Release Notes: Adolescent Brain Cognitive Development Study℠ (ABCD Study®) Data Release 4.0

Other Imaging Instruments

http://dx.doi.org/10.15154/1523041
October 2021

Change Log
October 2021 – Data Release 4.0
- Initial release

List of Instruments

Name of Instrument	Short Name
MRI Info	abcd_mri01
MR Findings	abcd_mrfindings01
(Minimally) Processed MRI Data	fmriresults01

General Information

The following information refers to the Adolescent Brain Cognitive Development Study℠ (ABCD) Data Release 4.0 available from https://nda.nih.gov/abcd. An overview of the ABCD Study® is at https://abcdstudy.org and detailed descriptions of the assessment protocols can be viewed at 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*.

MRI Info

The MRI Info instrument provides information on the MRI scanner used at each visit such as scanner manufacturer, model, magnetic field strength, device software version and date of acquisition. This is associated with the subject's NDAR Global Unique Identifier (GUID), age, sex, and date of interview.

ABCD MRI Protocols are detailed at
https://abcdstudy.org/images/Protocol_Imaging_Sequences.pdf

MR Findings

MR Findings: T1w and T2w-weighted images, if available, were screened for incidental findings by a Board Certified Neuroradiologist. Any findings requiring clinical investigation were relayed to appropriate site personnel via the ABCD Coordinating Center (CC).

The most important measure is the Report Score (mrif_score): 0= Image artifacts prevent radiology read; 1= No abnormal findings; 2 =Normal anatomical variant of no clinical significance; 3 =Consider clinical referral; 4=Consider immediate clinical referral.

The recommended inclusion criteria are that mrif_score = 1 OR mrif_score = 2.

(Minimally) Processed MRI Data

These instruments allow ABCD collaborators to find the location of DICOMs and minimally processed MR data to download. Targets can be filtered for:

- ID (subjectkey)
- Date (interview_date)
- Age (interview_age)
- Gender (sex at birth)
- QC Score (qc_outcome: pass;fail;questionable)
- Series type (scan_type; sMRI, dMRI, fMRI, field maps)
- Raw DICOMs location (file_source)
- Minimally processed data location (derived_files)

Preprocessed imaging data are packaged in archive files (tgz) for each image series containing BIDS formatted directory trees and NIfTI format data files (software to share preprocessed data: https://scicrunch.org/resolver/SCR_016016; consistent with BIDS specifications version 1.1.1: http://bids.neuroimaging.io/bids_spec.pdf). Imaging metadata derived from the original DICOM files are packaged along with each preprocessed data series as JSON files. The minimally processed T2w data are resampled into voxel-wise alignment with the T1w, which is rigid-body resampled into alignment with an atlas.

dMRI-specific information included diffusion gradients adjusted for head rotation (bvecs.txt), diffusion gradient strengths (bvals.txt), and a rigid-body transformation matrix specifying the registration between the dMRI image and the corresponding processed sMRI T1w image (stored in the JSON file). The dMRI minimally processed data are also kept in their original resolution, but reoriented into a standard alignment, based on registration to T1w, but not voxel-wise aligned with the T1w. A registration matrix supplied with the minimally processed dMRI data.

fMRI-specific information includes estimated motion time courses and a rigid-body transformation matrix specifying the registration between the fMRI image and the T_1w image (stored in the JSON file). The fMRI minimally processed data are kept in their original space and resolution, but a registration matrix is supplied with the minimally processed fMRI data. For task-fMRI series, event timing information is included as tab-separated value (tsv) files. The results of additional processing and ROI analysis are shared in tabulated form to the NDA database (https://scicrunch.org/resolver/SCR_016010), from which users can export spreadsheet files (tsv).

Information about this is included in the release notes and in our recent publication, Hagler et al., 2019, NeuroImage. Image processing and analysis methods for the Adolescent Brain Cognitive Development Study (doi: 10.1016/j.neuroimage.2019.116091). They also describe what processing steps are included in the "minimal processed" data shared on NDA.

There is no script available to run the ABCD minimal processing. There is a Docker that runs the complete ABCD Release 2.0 processing and analysis pipeline available at https://www.nitrc.org/projects/mmps_docker/ Other useful software packages include https://github.com/ABCD-STUDY/abcd-dicom2bids and https://github.com/ABCD-STUDY/abcd-hcp-pipeline.