

ABCD Human Subjects Study

Adolescent Brain Cognitive Development – ABCDSTUDY.org

Release Notes: Adolescent Brain Cognitive Development Study (ABCD) Fix Release 2.0.1

Task-Based Functional Magnetic Resonance Imaging (task-fMRI)

<http://dx.doi.org/10.15154/1503209>

March 2019

Change Log

March 2019 – ABCD Data Release 2.0

- Initial release

July 2019 – ABCD Fix Release 2.0.1

- Added notice of Fix Release 2.0.1 and updated instrument names

List of Instruments

NB: Short names associated with the 2.0 Release that have been renamed are indicated by the ~~strikethrough text~~.

Instruments	Short Name
ABCD Task fMRI MID Run 1 Beta Weights Part 1 (Release 2.0.1)	abcd_midr1bwp101 abcd_midr1bwp102
ABCD Task fMRI MID Run 1 Beta Weights Part 2 (Release 2.0.1)	abcd_midr1bwp201 abcd_midr1bwp202
ABCD Task fMRI MID Run 1 Beta Weights Destrieux Parcellations Part 1	abcd_midr1bwdp101
ABCD Task fMRI MID Run 1 Beta Weights Destrieux Parcellations Part 2 (Release 2.0.1)	abcd_midr1bwdp201 abcd_midr1bwdp202
ABCD Task fMRI MID Run 1 Standard Error of the Mean Part 1 (Release 2.0.1)	abcd_midsemp101 abcd_midsemp102
ABCD Task fMRI MID Run 1 Standard Error of the Mean Part 2 (Release 2.0.1)	abcd_midsemp201 abcd_midsemp202
ABCD Task fMRI MID Run 1 SEM Destrieux Parcellations Part 1	abcd_tmidr1sem dp101

ABCD Task fMRI MID Run 1 SEM Destrieux Parcellations Part 2 (Release 2.0.1)	abcd_tmidr1semdp201 abcd_tmidr1semdp202
ABCD Task fMRI MID Run 2 Beta Weights Part 1 (Release 2.0.1)	midr2bwp101 midr2bwp102
ABCD Task fMRI MID Run 2 Beta Weights Part 2 (Release 2.0.1)	midr2bwp201 midr2bwp202
ABCD Task fMRI MID Run 2 Beta Weights Destrieux Parcellations Part 1	abcd_tr2bwdp01
ABCD Task fMRI MID Run 2 Beta Weights Destrieux Parcellations Part 2 (Release 2.0.1)	abcd_tr2bwdp201 abcd_tr2bwdp202
ABCD Task fMRI MID Run 2 Standard Error of the Mean Part 1 (Release 2.0.1)	abcd_midr2semp101 abcd_midr2semp102
ABCD Task fMRI MID Run 2 Standard Error of the Mean Part 2 (Release 2.0.1)	abcd_midr2semp201 abcd_midr2semp202
ABCD Task fMRI MID Run 2 SEM Destrieux Parcellations Part 1	abcd_tr2semdp101
ABCD Task fMRI MID Run 2 SEM Destrieux Parcellations Part 2	abcd_tr2semdp201
ABCD Task fMRI MID Average Beta Weights Part 1 (Release 2.0.1)	midaparc02 midaparc03
ABCD Task fMRI MID Average Beta Weights Part 2 (Release 2.0.1)	midaparc202 midaparc203
ABCD Task fMRI MID Average Beta Weights Destrieux Parcellations Part 1	abcd_midabwdp01
ABCD Task fMRI MID Average Beta Weights Destrieux Parcellations Part 2 (Release 2.0.1)	abcd_midabwdp201 abcd_midabwdp202
ABCD Task fMRI MID Average Standard Error of the Mean Part 1 (Release 2.0.1)	abcd_midasemp101 abcd_midasemp102
ABCD Task fMRI MID Average Standard Error of the Mean Part 2 (Release 2.0.1)	abcd_midasemp201 abcd_midasemp202
ABCD Task fMRI MID Average SEM Destrieux Parcellations Part 1	abcd_midasemp101
ABCD Task fMRI MID Average SEM Destrieux Parcellations Part 2 (Release 2.0.1)	abcd_midasemp201 abcd_midasemp202
ABCD Task fMRI SST Run 1 Beta Weights	mrissstr1bw01
ABCD Task fMRI SST Run 1 Beta Weights Destrieux Parcellations Part 1	abcd_tfsstr1bwdp101
ABCD Task fMRI SST Run 1 Beta Weights Destrieux Parcellations Part 2	abcd_tfsstr1bwdp201
ABCD Task fMRI SST Run 1 Standard Error of the Mean	mrissstr1sem01
ABCD Task fMRI SST Run 1 SEM Destrieux Parcellations Part 1	abcd_tfsstr1semdp101
ABCD Task fMRI SST Run 1 SEM Destrieux Parcellations Part 2	abcd_tfsstr1semdp201
ABCD Task fMRI SST Run 2 Beta Weights	mrissstr2bw01
ABCD Task fMRI SST Run 2 Beta Weights Destrieux Parcellations Part 1	abcd_tfsstr2bwdp101
ABCD Task fMRI SST Run 2 Beta Weights Destrieux Parcellations Part 2	abcd_tfsstr2bwdp201
ABCD Task fMRI SST Run 2 Standard Error of the Mean	mrissstr2bwsem01
ABCD Task fMRI SST Run 2 SEM Destrieux Parcellations Part 1	abcd_tfsstr2semdp101

ABCD Task fMRI SST Run 2 SEM Destrieux Parcellations Part 2	abcd_tfsstr2sem01
ABCD Task fMRI SST Average Beta Weights	mriss02
ABCD Task fMRI SST Average Beta Weights Destrieux Parcellations Part 1	abcd_tfsstabw01
ABCD Task fMRI SST Average Beta Weights Destrieux Parcellations Part 2	abcd_tfsstabw02
ABCD Task fMRI SST Average Standard Error of the Mean	mrisssem01
ABCD Task fMRI SST Average SEM Destrieux Parcellations Part 1	abcd_tfsstasem01
ABCD Task fMRI SST Average SEM Destrieux Parcellations Part 2	abcd_tfsstasem02
ABCD Task fMRI nBack Run 1 Beta Weights	nbackr01
ABCD Task fMRI nBack Run 1 Beta Weights Destrieux Parcellations Part 1	abcd_tfncr1bw01
ABCD Task fMRI nBack Run 1 Beta Weights Destrieux Parcellations Part 2	abcd_tfncr1bw02
ABCD Task fMRI nBack Run 1 Standard Error of the Mean	nbackr1sem01
ABCD Task fMRI nBack Run 1 SEM Destrieux Parcellations Part 1	abcd_tfnbr1sem01
ABCD Task fMRI nBack Run 1 SEM Destrieux Parcellations Part 2	abcd_tfnbr1sem02
ABCD Task fMRI nBack Run 2 Beta Weights	nbackr02
ABCD Task fMRI nBack Run 2 Beta Weights Destrieux Parcellations Part 1	abcd_tfnbr2bw01
ABCD Task fMRI nBack Run 2 Beta Weights Destrieux Parcellations Part 2	abcd_tfnbr2bw02
ABCD Task fMRI nBack Run 2 Standard Error of the Mean	nbackr2sem01
ABCD Task fMRI nBack Run 2 SEM Destrieux Parcellations Part 1	abcd_tfnbr2dp01
ABCD Task fMRI nBack Run 2 SEM Destrieux Parcellations Part 2	abcd_tfnbr2dp02
ABCD Task fMRI nBack Average Beta Weights	nback_bw01
ABCD Task fMRI nBack Average Beta Weights Destrieux Parcellations Part 1	abcd_tfabw01
ABCD Task fMRI nBack Average Beta Weights Destrieux Parcellations Part 2	abcd_tfabw02
ABCD Task fMRI nBack Average Standard Error of the Mean	nbackallsem01
ABCD Task fMRI nBack Average SEM Destrieux Parcellations Part 1	abcd_tnbasem01
ABCD Task fMRI nBack Average SEM Destrieux Parcellations Part 2	abcd_tnbasem02

General Information

The following information refers to the Adolescent Brain Cognitive Development (ABCD) Study Annual Release 2.0 available from <https://data-archive.nimh.nih.gov/abcd>. An overview of the ABCD Study is at <https://abcdstudy.org> and detailed descriptions of elements of the study are listed in <https://abcdstudy.org/scientists/protocols>.

This document describes the contents of various instruments available for download. To understand the context of this information, see *Release Notes ABCD README FIRST* and *Release Notes ABCD Imaging Instruments*.

July 2019 Fix Release 2.0.1 Please ensure updated instruments contained in Fix Release 2.0.1 replace instruments downloaded from the original Data Release 2.0 as indicated in the above table. Short names associated with the 2.0 Release that have been renamed in Release 2.0.1 are indicated by the ~~striketrough-text~~.

- Image types
 - field maps: spin echo images with opposite phase encode polarity
 - multi-frame, gradient echo, echo-planar imaging
- Image processing (common to all fMRI)
 - head motion corrected by registering each frame to the first using AFNI's 3dvolreg (Cox, 1996)
 - B_0 distortions were corrected using the reversing gradient method (Holland, et al., 2010)
 - displacement field estimated from spin-echo field map scans
 - applied to gradient-echo images after adjustment for between-scan head motion
 - corrected for gradient nonlinearity distortions (Jovicich, et al., 2006)
 - between scan motion correction across all fMRI scans in imaging event
 - registration between T_2 -weighted, spin-echo B_0 calibration scans and T_1 -weighted structural images performed using mutual information (Wells, et al., 1996)
- task-fMRI specific pre-processing -- NOTE: not included in "minimal processing" (minproc)
 - removal of initial volumes
 - Siemens: 8 TRs
 - Philips: 8 TRs
 - GE DV25: 5 TRs
 - GE DV26: 16 TRs
 - normalization and demean
 - divide by the mean of each voxel, subtract 1, multiply by 100
- Estimation of task-related activation strength
 - general linear model (GLM) using AFNI's 3dDeconvolve (Cox, 1996)

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- nuisance regressors to model baseline, quadratic trend, and motion (Power, et al., 2014)
 - motion estimates, derivatives, and squared estimates and derivatives included
 - time points with framewise displacement (FD) > 0.9 mm censored (Siegel, et al., 2014)
 - hemodynamic response function
 - modelled as gamma functions with temporal derivatives, using AFNI's SPMG model
 - for MID and SST models, events modeled as instantaneous
 - for n-back, duration of cues (~3 s) and trial blocks (~24 s) modeled as square waves convolved with SPMG
 - GLM coefficients and t-statistics sampled onto cortical surface
 - projected 1mm into cortical gray matter along surface normal vector
 - Monetary Incentive Delay (MID)
 - predictors for anticipation of large, small, and no rewards and feedback for large, small, and no rewards for wins and losses
 - linear contrasts computed for anticipation of large and small reward vs. no reward, anticipation of large and small loss vs. no reward, feedback of win vs. no reward, and feedback of loss vs. no reward
 - Stop Signal Task (SST)
 - predictors for successful go trial, failed go trial, successful stop trial, and failed stop trial
 - contrasts computed for successful vs. failed stop trials and successful vs. failed go trials
 - Emotional n-back (n-back)
 - predictors for each type of stimulus (i.e. place and emotional face) in each of the n-back conditions (i.e., 0-back and 2-back) plus fixation
 - linear contrasts computed for 2-back vs. 0-back across stimulus types, emotional faces vs. places across memory loads, 2-back vs. 0-back for each stimulus type, and each memory load and each stimulus type vs. fixation
 - Regions of interest (ROIs)
 - subcortical structures labeled with atlas-based segmentation (Fischl, et al., 2002)
 - cortical regions labeled with the Desikan atlas-based classification (Desikan, et al., 2006)
 - cortical regions labeled with the Destrieux atlas-based classification (Destrieux, et al., 2010)
 - ROI average coefficients and t-statistics for each run were averaged across two runs, weighted by degrees of freedom
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