

QIBA fMRI Biomarker Committee (BC) Call

Wednesday, May 20, 2020 at 11 a.m. (CT)

Call Summary

In attendance

Feroze Mohamed, PhD (Co-chair)

David Soltysik, PhD (Co-chair)

Jay Pillai, MD (Co-chair)

Ping Hou, PhD

Ichiro Ikuta, MD, MMSc

Andrew Kalnin, MD

Nancy Obuchowski, PhD

James Voyvodic, PhD

Zhiyue Jerry Wang, PhD

RSNA staff

Joe Koudelik

Susan Stanfa

Review of Previous Call Summary

- The 05.06.2020 call summary was approved as presented

Next QIBA fMRI BC Call

- Drs. Pillai and Ikuta will be presenting on June 3 during the American Society of Neuroradiology (ASNR) virtual annual meeting and will be unavailable to participate in the next fMRI BC call
- The next call will be held on June 3 as scheduled, as a quorum is still expected

Discussion continued re: Soltysik D. [Optimizing data processing to improve the reproducibility of single-subject functional magnetic resonance imaging](#). *Brain Behavior*. 2020.

**Some information has been taken from presentation slides*

- Different motion correction methods to maximize fMRI reproducibility were compared
- Discussion re: plots for the percent of comparisons where the method was significantly better for the percent difference in activation volume (PDAV), the difference in center of mass (DCM), and the Dice Similarity Coefficient (DSC) for different motion correction methods, spatial smoothing methods, regression methods and thresholding methods
- Discussion re: example box plots across different:
 - Motion correction methods for the DCM for run 1 (language task: overt word repetition) and the DSC for run 1 (overt word repetition)
 - Spatial smoothing methods for the PDAV for run 4a (motor task: finger-tapping), the DCM for run 4a (finger-tapping) and the DSC for run 1 (overt word repetition)
 - Thresholding methods for the PDAV for run 3 (overt word generation)
- Discussion re: plots of effect sizes for PDAV, DCM, and DSC across motion correction methods, spatial smoothing methods, regression methods, and thresholding methods
 - Only significantly different ($p < .05$) cases were shown
 - Language tasks, motor tasks, and vision tasks were included for comparison
 - Ranges of effect size, from very small (0-0.20), small (0.2-0.5), medium (0.5-0.8), and large (0.8 and up) were indicated
 - It was noted that a large effect may not always be detected when these methods are employed
- Conclusions re: methods used to maximize fMRI reproducibility: the processing methods needed to improve reproducibility were dependent on the fMRI activation metric of interest

fMRI BC Discussion re: Dr. Soltysik's Publication

- Publication will be useful for forming a framework for aspects of the Language-Mapping fMRI Profile that need to be incorporated
- There were different ROIs for each of the five tasks
- Criteria used for selecting activation clusters for comparison was deemed fairly stringent (12 voxels to be considered); only pairs identified with centers of mass within 10 mms were included
 - Oftentimes, one cluster in an activation map does not match another; this would be an issue if using reproducibility writ large
 - Suggestion re: conducting a study to find how many clusters are identified in one session vs. a second session and to assess reproducibility
 - Suggestion to look at reproducibility as a function of other things, such as the number of clusters per session, or paired activations themselves
- If Profile users are able to perform affine motion correction, it can be incorporated into the Profile
- Use of minimal spatial smoothing and use of AMPLE thresholding were recommended for the Profile
- Motion in this study was relatively small overall, the maximum allowed threshold needs to be defined
- Limitations with commercial software were cited; the hope is that the Profile will encourage manufacturers to implement motion correction in their software (sw)
 - It was specified that AMPLE thresholding can be done visually with any sw package, but not automatically
 - While the option for turning on and off smoothing is typically available, kernel size cannot be adjusted
- The Profile should include minimal requirements so that sites using commercial software (with restrictions re: parameter adjustments) could still use it
- A run of paradigm tasks would need to be omitted if it were to contain too much motion, or another threshold would need to be used
- After motion correction is done, strong signal is an indication you have good data; it is even better if there is good activation in the correct clusters
- As long as the resulting map contains strong activation in the correct places, then the motion parameters themselves are less important
- fMRI BC members were encouraged to contact co-chairs re: papers they would like to discuss during an upcoming call

Next call: Wednesday, June 3, 2020 at 11 a.m. CT (1st & 3rd weeks of each month)

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