representations in second language acquisition and may be the cognitive basis of long-term L1/cross-linguistic transfer effects in SLA.

References

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Figure 1. *Log10RT in Control Trial (CT) and Violation Trial (VT) in Experiment 1.*

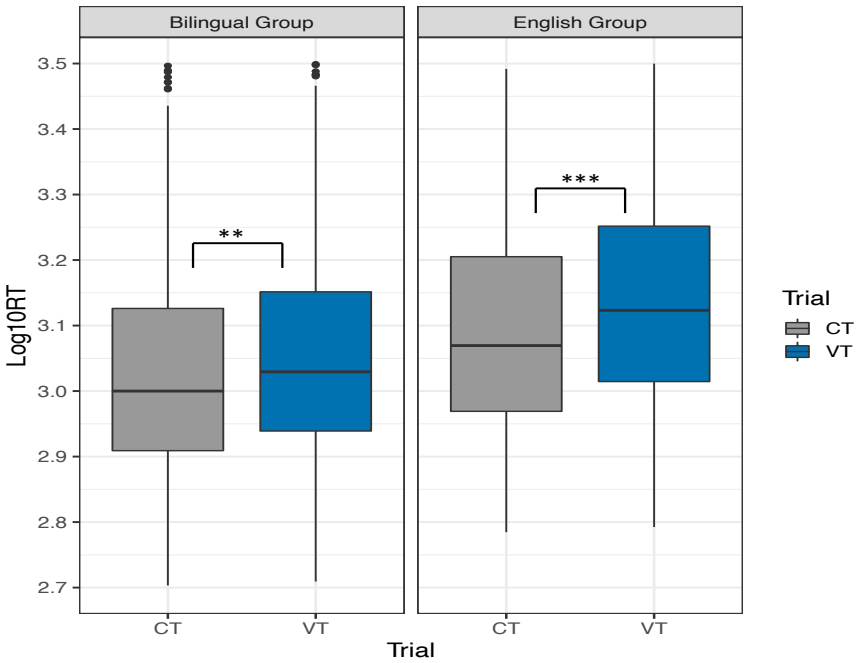
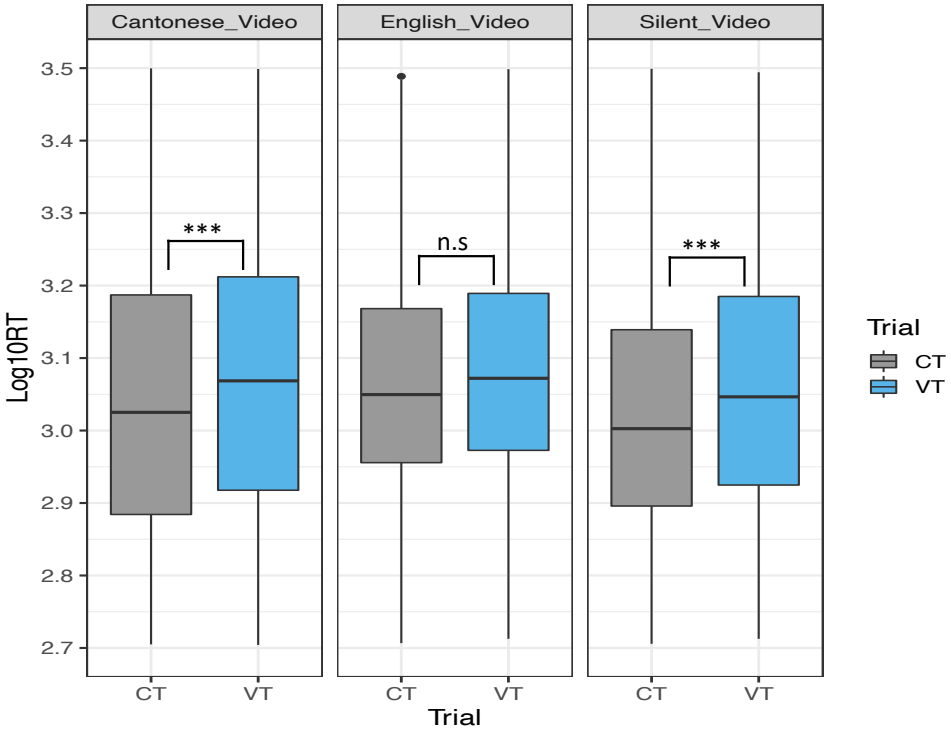


Figure 2. *Log10RT in Control Trial (CT) and Violation Trial (VT) in Experiment 2.*



Semantic Radicals in Chinese

Table 1 shows other fire and water semantic radicals in written Chinese. For example, the radical 灬 in 灼热 'scorching' signifies fire, while 水 in 水色 'aqua' denotes water. Note that all fire- or water-related compounds in Chinese are explicitly marked with these radicals. The presence of such linguistic marking in L1 Cantonese plays a critical role in implicit language learning (Leung & Williams, 2014). Like fire and water categories, long and flat distinctions are also linguistically marked in written Chinese. The classifier 張 is generally used with flat objects (e.g., *photos, blankets*), while the classifier 條 is commonly used with long, thin objects (e.g., *ties, straws*). Critically, this kind of linguistic encoding for long/flat objects does not exist in English. Leung and Williams (2014) found that only native Cantonese speakers learned the mappings between novel articles (e.g., *gi, ro, ul, ne*) and long/flat distinctions (e.g., *gi belt* in the English version; *gi 腰带* 'belt' in the Chinese version), while no learning effect was found for native English speakers. This is the first study that provided evidence that cross-linguistic differences affect implicit language learning. Given these findings, we also hypothesized that the presence of fire and water linguistic marking in L1 Cantonese will facilitate the learning of the association between artificial articles and fire/water semantic categories in a novel language, as it will only require Cantonese speakers to create new mappings for categories that are already highly available in their linguistic representation.

Table 1: *Fire and water semantic radicals in Chinese*

Fire	Water
火	水
灬	氵