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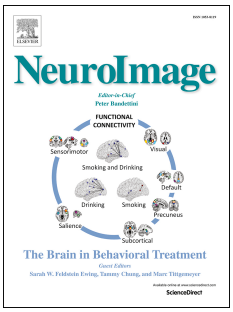

Harmonization of cortical thickness measurements across scanners and sites

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ACCEPTED MANUSCRIPT

Harmonization of cortical thickness measurements across scanners and sites

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Abstract

With the proliferation of multi-site neuroimaging studies, there is a greater need for handling non-biological variance introduced by differences in MRI scanners and acquisition protocols. Such unwanted sources of variation, which we refer to as "scanner effects", can hinder the detection of imaging features associated with clinical covariates of interest and cause spurious findings. In this paper, we investigate scanner effects in two large multi-site studies on cortical thickness measurements across a total of 11 scanners. We propose a set of tools for visualizing and identifying scanner effects that are generalizable to other modalities. We then propose to use ComBat, a technique adopted from the genomics literature and recently applied to diffusion tensor imaging data, to combine and harmonize cortical thickness values across scanners. We show that ComBat removes unwanted sources of scan variability while simultaneously increasing the power and reproducibility of subsequent statistical analyses. We also show that ComBat is useful for combining imaging data with the goal of studying life-span trajectories in the brain.

Keywords: Harmonization, Multi-Site, Cortical thickness, ComBat, Inter-scanner.

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