

## QIBA fMRI Biomarker Committee (BC) Call

Wednesday, April 1, 2020 at 11 a.m. CT

### Call Summary

#### In attendance

Feroze Mohamed, PhD (Co-chair)

David Soltysik, PhD (Co-chair)

Jay J. Pillai, MD (Co-chair)

Cathy Elsinger, PhD

Mai-Lan, Ho, MD

Ichiro Ikuta, MD, MMSc

Ho-Ling (Anthony) Liu, PhD

Nancy Obuchowski, PhD

Kiran Talekar, MD

Jim Voyvodic, PhD

#### RSNA staff

Joe Koudelik

Susan Stanfa

#### Review of Previous Call Summary

- The 03.18.2020 call summary was approved as presented

#### Profile

- Discussion continued re: [Neurosynth](#), a platform for large-scale, automated synthesis of functional magnetic resonance imaging (fMRI) data that can be used for a literature search on language studies
  - This resource also includes ROI maps available for download
  - Consensus language activation maps created based on meta-analysis of data from published articles
- Dr. Ikuta referenced Yarkoni T, et al. [Large-scale automated synthesis of human functional neuroimaging](#). 2011; 8(8):665-70.
- USC [Laboratory of Neuro Imaging \(LONI\)](#) brain atlases were mentioned
  - Dr. Liu used the LPBA40 atlas to choose anatomical areas
  - The Neurosynth mask was multiplied by the anatomic mask
- The LPBA40 atlas is described in this paper: Shattuck DW, et al. [Construction of a 3D probabilistic atlas of human cortical structures](#). *NeuroImage*. 2008; 39(3):1064 – 1080.
  - The construction of a digital brain atlas composed of data from manually delineated MRI data was described
  - The atlas was generated from a set of T1-weighted MRI volumes collected from 40 healthy volunteers
  - The atlas data sets produced by this research are being made available publicly via [website](#); additionally, the anonymized individual subject data is available to investigators
  - The main product of this research, the probabilistic maps of brain structure, can be used as a basis for the analysis of various types of neuroimaging data. The atlases can be used to assign structure probabilities to new images by aligning the images and the atlas.
- Hsu AL, et al. [Presurgical resting-state functional MRI language mapping with seed selection guided by regional homogeneity](#). *Magn Reson Med*. 2019 Dec 2. doi: 10.1002/mrm.28107. [Epub ahead of print]
  - During a prior call, Dr. Liu, one of the authors of this article, had explained the methodology and sent the mask to Dr. Voyvodic
  - A search was performed in Neurosynth using the term, “language” and it yielded 1101 studies
  - Dr. Voyvodic had downloaded the atlas from Neurosynth, manipulated it, then compared it with Dr. Liu’s mask
  - This process will be used to help create ROIs that may be able to differentiate certain aspects of tasks to be used in Profile
  - Laterality can be compared by making a symmetric version of the maps and seeing where activation appears in the Broca’s (BA) and Wernicke’s (WA) areas in the maps of particular individuals

- Neurosynth Map shows activation within an anatomical context, language-related areas are identified in MNI space reference atlas (from the Montreal Neurological Institute)
- ROIs need be defined based on sound principles; Neurosynth deemed helpful
  - Key is to have ROIs that are anatomically appropriate and functionally relevant
  - Reproducibility data for all the ROIs and clusters are needed
- Neurosynth activation maps are functionally relevant because they are derived from a metaanalysis
- Supplementary motor area (SMA) may be included as an ROI; the inferior frontal cortex is an ROI that could be used
- The language mask from the Neurosynth atlas is large and not specific; it needs to be divided into separate cluster areas
  - E.g., BA, WA, superior temporal, middle frontal, SMA
  - Large ROIs to be applied as the first step toward lateralization measures; they will be included if they co-lateralize
  - Localization analysis has to be cluster-based
  - For laterality, the ROIs will not need to be subdivided into clusters within relevant regions
  - Broca's and Wernicke's areas to be included for lateralization
- The Profile needs to state that if a particular task is used, specific areas will be activated reproducibly; this will be easier to do when starting with a simpler approach such as Neurosynth

**Next call:** Wednesday, April 15, 2020 at 11 a.m. CT (1<sup>st</sup> & 3<sup>rd</sup> weeks of each month)

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