

Group of Subjects with Structural Data

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August 18, 2023

For *structural data*, we will upload a file containing the structural values for different brain areas across subjects that belong to the same group. For example, the structural values could correspond to cortical thickness or gray matter volumes obtained from T1-weighted MRI data. Then a connectivity matrix is computed using correlations in structural values between each pair of brain regions. This Tutorial explains how to prepare and work with this kind of data.

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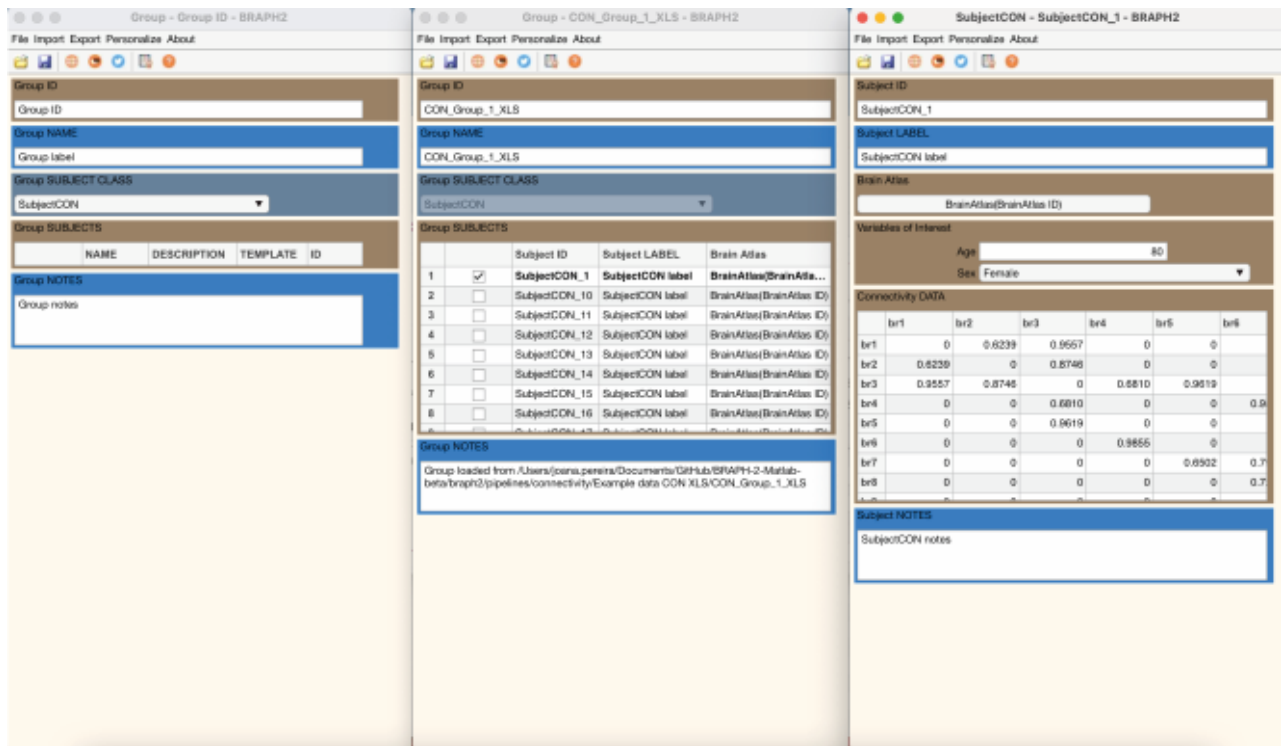


Figure 1: GUI for a group of subjects with structural data. Full graphical user interface to upload a group with structural data in BRAPH 2.0.

Open the GUI

In most analyses, the group GUI is the second step after you have selected a brain atlas. You can open it by typing `braph2` in the MatLab's terminal, which allows you to select a pipeline containing the steps required to perform your analysis and upload a brain atlas. After these steps have been completed you can upload your group's data, as shown in Figure 2.

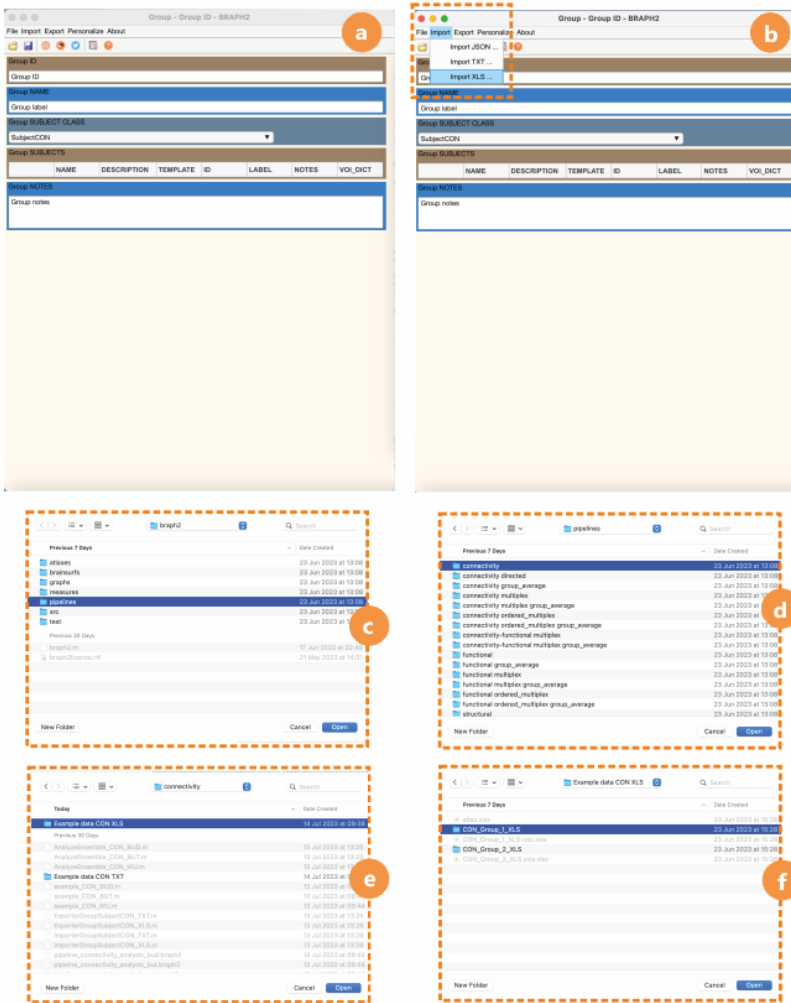


Figure 2: **Upload the data of a group of subjects.** Steps to upload a group of subjects with structural data using the GUI and an example dataset: **a** Open the group GUI. **b** Import the structural values in XLS or TXT format (see below for details on their format). To upload the test structural data: **c-f** navigate to the BRAPH 2.0 folder pipelines, **d** structural, **e** Example data ST XLS, and **f** select the structural values of one group `ST_Group_1_XLSX`.

To open the GUI and upload the brain structural data, you can also do it from the command line (i.e., without opening an analysis pipeline) by typing the commands in Code 1.

Code 1: Code to launch the GUI to upload a structural file for a group of subjects. This code can be used in the MatLab command

line to launch the GUI to upload a structural file without having to open a pipeline.

```
1 gr = Group('SUB_CLASS', 'SubjectST'); ①
2
3 gui = GUIElement('PE', gr); ②
4 gui.get('DRAW') ③
5 gui.get('SHOW') ④
```

① creates a new object Group to use structural values for assessing connectivity i.e., SubjectST.

② creates a GUI to upload the group data.

③ draws the GUI.

④ shows the GUI.

Visualize the Group Data

After completing the steps described in Figure 2, you can see the data (Figure 3a), and change the Group ID, name, and notes (Figure 3b).

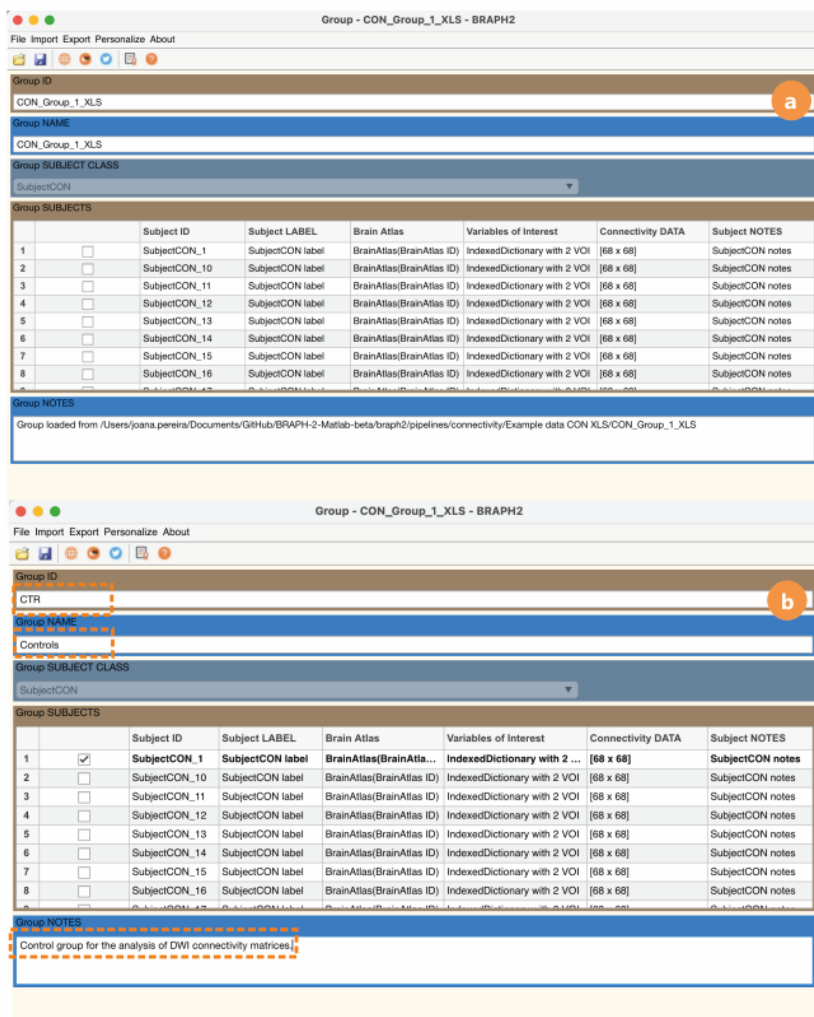


Figure 3: **Edit the group metadata.** **a** The GUI of the group's structural data. **b** The information you see on this GUI that can be changed. In this example, we have edited the ID, name, and notes of the group but can also change the subject's specific information.

Visualize Each Subject's Data

Finally, you can open each subject's structural values by selecting the subject, right click, and select "Open selection" (Figure 4a), which shows the structural values (Figure 4b). Here, you can also change the subject's metadata (ID, label, notes), its variables of interest, and the structural values.

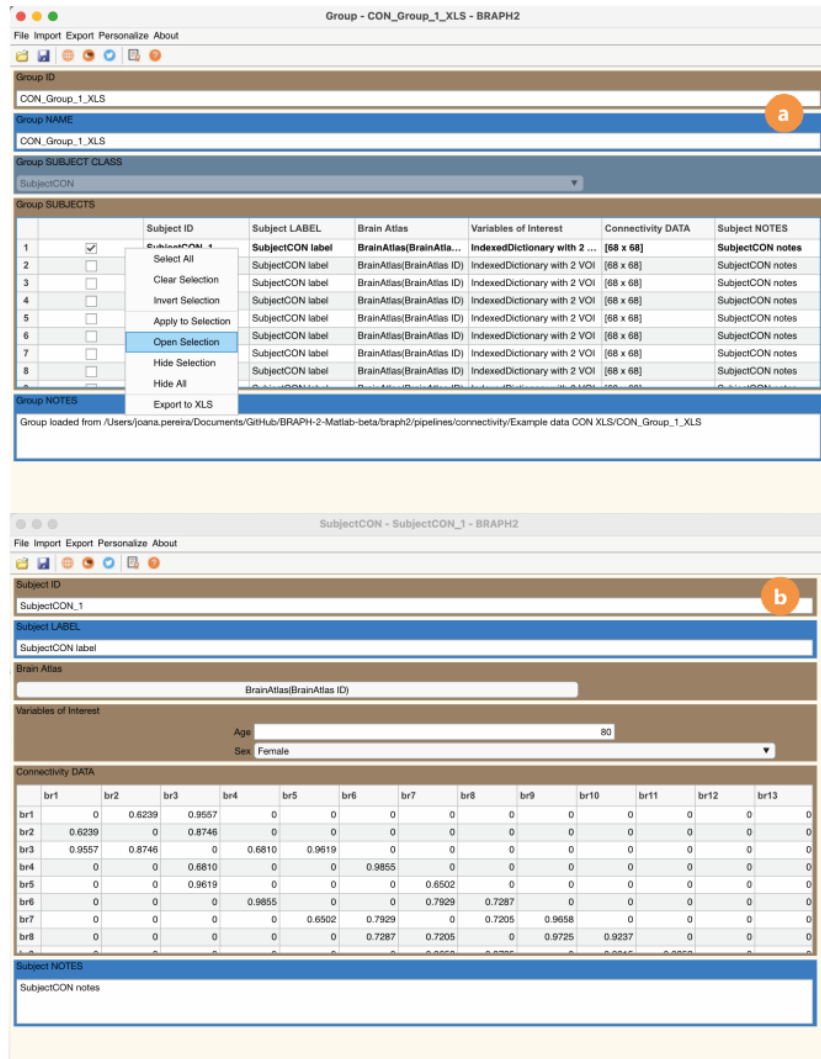


Figure 4: **Edit the individual subject data.** **a** Each subject's structural values can be opened by selecting the subject, right click, and select "Open selection" **b** In this subject GUI, it is possible to view and edit the metadata of the subject (ID, label, notes), its variables of interest (in this case, age and sex), and the structural values.

Preparation of the Data to be Imported

To be able to import structural data into BRAPH 2.0, you need to include the structural values for all subjects in a single file in excel or text format. Below you can see how this file should look like.



Figure 5: **Data preparation.** The data should be organised in the following format: **a** The structural values from each subject belonging to the same group should be included in a single file (for example, CON_Group_1_XLS).

Adding Covariates

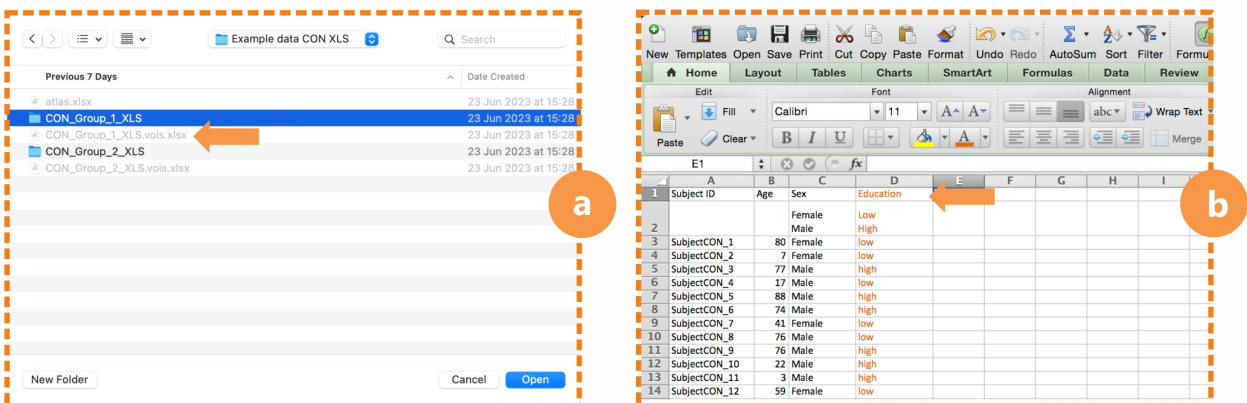


Figure 6: **Edit the Covariates.** Information that can be changed in the Covariates file: **a** The values of the variables of interest (vois). **b** In case the vois are categorical, you can state which categories they have.

It is very common to have *variables of interest* (i.e., *covariates* and *correlates*) in an analysis. In BRAPH 2.0, these variables of interest should be included in a separate excel file placed in the same directory as the group's structural data and with the same name as this data followed by `.vois` (Figure 6a). This file should have a specific format (Figure 6b):

Subject IDs (column A). Column A should contain the subject IDs starting from row 3.

Variables of interest (column B and subsequent columns). Column B (and subsequent columns) should contain the variables of interest (one per column). In this example we have "Age" and "Sex", as in the example file, as well as the additional "Education". In each column, row 1 should contain the name of the variable of interest, row 2 should contain the categories separated by a return (only for categorical variables of interest, like "Sex" and "Education"), and the subsequent rows the values of the variable of interest for each subject.