jMetrik 2.1

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Many researchers are curious about Rasch analysis and would like to try it with their own data, and most have a need for classical test statistics from time to time. However, with prices ranging from $150 to well over $1000 (US), test software can be a major investment, leaving researchers unsure of where to get started. In our first software column, we will introduce free alternative to commercial packages called jMetrik, and detail how to get started with the program.

What is jMetrik?

jMetrik is a free, open-source software tool for psychometrics. Unlike packages for R which rely on command lines, it offers a Graphical User Interface, making it easy for beginners to navigate. It is Java-based, so it is 100% cross-platform, offering identical operation on Windows, Macintosh, and Linux. It offers a range of statistical and psychometric functions that are usually not available for free, including:

- Descriptive statistics
- Classical test theory (CTT) item analyses
- Rasch modeling
- Test equating
- DIF analyses
- Graphing
- Some confirmatory factor analysis functions

Although it can be a little rough around the edges, it is a convenient tool for testing on a budget. In this, the first Software Corner article, I will explain the basics of getting started with jMetrik.

Obtaining and installing the software

The software is freely available from the following URL:

http://www.itemanalysis.com/user-form.php

Enter your name, email, and location, and you will be directed to a page from which you can download the version for your operating system. Note that if you are a Mac user, you may need to install Java separately. The page includes a link to do so.

Formatting and importing your data

Probably the most confusing aspect of getting started with jMetrik is simply entering your data, as jMetrik, like RUMM2020, follows a database model rather than a file-based model. This is very convenient for keeping all of your data sets and results together for a project, but comes at the cost of a somewhat more-involved data importing process initially.

Laying out your data

In all likelihood, your data is in an Excel (or compatible) spreadsheet. Although jMetrik cannot read Excel files, the data can be easily exported to a text-based format that can be read. In this section I will explain the process for tab-delimited files (although jMetrik supports other text formats as well).

1. Lay out your data.

In Excel, lay out your data so that cases are in rows and items are in columns. You may also include non-item variables such as case IDs and gender (see Fig. 1). **Be sure to save this in Excel before moving on to the next step.**

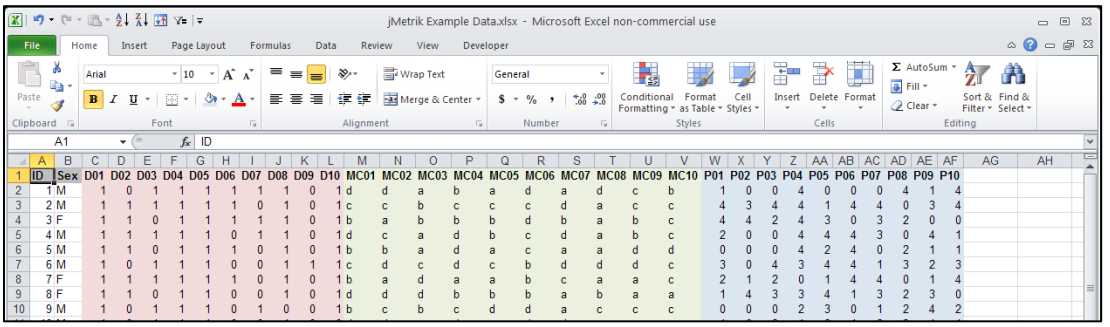

Figure 2. **Example data layout in Microsoft Excel, with case ID, sex, dichotomous items, multiple-choice items, and polytomous items.**

2. Save your data as tab-delimited text.

Go to the File tab (Windows) or menu (Macintosh), and choose "Save as." In the save dialog, set the format to tab-delimited text. See Figures 1 (Windows) and 2 (Macintosh) for the locations of this option.

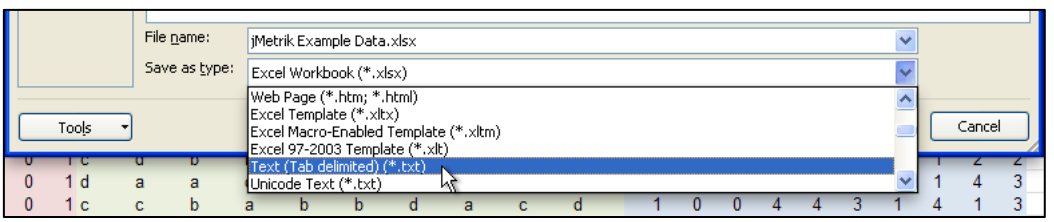

Figure 3. **Saving as tab-delimited text in Excel for Windows.**

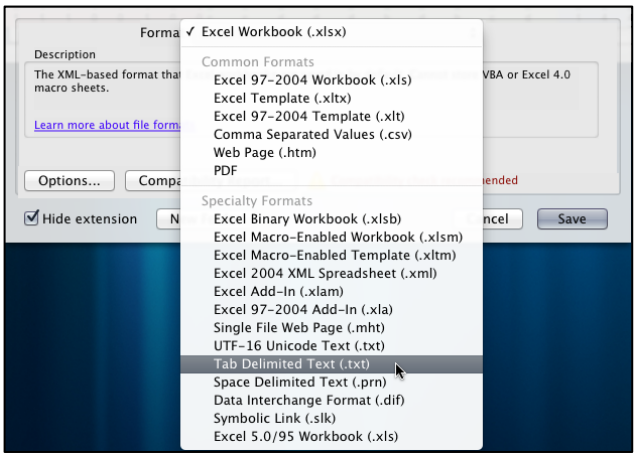

Figure 4. **Saving as tab-delimited test in Excel for Macintosh.**

You will see two dialog boxes asking if you would like save only the active sheet, and then if you would like to continue to save and lose formatting. Click "OK" and "Yes" to both of these. They will not affect your Excel data, which you saved before exporting a plain-text copy.

Importing your data into jMetrik

You cannot import your data into jMetrik until you have defined a database. Before doing that, however, you may want to create a new workspace, which can hold multiple databases and outputs for a project. This is entirely optional.

1. (Optional) Add a new workspace.

Workspaces allow you to keep projects totally separate. If you will be using jMetrik for several projects at the same time, this step is recommended. When the software starts, it uses a default workspace. If you would like a separate one, choose "Add Workspace…" from the Manage menu. Give it a name and a location to save it, and click "Add" (see Figure 4).

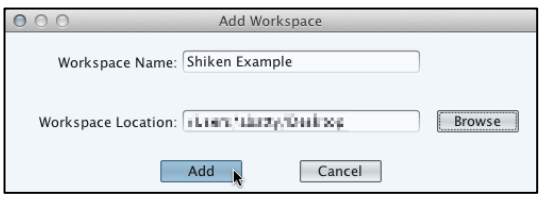

Figure 5. Adding a workspace.

Once you create a new workspace, you will need to change to it by going to the Manage menu and choosing "Change Workspace…" You will be presented with a list of available workspaces. Choose your new workspace, as in Figure 5.

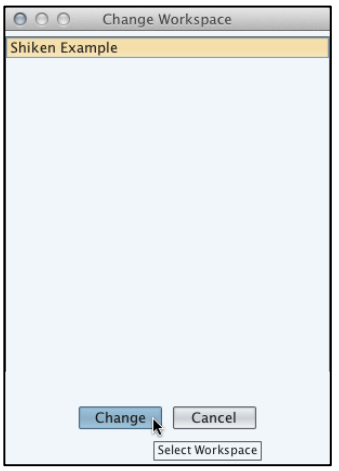

Figure 6. Changing to the new workspace.

2. Add a new database to the workspace.

After either creating a new workspace or electing to simply use the default, go to the Manage menu and select "New Database…" Give the new database a descriptive name. This database will hold all the data associated with your project, so it should be something easy to identify.

3. Import your data table.

The database created in the last step is empty. The next step is to add a data table. Go to the Manage window and select "Import Data…" In the open dialog that appears, navigate to the data file you exported from Excel and set the delimiter to "Tab". If your data file has the variable names in the first row, be certain to select that option. Click "Browse" to import the data. See Figure 6.

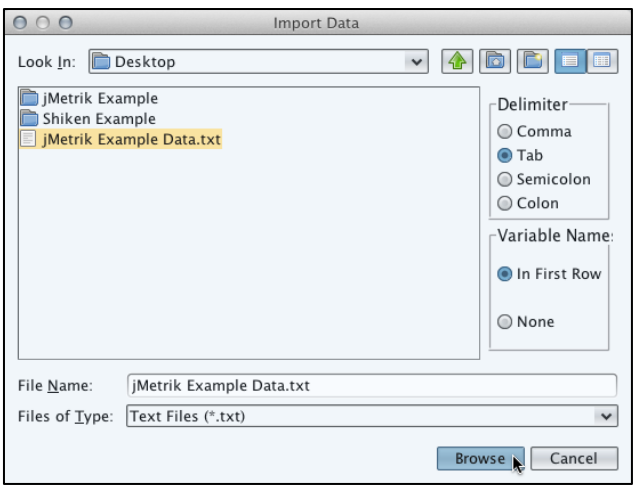

Figure 7. Import data dialog box.

In the dialog that appears, give the data set a name. You cannot use spaces in this name. Leave "Rows to Scan" blank to include all data. Finally, click "Import." See Figure 7 for an example.

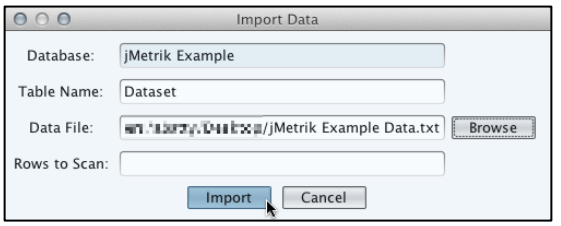

Figure 8. Creating the data table.

Scoring Item Responses

Because jMetrik can accommodate many kinds of item data, you will need to provide the scoring information for each item (anything that is not scored will be listed as "Not Item." Although this can be a little tedious with multiple-choice (MC) data, it does allow for CTT distractor analyses. To begin this process, click the "Variables" tab at the bottom of the jMetrik window (see Figure 8).

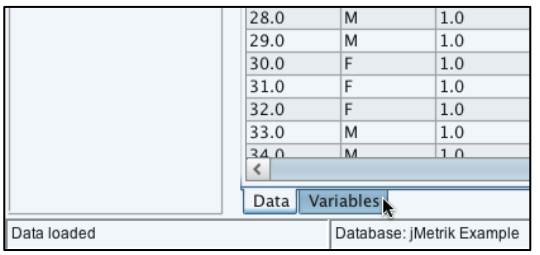

Figure 9. Switching to the variable tab.

In the variable tab, click the cell in the "Scoring" column for the first item. The Option Scoring dialog will appear. Refer to the following sections for binary, MC, and polytomous data.

Scoring binary items

1. Set the scoring for the first item.

In the Option Scoring dialog, enter "0" in the Option column, and "0" in the Score column. On the next line, insert a "1" in both fields. **Be sure to move to the next line or the values will not be registered.** See Figure 9.

2. Replicate the scoring for the rest of the binary items.

After entering the scoring for the first item, click "Replicate," as in Figure 9.

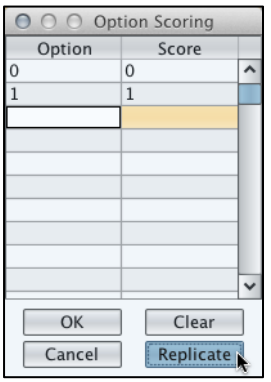

Figure 10. Option Scoring for binary items.

3. Set the items to which to replicate the first item's scoring.

After clicking "Replicate," a dialog box will appear. On the left are all of the variables in the data table. Select the items to which you wish to apply the first item's scoring on the left (NOTE: Click the first item and then shift-click the last item to select a range.) and click the right arrow to add it to the list to which the scoring will be added. See Figure 10.

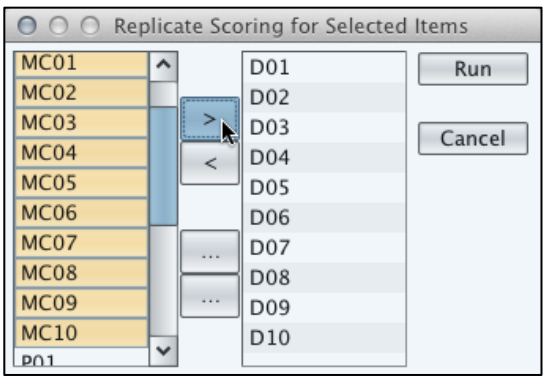

Figure 11. **Setting items to which to replicate scoring.**

4. Finish replication.

Click "Run" on the replication dialog, and "Okay" on the verification.

Scoring MC items

MC items are a little more difficult, since there are multiple scoring possibilities, depending on the correct option for the item in question.

1. Set the scoring for the first item.

Once again, click in the Scoring column for an item and enter the option scoring for that item (see Figure 11).

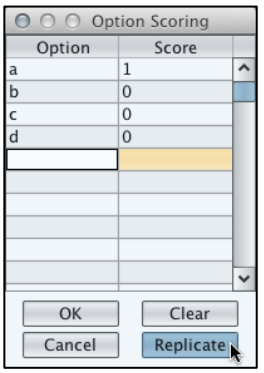

Figure 12. Option Scoring for MC items.

2. Replicate the scoring for the rest of the items with the same scoring.

Replicate the scoring for the first item you scored to every item with the same correct answer. For example, all the items for which "a" is the correct answer should have the scoring showing in Figure 11 replicated to them. Repeat for "b", "c", "d", etc. In the Replicate dialog, you can select multiple items with ctrl-click (Windows) or cmd-click (Macintosh).

Scoring polytomous items

Since jMetrik includes the rating scale and partial credit models, polytomous data is a possibility. Scoring of this data follows the same logic as that of the binary data. Simply set each number to its value. NOTE: If you need to collapse categories, simply assign the same score to two categories. Refer to Figure 12 for an example. Replicate for all the items to which this scoring is relevant.

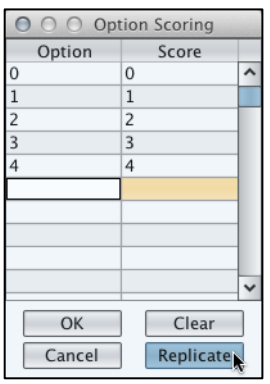

Figure 13. **Option Scoring for polytomous items.**

Finishing variable definition

On the Variables tab, you may add easy-to-read labels to the variables if you wish.

Analyses

Once the data are imported and scored, analyses are fairly straightforward with the graphical user interface. Overall, the interface for these analyses is very similar to that of SPSS, and to the

Replicate dialogs discussed above. Analyses and graphs output to tabs in the jMetrik window. Refer to the following sections for saving this information for use in other analyses or elsewhere.

Saving Rasch scores to the data table

Some analyses, particularly Rasch, can write the results to variables in the data table, to be used in further analyses. In the case of Rasch analyses, this option is located under the Person tab in the Rasch analysis dialog (see Figure 13).

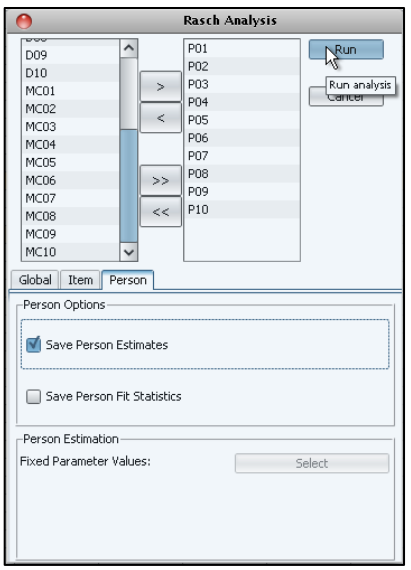

Figure 14. **Saving Rasch person estimates to the data table.**

Saving text outputs

If your analysis has created a text output that you would like to use elsewhere, click the "Text File Save As" button in the toolbar, or select "Text File Save As" from the File menu (see Figure 14).

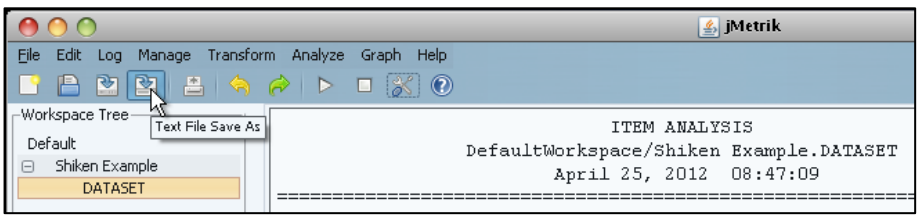

Figure 15. **The Text File Save As button in the toolbar.**

Saving graphical outputs

Graphs can be saved by right-clicking them and selecting "Save as…" The file that is created is in the Portable Network Graphics (.png) format. See Figure 15.

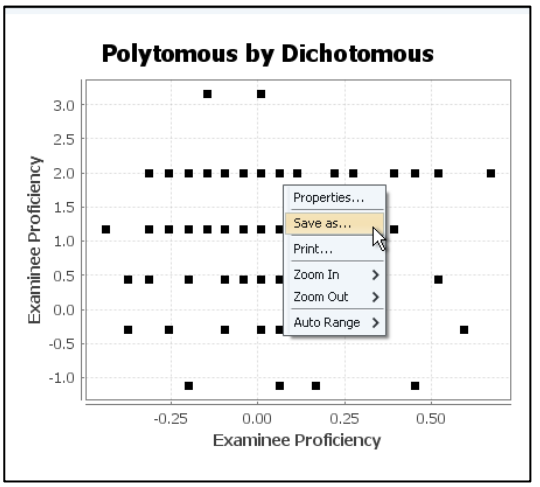

Figure 16. Saving a graph to a file.

Conclusion

Although setting up the data for analysis can be tedious, jMetrik offers researchers and students on a budget a suite of psychometric analyses for free. In a field where even software with very limited functionality is routinely priced in the hundreds of US dollars, this is a welcome alternative. Despite having an ever-growing number of psychometric software tools at my disposal, the lack of licensing difficulties and cross-platform compatibility of jMetrik has made it my first go-to tool for quick or exploratory analyses. I encourage you to try it out; I think you will be surprised by what it can offer for the price.