

EFashiny: An User-Friendly Shiny Application for Exploratory Factor Analysis

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Summary

EFashiny is a user-friendly web application for exploratory factor analysis (EFA) (David J. Bartholomew 2011). The motivation to create EFashiny is to streamline the routine work flow of EFA so that users unfamiliar with R can perform the analysis interactively in a web browser.

Employing the graphical user interface (GUI) of `shiny` (Winston Chang 2017) framework (Figure 1), EFashiny provides an integrated platform to perform EFA with a drop-down menu, offering a number of choices to manage, explore, analyze and visualize data. EFashiny automates these processes by wrappings together several R (Team 2000) packages, such as `ggplot2` (Wickham 2016), `psych` (Revelle 2017), `psycho` (Makowski 2018), and `EGA` (Golino and Epskamp 2017), etc. For example, users can point-and-click to obtain graphical display of confidence intervals for factor loadings, which is not available in many commercial software. Moreover, results of analysis are presented on-line as tables and graphs and they can be saved and exported by the user.

Key features of EFashiny include:

- An easy-to-use GUI to free users from scripting in R
- A step by step analysis flow to perform EFA
- Quick ways to summarize data by tables or graphs
- Several ways to explore factor retention numerically or graphically
- Several ways to explore factor extraction and rotation numerically or graphically
- A display of confidence intervals for factor loadings
- Several ways to link visualization of correlation matrix with factor structure
- Default options are chosen according to recommendations in the literature (Henson and Roberts 2006)
- A demonstration using a real psychological scale dataset

Although the EFashiny application is primarily aimed at behavioral researchers who want to perform EFA on a set of associated variables (e.g., item-level scale dataset), it can also be used to explore FA-based connectivity analyses (McLaughlin et al. 1992) in instrument data, such as event related potentials (ERPs) and functional near-infrared spectroscopy (fNIRS).

In conclusion, EFashiny allows researchers to harness the combined power of many R packages together for performing interactive EFA and obtaining numerical and graphical results in a user-friendly menu-driven GUI. Documentation, tutorials and usages can be found on **our page**.

References

- David J. Bartholomew, Irini Moustaki, Martin Knott. 2011. *Latent Variable Models and Factor Analysis: A Unified Approach*. John Wiley & Sons. New Jersey.
- Golino, Hudson F, and Sacha Epskamp. 2017. “Exploratory Graph Analysis: A New Approach for Estimating the Number of Dimensions in Psychological Research.” *PLOS ONE* 12 (6). Public Library of Science:1–26. <https://doi.org/10.1371/journal.pone.0174035>.
- Henson, Robin K., and J. Kyle Roberts. 2006. “Use of Exploratory Factor Analysis in Published Research: Common Errors and Some Comment on Improved Practice.” *Educational and Psychological Measurement* 66 (3):393–416. <https://doi.org/10.1177/0013164405282485>.



Figure 1: The GUI of EFAshiny

- Makowski, Dominique. 2018. "The Psycho Package: An Efficient and Publishing-Oriented Workflow for Psychological Science." *Journal of Open Source Software* 3 (22):470. <https://doi.org/10.21105/joss.00470>.
- McLaughlin, Thomas, Bruce Steinberg, Birger Christensen, Ian Law, Agnete Parving, and Lars Friberg. 1992. "Potential Language and Attentional Networks Revealed Through Factor Analysis of rCBF Data Measured with Spect." *Journal of Cerebral Blood Flow & Metabolism* 12 (4):535–45. <https://doi.org/10.1038/jcbfm.1992.77>.
- Revelle, William. 2017. *Psych: Procedures for Psychological, Psychometric, and Personality Research*. <https://cran.r-project.org/web/packages/psych/>.
- Team, R Core. 2000. "R Language Definition." *Vienna, Austria: R Foundation for Statistical Computing*.
- Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer. New York.
- Winston Chang, JJ Allaire, Joe Cheng. 2017. *Shiny: Web Application Framework for R*. <https://cran.r-project.org/web/packages/shiny/>.