

shiny-rmcorr: A web application for repeated measures correlation

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Summary

The most common techniques for calculating the correlation between two variables are based on the assumption that each data point of paired measures represents an independent observation. For example, a study might calculate the correlation between the height and weight of randomly-drawn sample of people, where each person contributes a data point consisting of one height and one weight. However, it is not unusual for studies to use repeated measures designs, such as a study that collected height and weight from the same randomly-drawn sample of people at three different time points. In this example, each person contributes three data points of paired measures. These would not be considered independent observations. One common solution to this problem is to use aggregated data by taking an average of the repeated measures data of each person and then correlating these averages. Another solution is to calculate the repeated measures correlation (Bakdash & Marusich, 2017; Bland & Altman, 1995a, 1995b), which assesses the common intra-individual (within-participants) association for paired repeated measures. The repeated measures correlation technique is conceptually similar to a null multilevel model, with a common slope but varying intercept for each individual. Calculating the repeated measures correlation has the two-fold benefit of being simpler and more straightforward to implement than a multilevel model, with the potential for far greater power than the aggregation solution.

We previously developed the `rmcorr` R package (Bakdash & Marusich, 2020) to make this technique widely available for researchers; it has since also been adapted as a function in the Pingouin statistics package (Vallat, 2018) for Python. However, the use of both of these packages requires some facility with statistical programming languages and thus not easily accessible for all researchers.

We have created the `rmcorr-shiny` application, which provides an intuitive interface for computing and plotting the repeated measures correlation (see Figure 1 below). The primary features of `rmcorr-shiny` include:

- The ability to import data in different file formats or use one of four included sample datasets.
- The display of raw output from `rmcorr` as well as formatted output for reporting results.
- Multiple options to generate and customize `rmcorr` plots (making use of the `ggplot2` package (Wickham, 2016; Wickham et al., 2020) and palettes from the `RColorBrewer` (Neuwirth, 2014) and `pals` (Wright, 2019) packages).
- Customized R code using the data and options chosen by the user that can be directly pasted and executed in R to produce the same output as in `rmcorr-shiny`.
- The ability to download plots (in a variety of file formats) or a .zip file of all output.

Note that many features were borrowed from the Raincloud-shiny app (“Raincloud-shiny,” 2021) (not sure the best way to phrase this, or cite)

Screenshot (placeholder until we have a near-final version?)

`rmcorr-shiny` can be used in a web browser [here](#) (should we make this into a package too? i saw other people do that. then people can run it locally) (also, should we change the name of the repo to match the app? hyphen versus underscore)

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