

Subcortical restructuring with increasing language experience: insights from bilinguals and trilinguals

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Learning a language is akin to learning a skill, and subcortical structures adapt with increasing language experience and expertise (Hervais-Adelman et al., 2018; Pliatsikas et al., 2017; Berken et al., 2016; Burgaleta et al., 2016). However, the trajectory and limits of these restructuring remain unclear. In support of the Dynamic Restructuring Model (Pliatsikas, 2020), previous findings on bi/multilinguals appear to reflect a process of renormalisation where volumetric expansions that occur during the early stages of additional language learning are followed by contractions to baseline volumes upon acquiring greater adeptness at the skill (DeLuca et al., 2018; Elmer et al., 2014). We obtained T1-weighted images from 14 English monolinguals from the UK, and 14 English-Malay bilinguals and 14 English-Malay-Chinese/Tamil/Japanese/Korean trilinguals from Malaysia. The volumes of subcortical structures were extracted using FSL pipelines and compared across groups. The results revealed significant group differences for all structures except for the caudate nucleus. The accumbens is significantly smaller in monolinguals when compared to bilinguals, but is not different between monolinguals and trilinguals. Monolinguals have significantly smaller volumes than both bilinguals and trilinguals in the hippocampus, putamen, thalamus, pallidum and amygdala. Linear regression models further revealed that more lateralised restructuring occurred for the accumbens, hippocampus and thalamus. These results highlight the dynamic process of subcortical restructuring, and more specifically supports the concept of structural renormalisation with increasing language experience. Additionally, structures with roles in language processing and production, and higher-order cognition such as executive control, memory and learning seem to be the quickest to renormalise. This may be attributed to similar cognitive demands involved in controlling and processing additional languages (Kroll et al., 2014; Bialystok et al., 2012; Abutalebi & Green, 2007).

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