Structural neural correlates of habitual code-switching practices in bilinguals

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Bilingualism impacts brain structure, especially in regions involved in language control and processing. However, existing studies have so far yielded inconsistent results in terms of location and direction of the structural brain changes (Pliatsikas 2020). Although the quantity and the quality of switching between languages has been identified as an important source of variability in the results, crucial evidence linking habitual switching practices and structural brain adaptations is missing. Specific ways how bilinguals code-switch require different levels of cognitive control processes (Treffers-Daller 1991). To this end, engagement in these various code-switching practices can have also variable effects on the brain structure. Here we used structural MRI and non-linear modelling to investigate the effects of habitual code-switching (CS) practices on brain structure among Czech-English bilinguals. We studied the effects of usage frequency of various CS types on the volumes of the caudate nucleus and the thalamus, two subcortical hubs subserving language switching (Abutalebi & Green 2016). The CS types were categorised by directionality (L1-L2 or L2-L1) (Hell, Litcofsky & Ting 2015) and the level of separation of the two languages (Muysken 2013). Volumes of caudate nuclei were positively correlated with overall CS frequency, with stronger effects for switches from L1 to L2. Thalamic volumes were positively correlated with engagement in forms of CS for which the two languages are more separate, with stronger effects for switching from L2 to L1. Taken together, the current findings suggest that engagement in specific code-switching types may condition the observable estimates of brain volumes across bilingual individuals. We will discuss how these results advance existing models on code-switching processing and control, underlining the dynamicity of experience-dependent neuroplasticity. We will argue that language switching practices might be a key to reconciliation of the seemingly contradictory findings in studies on bilingualism-induced brain adaptations.

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