

QIBA fMRI Biomarker Committee (BC) Call

Wednesday, February 17, 2021 at 11 a.m. (CT)

Call Summary

In attendance

Jay Pillai, MD (Co-chair)

David Soltysik, PhD (Co-chair)

Shruti Agarwal, PhD

Michael Boss, PhD

Cathy Elsinger, PhD

Ichiro Ikuta, MD, MMSc

Kiran Talekar, MD

Gudrun Zahlmann, PhD

Francisco Zamorano, PhD

RSNA staff

Joe Koudelik

Susan Stanfa

Review of Previous Call Summary

- The 02.03.2021 call summary was approved as presented

Overview of Dr. Pillai's Studies

- Overview: Agarwal S, Hua J, Sair HI, Gujar S, Bettgowda C, Lu H, and Pillai JJ. [Repeatability of language fMRI lateralization and localization metrics in brain tumor patients](#). *Hum Brain Mapp*. 2018.
- It was noted that at the time of data acquisition, there was no intention to study repeatability or reproducibility
- Tasks included sentence completion (SC) (37 patients) and silent word generation (SWG) (78 patients); only right-handed subjects included
- Test-retest period was composed of consecutive runs within the same scan session
 - Uncertainty in data quality based on real-time fMRI mapping resulted in task repetition within the same scan session
 - Surprisingly good quality data were obtained from both runs of the same tasks in patients who underwent repeat runs
- Findings indicated that SWG and SC tasks were effective in activating critical language areas
- Only data that met minimum quality control metric criteria were included in the analysis
- There were no concerns regarding confounding variables such as NVU, mass effect from lesions or displacement of eloquent cortex since these remained constant between the two consecutive runs during the same scan session, and thus did not affect repeatability of the data
- The main difference between Dr. Pillai's and Dr. Voyvodic's studies, was that Dr. Pillai had not specifically planned to evaluate reproducibility
- It was recommended that study differences be considered before comparing Dr. Pillai's and Voyvodic's results
- Dr. Pillai's study went beyond looking at Wernicke's area (WA) and Broca's area (BA); individual gyral parcellations were included based on the AAL template, as well as larger expressive and receptive language ROIs
 - To assess laterality index (LI), two different approaches were used based on Pillai and Zaca. [Relative utility for hemispheric lateralization of different clinical fMRI activation tasks within a comprehensive language paradigm battery in brain tumor patients as assessed by both threshold-dependent and threshold-independent analysis methods](#). *Neuroimage*. 2011. The most effective tasks provided the best lateralization results regardless of the type of LI calculation used.
 - This paper evaluated threshold-dependent LIs based on a wide range of T-value thresholds, as well as a threshold-independent approach using the T-value-weighted sums of all positively correlated voxels within each hemispheric ROI
- The HBM paper evaluated both changes in LI and center of mass (CoM) from the first to the second runs of each task (SWG & SC) through indices described as LI_{VAR} and CoM_{VAR}
 - The median, as well as 25th and 75th percentiles for values were plotted in the graphs in this paper
- Overall, the repeatability for both LI and CoM were best for smaller ROIs, and repeatability was better for CoM than for LI, regardless of specific ROI used for LI computation

- Values of median CoM_{VAR} were as low as 2.0 mm for the Broca's area (BA) ROI and 4.0 for the Wernicke's area (WA) ROI for the SC task and 2.0 mm for BA and 2.8 mm for WA using the threshold-independent approach (i.e., considering all clusters of positively-correlated voxels within an ROI) and slightly higher using the AMPLE 50% threshold-dependent approach (i.e., only voxels above 50% of the local maximum T-value within the chosen ROI)
- When LI variability was greater than one, dominance switched from one hemisphere to another; when variability was less than one, dominance remained the same
- Region-specific LIs were examined; reproducibility was quite good with expressive language regions and there was also good reproducibility in smaller areas
- Value was found in using a threshold-independent approach, as there was very good repeatability for CoM, which was superior to the AMPLE threshold-dependent approach, as stated above, regardless of selected ROI

Next call: Wednesday, March 3, 2021 at 11 a.m. CT (1st & 3rd weeks of each month)

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