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NeuroImage Editorial Office

Montréal, July 9th 2016

To whom it may concern,

I am writing on behalf of the co-authors to submit the manuscript «Statistical power and measurement bias in multisite resting-state fMRI connectivity» to your consideration for publication in Neuroimage.

Studies based on connectivity measures derived from functional magnetic resonance imaging are increasingly pooling data acquired at multiple sites. While this may allow investigators to speed up recruitment or increase sample size, multisite studies also potentially introduce systematic biases in connectivity measures across sites. In this work, we measure the inter-site bias in connectivity and its impact on our ability to detect individual and group differences. Our study was based on real multisite fMRI datasets collected in N=345 young, healthy subjects across 8 scanning sites with 3T scanners and heterogeneous scanning protocols, drawn from the 1000 functional connectome project. We first empirically show that typical functional networks were reliably found at the group level in all sites, and that the amplitude of the inter-site bias was small to moderate. We then implemented a series of Monte-Carlo simulations, based on real data, to evaluate the impact of the multisite bias on detection power in statistical tests comparing two groups (with and without the effect) using a general linear model, as well as on the prediction accuracy of group labels using a support-vector machine. Simulations revealed that using data from heterogeneous sites only slightly decreased our ability to detect changes compared to a monosite study with the GLM, and had a more serious impact on prediction accuracy. However, the deleterious effect of multisite data pooling tended to decrease as the total sample size increased, to a point where differences between monosite and multisite simulations were marginal. Taken together, our results support the feasibility of multisite studies in rs-fMRI provided sample size is large enough.

To the best of our knowledge, the study of multisite impact on detection power and accuracy was the first large attempt to quantify the impact of the multisite bias on our ability to perform univariate and multivariate analysis. We hope that you will consider favorably our work for publication in Neuroimage.

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Best regards,

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