Harmonisation of between-scanner MRI data for longitudinal studies

Longitudinal cohort MRI studies are becoming increasingly popular. In these studies, the same individuals are scanned multiple times over a number of years, or even decades, allowing us to study how their brains change as they develop (e.g. CALM [https://calm.mrc-cbu.cam.ac.uk/]) or age (e.g. CamCAN [https://www.cam-can.org/]). Therefore, such studies can generate extremely rich multi-modal MRI datasets, but there can be significant challenges as well. In particular, the longer the time between multiple scanning time points, the more likely it is that the scanner(s) involved will have been through a number of software and hardware changes, some planned and some unplanned. Even when imaging parameters are matched as closely as possible before and after any scanner changes, significant software or hardware changes will undoubtedly result in differences in data quality. Because these differences are inherently correlated with the changes we are hoping to measure – e.g., the effects of development/ageing in brain structure and function – robust data harmonisation pipelines need to be developed before combining data from multiple scanning time-points. Otherwise we run the risk of over- or under-estimating the magnitude of any effects we find. A number of data harmonisation algorithms for MRI data already exist in the literature (see for example Fortin et al., 2017, and Tax et al., 2019), so the first step for this project will be the evaluation of the different algorithms available using a ‘travelling heads dataset’ (i.e., a dataset where the same people were scanned across two different scanners). Once suitable harmonisation procedures have been identified, either by applying existing algorithms or developing new ones, these methods will then be used to combine multiple scanning time points for existing datasets for the study of brain development and/or ageing.

References and URL(s)

Reference
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5736019/
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