**PROTOCOL: MFC Means (2/17/17: MFC Cocaine)**

**Modified by Corinne McGill 12/7/18; 1/04/18**

**SCRIPTS PATH:** /data/cairhive0/studies\_large/helpern\_share/VAdisetiyo/MFC\_Cocaine/Scripts

**I. PROCESS MPR w/FREESURFER & CONVERT OUTPUTS TO REQURIED FORMAT**

**>>vi FSprocess** (Freesurfer scripts, comment out last function)

export SUBJ\_ID=$1

export SUBJECTS\_DIR=/studies\_large/helpern\_share/VAdisetiyo/MFC\_Cocaine/freesurfer

#this is telling the computer to put output files in the freesurfer folder you created

source /Applications/freesurfer/FreeSurferEnv.sh

#setup freesurfer environment. Path may be different on your computer

recon-all -s $SUBJ\_ID –I {path\_to\_MPRAGE}

#recon-all -s $SUBJ\_ID -all &.

**>>./mega1\_FSprocess** (‘mega’: batch script - ensure list is current; this script calls the Freesurfer scripts; have to run twice: 1st with all but last function commented, then after confirm no error, run with last function on and second to last function commented)

**>>vi FSprocess**

export SUBJ\_ID=$1

export SUBJECTS\_DIR=/studies\_large/helpern\_share/VAdisetiyo/MFC\_Cocaine/freesurfer

source /Applications/freesurfer/FreeSurferEnv.sh

#setup freesurfer environment. Path may be different on your computer

#recon-all -s $SUBJ\_ID –I {path\_to\_MPRAGE}

recon-all -s $SUBJ\_ID -all &.

**>>./mega1\_FSprocess** (after confirm no error, re-run with last function on and second to last function commented out)

Outputs: (…/freesurfer/{ID}/mri/)

aparc+aseg.mgz

aseg.mgz

wmparc.mgz

brainmask.mgz

**>>./mega2\_rename**

Outputs: (/freesurfer/‘ID’/mri/)

4003\_aseg.mgz

4003\_wmparc.mgz

4003\_brainmask.mgz.

**>>./mega3\_mriconvert**

Outputs: (/freesurfer/‘ID’/mri/)

4003\_aparc+aseg.nii

4003\_aseg.nii

4003\_wmparc.nii

4003\_brainmask.nii

**>>./mega4\_copy** (copy out all prior files from ‘freesurfer/ID/mri’ folder to ‘Registration\_Processing’ folder)

**>>matlab: convert\_bit\_depth\_script.m** (Batch script in ‘Scripts/Processing Scripts’ folder; need to be in same folder as convert\_bit\_depth.m; NOTE: can run on any version of MATLAB: e.g., R2012a)

Outputs (freesurfer/’ID’/mri):

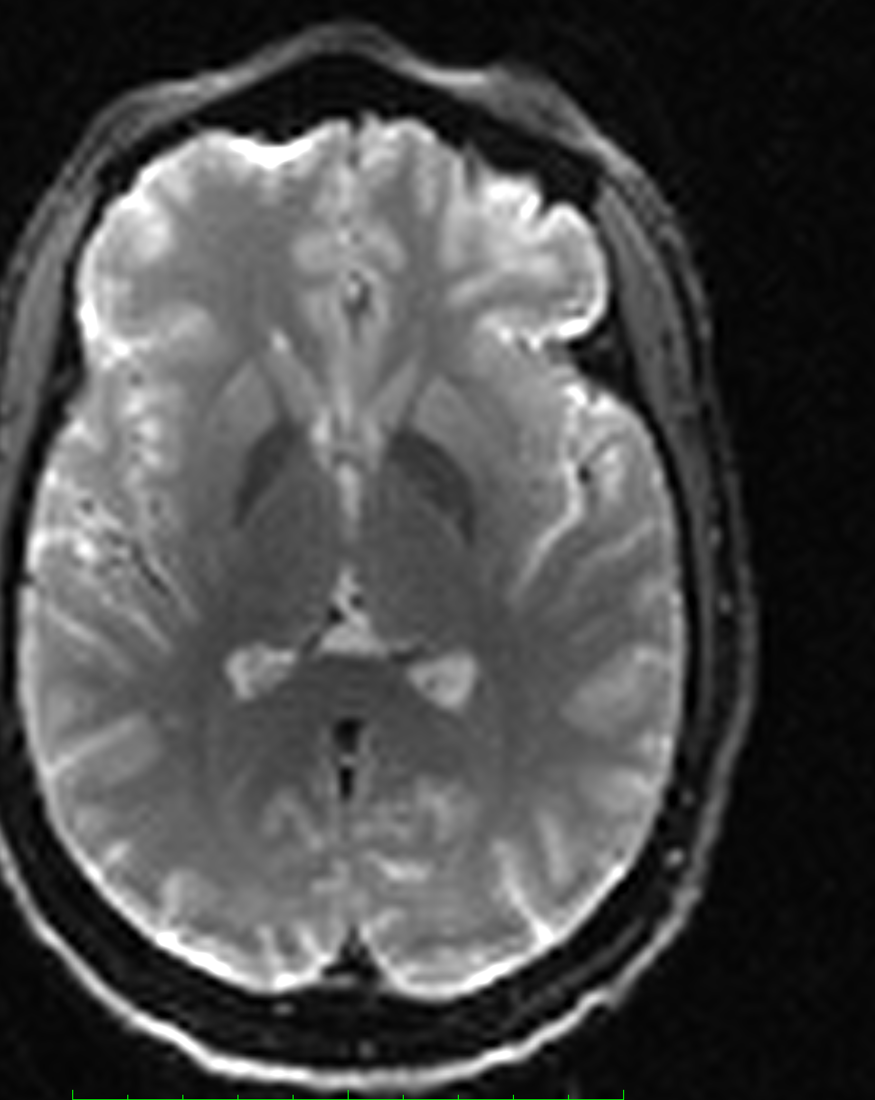
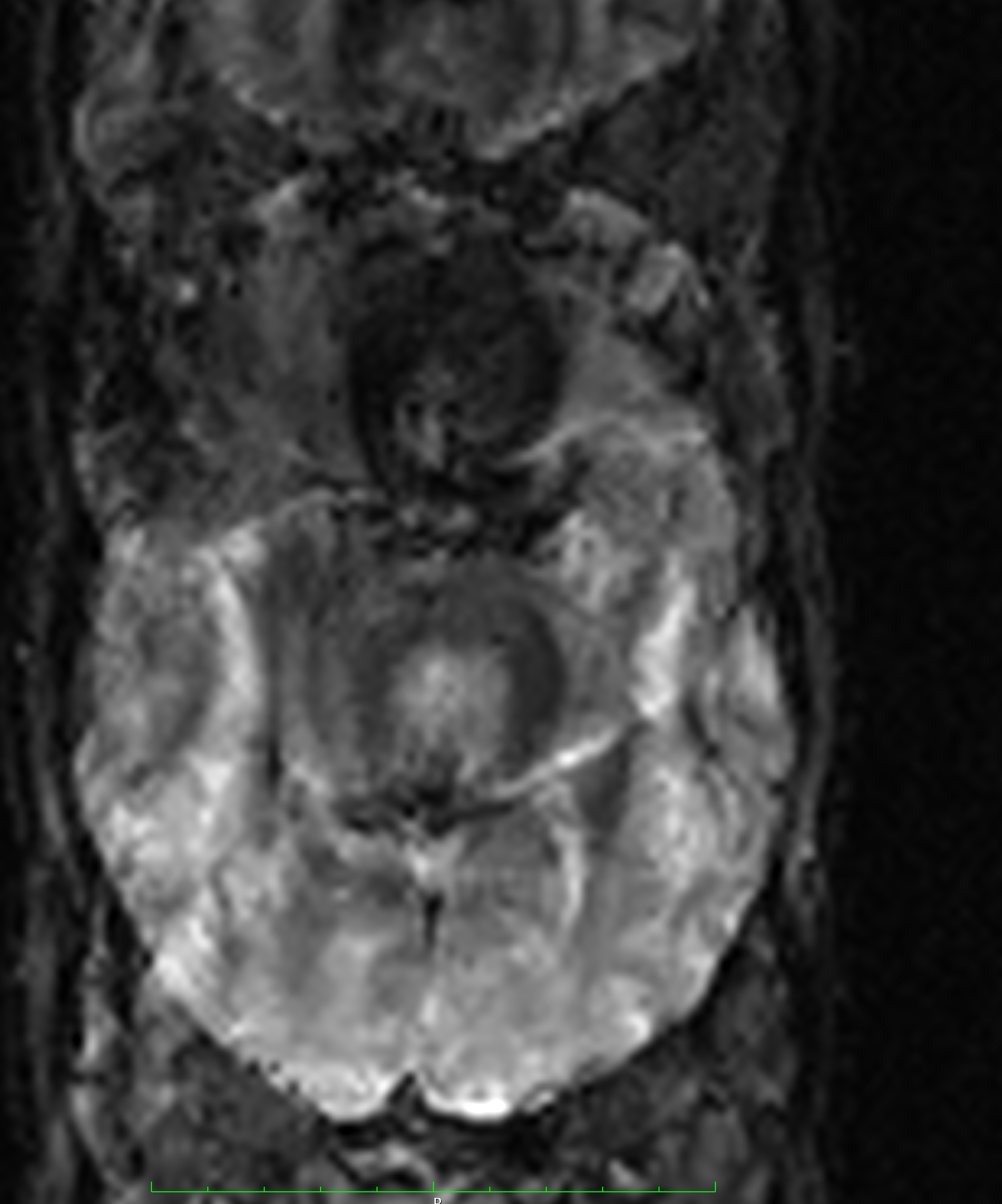
2b\_4003\_aparc+aseg.nii

2b\_4003\_wmparc.nii

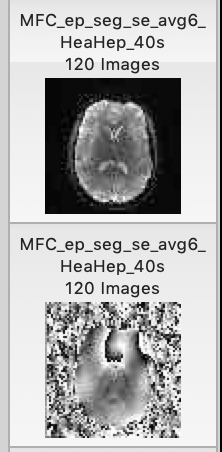
**II. QC AND PROCESS MFC MAPS** (Refer to PROTOCOL\_Process\_MFC1160\_2.21.17.docx for current method)

* QC MFC images and choose best 4 averages to process.
  + Deep gray matter structures (high iron) are most important.

GOOD BAD

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* Organize according to file structure below.



Avg=MFC avg

Avgp=corresponding phase image (sequence right after)

**>>matlab: process\_all\_subjects\_mfc\_160\_UR.m** (Batch script in ‘Scripts/Processing Scripts’ folder, requires MATLAB R2009b version)

Outputs: (/MFC\_Cocaine/ ‘ID’/MFC/MFC\_nii)

4003\_mask\_rejslices.nii

4003\_mfc.nii

4003\_mfc\_macro.nii

4003\_mfc\_micro.nii

**>>matlab: PROCESS1\_create\_mic\_mac\_ratio.m** (Batch script in ‘Scripts/Processing Scripts’ folder; NOTE: can run on any version of MATLAB: e.g., R2012a)

Outputs: (/MFC\_Cocaine/ ‘ID’/MFC/MFC\_nii)

4003\_mic\_mac\_ratio.nii

4003\_mac\_larger.nii (binary)

4003\_mic\_eq\_larger.nii (binary)

**III. NORMALIZE MFC MAPS TO COMMON SPACE** (MNI152 space)

Generate transformation matrix taking MFC to Freesurfer (brainmask.nii) space

* Generate linear transformation from MFC (use ‘mfc\_1\_1.nii’ as 0shift image) to Freesurfer’s T1 (brainmask.nii)
* Generate nonlinear transformation from T1 to MNI

**Apply transformations to the following files:**

4003\_mac\_larger.nii

4003\_mask\_rejslices.nii

4003\_mfc\_macro.nii

4003\_mfc\_micro.nii

4003\_mfc.nii

4003\_mic\_eq\_larger.nii

4003\_mic\_mac\_ratio.nii

2b\_4003\_aparc+aseg.nii

2b\_4003\_wmparc.nii

4003\_aseg.nii

4003\_brainmask.nii

**IV. CREATE & VISUALIZE ROIS FOR ANALYSES**

**>>matlab: individual\_CROIS.m** (Batch script in ‘Scripts/Processing Scripts’ folder; NOTE: can run on any version of MATLAB: e.g., R2012a; binary masks in MNI space for each subject)

Outputs:

4003\_CombHippo.nii

4003\_CombAmygdala.nii

4003\_CombCerebellum.nii

4003\_CombThalamus.nii

4003\_CombCaudate.niim

4003\_CombAccumbens.nii

4003\_CombPutamen.nii

4003\_CombPallidum.nii

**>>matlab: consensus\_mask\_script\_22017.m** (Batch script in ‘Scripts/Processing Scripts’ folder; NOTE: can run on any version of MATLAB: e.g., R2012a)

Outputs: (/MFC\_Cocaine/Scripts/)

imgsum\_CombHippo.nii

imgsum\_CombAmygdala.nii

imgsum\_CombCerebellum.nii

imgsum\_CombCaudate.nii

imgsum\_CombAccumbens.nii

imgsum\_CombPutamen.nii

imgsum\_CombPallidum.nii

**>>matlab: VISUAL\_thresh\_mask.m** (OPTIONAL: creates mask of consensus map created in previous script where specific threshold value; Batch script in ‘Scripts/Processing Scripts’ folder; NOTE: can run on any version of MATLAB: e.g., R2012a)

Outputs

Thresh12\_imgsum\_CombCaudate.nii

Thresh12\_imgsum\_CombPallidum.nii

Thresh12\_imgsum\_CombPutamen.nii

Thresh12\_imgsum\_CombThalamus.nii

Thresh12\_imgsum\_CombAccumbens.nii

Mask12\_imgsum\_CombCaudate.nii

Mask12\_imgsum\_CombPallidum.nii

Mask12\_imgsum\_CombPutamen.nii

Mask12\_imgsum\_CombThalamus.nii

Mask12\_imgsum\_CombAccumbens.nii

**>>matlab: PROCESS2\_ROIS\_mac\_mic.m** (OPTIONAL: creates individual ROIs for the

consensus ROI made in previous script, where the individual has greater macro or micro dominated MFC - for secondary analysis or visualization; Batch script in ‘Scripts/Processing Scripts’ folder; NOTE: can run on any version of MATLAB: e.g., R2012a)

Outputs:

ROI\_mac (folder)

ROI\_mic (folder)

**V. EXTRACT MEANS FROM ROIS**

**>>matlab: process\_histograms\_script\_ADHD\_comb\_MFC\_anatomical\_prob\_VA.m**

(Batch scripts in ‘Scripts/Processing Scripts’ folder; NOTE: can run on any version of MATLAB: e.g., R2012a)

Outputs: (/data/cairhive0/studies\_large/helpern\_share/VAdisetiyo/MFC\_Cocaine/Analyses)

Histograms\_MFC\_sum11\_2.21.17/statistics\_all\_metrics\_n11\_2.21.17.txt

**>>process\_histograms\_script\_MFC\_FS\_mac.m** (OPTIONAL: in ‘Scripts/Processing Scripts’ folder) **>>process\_histograms\_script\_MFC\_FS\_mic.m** (OPTIONAL: in ‘Scripts/Processing Scripts’ folder)