

Music Reading Expertise Facilitates Implicit Statistical Learning of Sentence Structures in a Novel Language: Evidence from Eye Movement Behavior

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Abstract : Music notation and text reading both involve statistical learning of music or linguistic structures. However, it remains unclear how music reading expertise influences text reading behavior. The present study examined this issue through an eye-tracking study. Chinese-English bilingual musicians and non-musicians read English sentences, Chinese sentences, musical phrases, and sentences in Tibetan, a language novel to the participants, with their eye movement recorded. Each set of stimuli consisted of two conditions in terms of structural regularity: syntactically correct and syntactically incorrect musical phrases/sentences. They then completed a sentence comprehension (for syntactically correct sentences) or a musical segment/word recognition task afterwards to test their comprehension/recognition abilities. The results showed that in reading musical phrases, as compared with non-musicians, musicians had a higher accuracy in the recognition task, and had shorter reading time, fewer fixations, and shorter fixation duration when reading syntactically correct (i.e., in diatonic key) than incorrect (i.e., in non-diatonic key/atonal) musical phrases. This result reflects their expertise in music reading. Interestingly, in reading Tibetan sentences, which was novel to both participant groups, while non-musicians did not show any behavior differences between reading syntactically correct or incorrect Tibetan sentences, musicians showed a shorter reading time and had marginally fewer fixations when reading syntactically correct sentences than syntactically incorrect ones. However, none of the musicians reported discovering any structural regularities in the Tibetan stimuli after the experiment when being asked explicitly, suggesting that they may have implicitly acquired the structural regularities in Tibetan sentences. This group difference was not observed when they read English or Chinese sentences. This result suggests that music reading expertise facilitates reading texts in a novel language (i.e., Tibetan), but not in languages that the readers are already familiar with (i.e., English and Chinese). This phenomenon may be due to the similarities between reading music notations and reading texts in a novel language, as in both cases the stimuli follow particular statistical structures but do not involve semantic or lexical processing. Thus, musicians may transfer their statistical learning skills stemmed from music notation reading experience to implicitly discover structures of sentences in a novel language. This speculation is consistent with a recent finding showing that music reading expertise modulates the processing of English nonwords (i.e., words that do not follow morphological or orthographic rules) but not pseudo- or real words. These results suggest that the modulation of music reading expertise on language processing depends on the similarities in the cognitive processes involved. It also has important implications for the benefits of music education on language and cognitive development.

Keywords : eye movement behavior, eye-tracking, music reading expertise, sentence reading, structural regularity, visual processing

Conference Title : ICMPC 2018 : International Conference on Music Perception and Cognition

Conference Location : Tokyo, Japan

Conference Dates : March 27-28, 2018