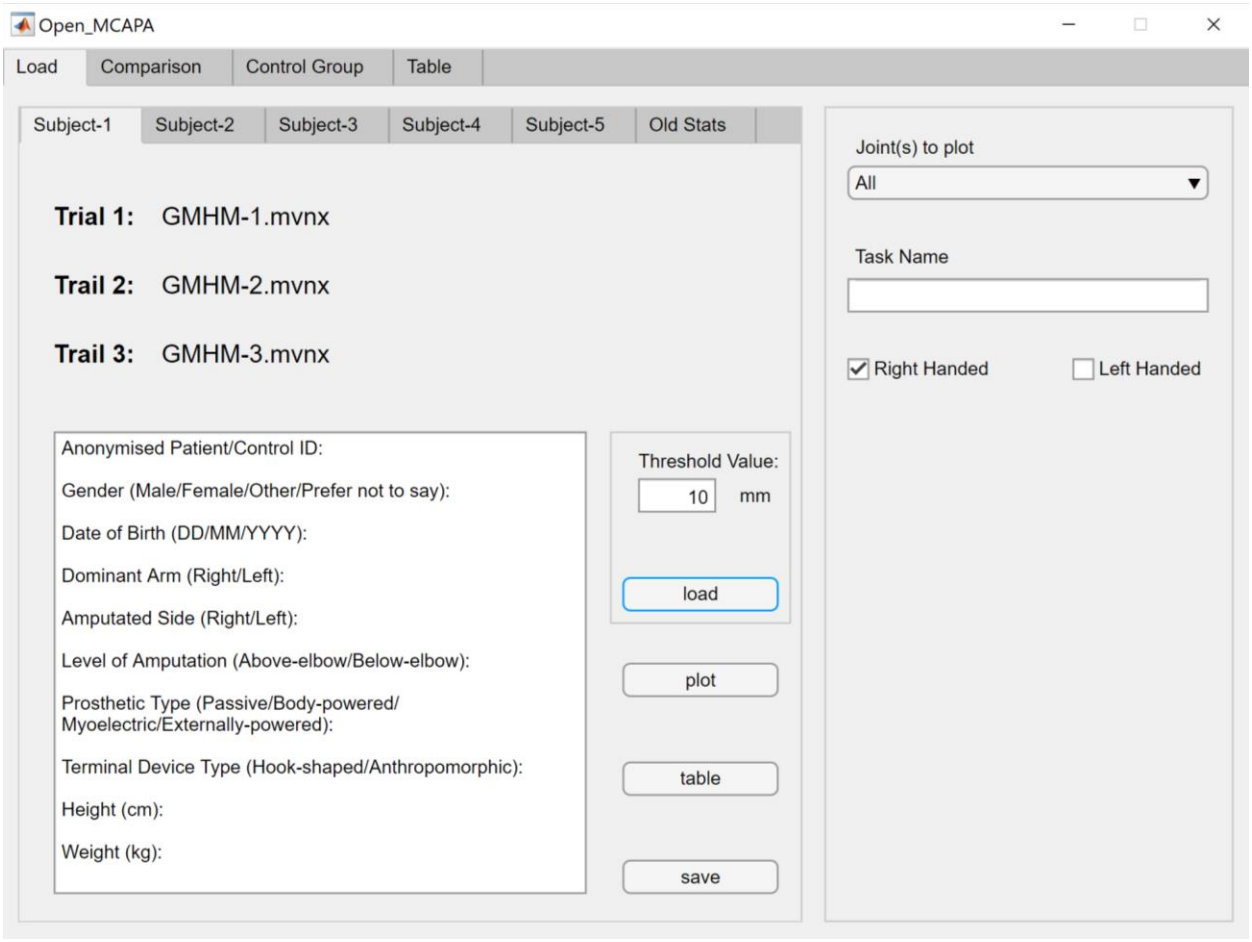
Introduction

Motion **C**apture **A**nalysis & **P**lotting **A**ssistant (**MCAPA**) is developed for analyzing upper limbs' joint angles captured by the Xsens[1] motion capture systems. The app has four different tabs, 'Load', 'Comparison', 'Control Group', and 'Table'. This is a run through of all the tabs and functionalities of the app.

Load

The app starts up on the 'Load' tab. This is where you import the data sets to be processed throughout the session.

There are two sections on this tab. To the left it's the loading window, and to the right it's a property input window for individual plots.



Loading New Data

To load a new set of data, first, input a threshold value (in millimeters), which determines the initial and final valid frames (only frames in between the first and last frames to pass the threshold will be valid). And then choose one of the five subject tabs, and press the load button, and a file selection window will pop up. Select up to three *.mvnx[2] files to be imported (once loaded, you'll NOT be able to

add more files to the same subject without overwriting the previous import, so please select all desired files at once). Once imported, a notification will pop up displaying 'loading success', please do NOT try to carry out any other tasks in the app until then.

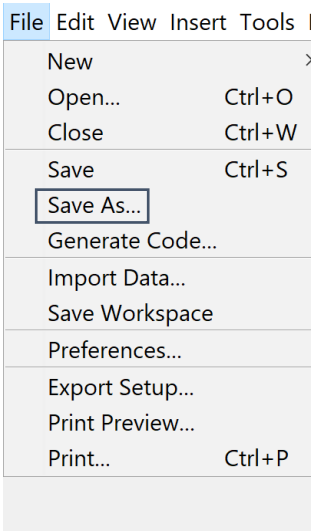
The note pad below is for entering basic information regarding the subject, the pre-existing texts are recommendations for what to record, and can be edited.

Once imported, the data set could be saved for later uses, either as old stats or a new control group profile. To save the data and the attached note pad, press the [save] button, and a file saving window will pop up, select a folder and enter an appropriate name. The data will be saved as a *.mat[3] file, and the notes will be saved in a text file.

Plot and Data Table

To generate a plot, first select the angle(s) to plot in the drop down to the right, this will not affect the data table. Then, enter the name of the task captured, this will show up in the title of the plot as well as the data table. Check the 'left handed' check box if the task was carried out with the left arm, if both 'left handed' and 'right handed' check boxes are unchecked, the task is processed for the right arm by default. Once the above properties have been entered, press the [plot] button to generate a plot, or press the [table] button which will take you to the table tab of the app, listing the maximum, minimum angles and movement range for every degree of freedom.

To save a plot, go to 'File' in the manu bar, and select 'Save As…', saving as a *.jpg is recommanded.



To save a data table, simply press the [save] button below the table, and a saving window will pop up. The table will be saved in a Microsoft® Excel file.

Loading Saved Data

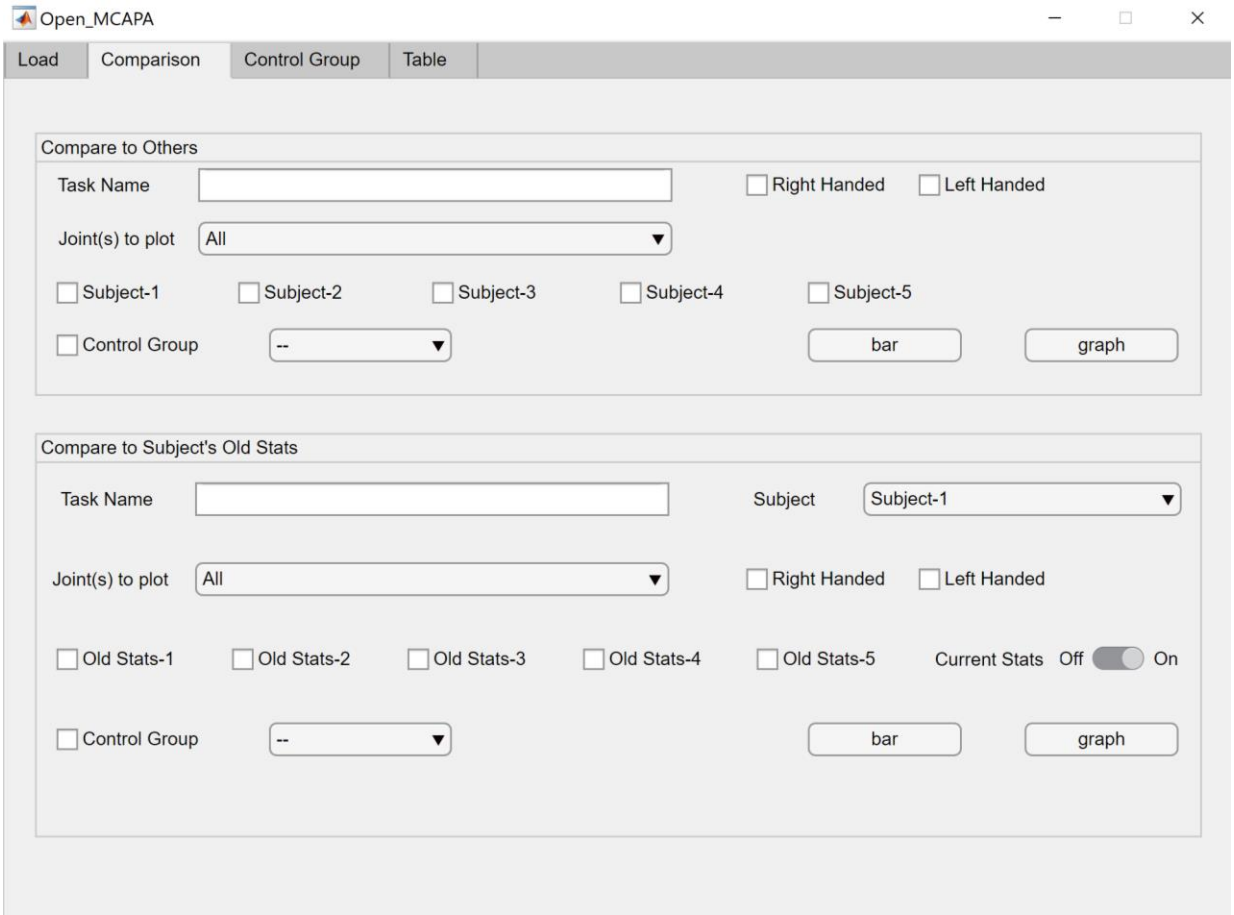
Previously saved *.mat files can be loaded as old stats for further comparison. To import the *.mat files, go to the 'Old Stats' tab where up to 5 old data sets can be loaded separately by pressing the load buttons.

Comparison

Before you start making comparisons, select the joint angle(s) to be plotted, enter the task name, and indicate whether it was a left-handed task.

Quantitative and qualitative comparisons could be done for:

1. Between subjects
2. Between a subject's recent and past captures
3. To a control group with non-amputees



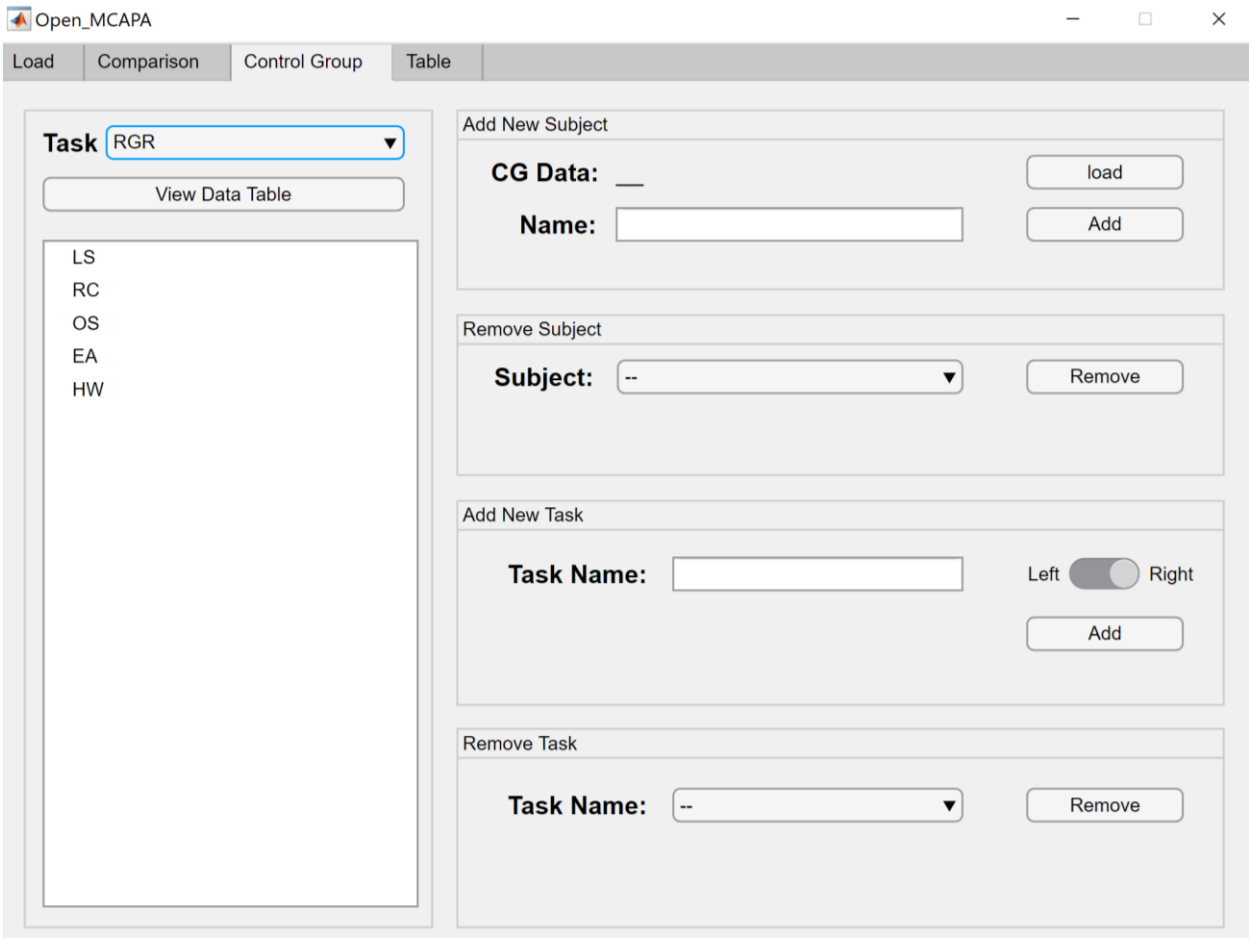
Tick all the data sets to be compared. For the control group (CG), select the task in the drop down next to the tick box. For comparisons between a subject's recent and past captures, select a subject from the 'Subject' drop down if the recent data is imported as one of the five subjects in the 'Load' tab.

Quantitative comparisons are done by pressing the bar button, and it's presented as bar plots of maximum and minimum angles and ranges side by side. All joint angles cannot be plotted together for this type of comparison due to visibility issues.

Qualitative comparisons are done by pressing the graph button, and it's presented as overlapping line plots of the joint movements.

Control Group

The 'Control Group' tab allows you to manage the control group profiles. You can add or remove subjects from the control group (CG) profiles and view CG angle tables for different tasks. To manage a CG profile, select a task from the 'Task' drop down, and indicate whether to edit the left-handed or the right-handed profile of the task. The list on the left shows all the subjects in the selected profile.



Adding New CG Subject

To add a subject, first save the data as a *.mat file in the 'Load' tab. Then, press the load button, and a file selection window will pop up. Import the *.mat file, give it an appropriate name and press the Add button.

Removing a CG Suject

To remove a subject, select the subject to remove from the drop down, and press the Remove button.

Adding New CG Task

To add a new task, enter the task name in the edit field, select the arm used to carry out the task (left/right), and then press the Add button. Once the task is added, add the subjects to it using the add new CG subject feature.

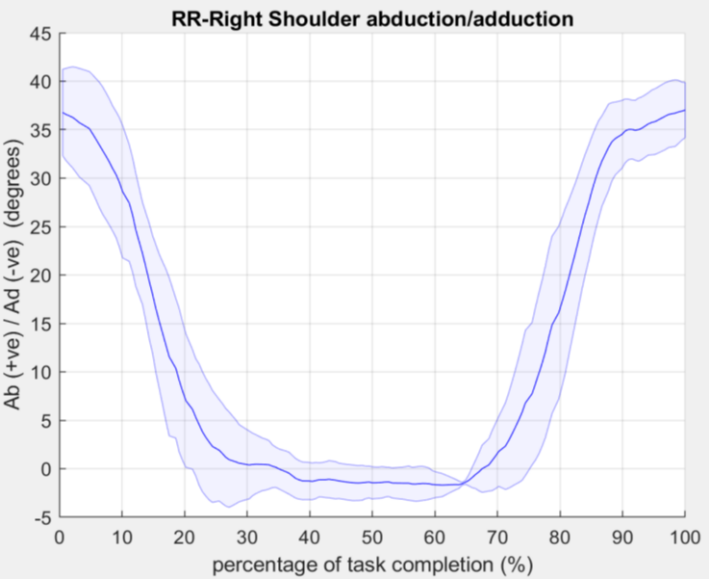
Removing a CG Task

To remove a task, select the task to remove from the drop down, and press the Remove button.

Additional Info

Interpreting the Plots

For plots with more then one trials included, the solid line in the middle is the median, and the shaded area is the IQR.



Saving Files

When saving a file, make sure the file's name does not begin with a number or contain any symbols other than the underscore (_).

1. Xsens is a 3D motion tracking technology and products development company. Visit Xsens website at www.xsens.com
2. *.mvnx file type is developed by Xsens for their MVN Analyze software.
3. *.mat file type is developed by mathworks containing MATLAB® formated data.