Robust and variable group level effects as a result of divergent motion preprocessing strategies

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**Background:** In recent years resting state functional magnetic resonance imaging (rs-fMRI) became a popular method of investigation of brain intrinsic organization in both healthy population and in neuropsychiatric disorders. Movement during scanning presents one of the prominent nuisance factors that influences quality of the data and the further analysis (1). Thus motion needs to be accounted for during the pre-processing (2). DPARSFA (3) offers several options for removing motion artefacts but the influence on group level statistics is not known. Therefore, we investigated how do pre-processing options affect correlation between functional connectivity (FC) map of anterior mid cingulate cortex (aMCC) and age, a frequently used covariate in group analysis.

**Methods:** 60 subjects completed rs-fMRI session in 7T (Siemens, Erlangen, DE). Data were preprocessed in SPM12 and DPARSFA. Motion regression was done with Rigid-body 6 and Friston 24. Threshold for scrubbing was set by calculating outliers based on Framewise Displacement (FD) Jenkinson of all subjects. Scrubbing was thus done on 0.16 and on a more lenient threshold of 0.5. Subjects that had motion exceeding 2 mm (voxel size) or had more than 10% of volumes over 0.16 were excluded. For 48 subjects (26 women, age=27.02±6.98) aMCC FC map was calculated and correlation between age and FC was ran. All results are reported at p< 0.05 FWE corrected cluster level, k> 70.

**Results:** AMCC FC maps calculated with Rigid-body 6 and scrubbing at 0.5 showed positive correlations with age towards L Inferior Frontal Gyrus (IFG), L Middle Temporal Gyrus (MTG) and L Inferior Parietal Lobule (IPL), but no significant results for threshold 0.16. For FC maps calculated with Friston 24 and scrubbing at 0.5 there was also positive correlation with age towards L IFG, L MTG and L IPL, whereas scrubbing at 0.16 showed only towards L IPL.

**Conclusions:** Although pre-processing strategies showed similar patterns of results this investigation points to the necessity of careful examination of the motion parameters and customizing the pipeline to the data at hand. Additional variables in motion regression, as for Friston 24, remove not only variance due to motion but also extra components possibly unrelated to it (4). Threshold for scrubbing showed to be an important factor too. Using high threshold such as 0.16 averages the natural variance of brain signals and flats out possible relations to other variables to it.

**References:**
1. Yan, C. G. et al., 2013.