1   R you ready for some data?

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Abstract

Want to write a paper using R Markdown? Keep reading to see how.

Keywords: APA, R Markdown

Word count: Not that many.

16   R you ready for some data?

17   It is possible to write an entire APA-formatted article in R Markdown. This very brief

18 paper shows how it might be done. As illustration, we use the data from a brief, informal

19 survey of participants in the inaugural R Bootcamp at Penn State. We predicted that higher

20 levels of enthusiasms for "Game of Thrones"" would be reported by respondents with *lower*

21 reported hours/day of preferred sleep, at least among younger respondents.

22   **Methods**

23   Consistent with open and transparent science practices, we report how we determined

24 our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

25 **Participants**

26   We asked participants in an optional "R Bootcamp" held at the Pennsylvania State

27 University Department of Psychology to complete an anonymous survey using a Google

28 Form. We asked participants to report their age in years. A total of 50 respondents

29 answered the survey with a reported age of [23-54] years.

30 **Material**

31   The survey can be found at this URL: https:

32 //docs.google.com/forms/d/1l5OX8PcN_lfVn3ykr_PtHCzhRbWzMbxhqtgILD45zRg/edit.

33 There were five questions asked:

34   1. Your current level of experience/expertise with R

35   2. Your enthusiasm for Game of Thrones [1..10 scale]

36   3. Age in years

37   4. Preferred number of hours spent sleeping/day

38   5. Favorite day of the week?

39   6. Are your data tidy?

Procedure

We emailed a link to the survey to the list of participants. We also include a link to the survey on the web page containing the course schedule (https://psu-psychology.github.io/r-bootcamp/schedule.html). We encouraged participants to complete the survey after the first day's material.

Data analysis

We used R (3.4.1, R Core Team, 2017) and the R-packages *dplyr* (0.7.0, Wickham & Francois, 2016), *ggplot2* (2.2.1, Wickham, 2009), *googlesheets* (0.2.2, Bryan & Zhao, 2017), *papaja* (0.1.0.9492, Aust & Barth, 2017), *purrr* (0.2.2, Henry & Wickham, 2017), *readr* (1.1.0, Wickham, Hester, & Francois, 2017), *tibble* (1.3.3, Wickham, Francois, & Müller, 2017), *tidyr* (0.6.1, Wickham, 2017a), and *tidyverse* (1.1.1, Wickham, 2017b) for all our analyses. The code used to generate these analyses is embedded in this document. To view it, see the R Markdown file in the GitHub repository associated with this paper.

Results

Table 1 summarizes the Game of Thrones ratings data by levels of R experience.

Let's examine the correlations between our continuous variables. There is a negative correlation ($r = -.92$, 95% CI $[-.95, -.86]$) between Game of Thrones enthusiasm and age ($t(48) = -16.19$, $p < .001$), a negative correlation ($r = -.48$, 95% CI $[-.67, -.23]$) between Game of Thrones enthusiasm and sleep ($t(48) = -3.79$, $p < .001$), but no correlation ($r = .22$, 95% CI $[-.06, .47]$) between age and sleep ($t(48) = 1.55$, $p = .128$). Figures 1 and 2 depict these patterns.

To test the hypothesis that GoT enthusiasm varies as a function of R expertise and the extent to which respondents use tidy data, we carried out a one-way ANOVA. R experience ($F(4, 40) = 0.12$, MSE $= 5.29$, $p = .974$, $\eta_p^2 = .012$) and the use of tidy data principles ($F(1, 40) = 0.17$, MSE $= 5.29$, $p = .686$, $\eta_p^2 = .004$) did not predict enthusiasm for Game of

65   Thrones. Table 3 summarizes these results.

Discussion

67   These results show how awesome it can be to use R, R Markdown, and literate

68   programming principles to conduct and open, transparent, and reproducible psychological

69   science. Yay, us!

70   There are no limitations to what we can accomplish using these tools. So, let's get to it.

References

Aust, F., & Barth, M. (2017). *papaja: Create APA manuscripts with R Markdown.*
Retrieved from https://github.com/crsh/papaja

Bryan, J., & Zhao, J. (2017). *Googlesheets: Manage google spreadsheets from r.* Retrieved
from https://CRAN.R-project.org/package=googlesheets

Henry, L., & Wickham, H. (2017). *Purrr: Functional programming tools.* Retrieved from
https://CRAN.R-project.org/package=purrr

R Core Team. (2017). *R: A language and environment for statistical computing.* Vienna,
Austria: R Foundation for Statistical Computing. Retrieved from
https://www.R-project.org/

Wickham, H. (2009). *Ggplot2: Elegant graphics for data analysis.* Springer-Verlag New York.
Retrieved from http://ggplot2.org

Wickham, H. (2017a). *Tidyr: Easily tidy data with 'spread()' and 'gather()' functions.*
Retrieved from https://CRAN.R-project.org/package=tidyr

Wickham, H. (2017b). *Tidyverse: Easily install and load 'tidyverse' packages.* Retrieved
from https://CRAN.R-project.org/package=tidyverse

Wickham, H., & Francois, R. (2016). *Dplyr: A grammar of data manipulation.* Retrieved
from https://CRAN.R-project.org/package=dplyr

Wickham, H., Francois, R., & Müller, K. (2017). *Tibble: Simple data frames.* Retrieved from
https://CRAN.R-project.org/package=tibble

Wickham, H., Hester, J., & Francois, R. (2017). *Readr: Read rectangular text data.*
Retrieved from https://CRAN.R-project.org/package=readr

Table 1

Descriptive statistics of Game of Thrones enthusiasm by R experience.

R_exp	Mean	Median	SD	Min	Max
none	4.60	5.00	1.51	2.00	6.00
limited	4.80	4.50	2.53	1.00	8.00
some	5.00	4.50	2.00	2.00	8.00
lots	5.30	5.00	2.87	1.00	10.00
pro	4.90	4.50	1.85	2.00	8.00

Note. This table was created with apa_table()

Table 2

Correlation table of the example

data set.

	GoT	Age_yrs
GoT		
Age_yrs	-0.92***	
Sleep_hrs	-0.48***	0.22

Note. This is a correlation table

created using apa_table().

Table 3

ANOVA table for the analyis of the example data set.

Effect	F	df_1	df_2	MSE	p	η_p^2
R exp	0.12	4	40	5.29	.974	.012
Tidy data	0.17	1	40	5.29	.686	.004
R exp × Tidy data	0.32	4	40	5.29	.865	.031

Note. This is a table created using apa_print() and apa_table().
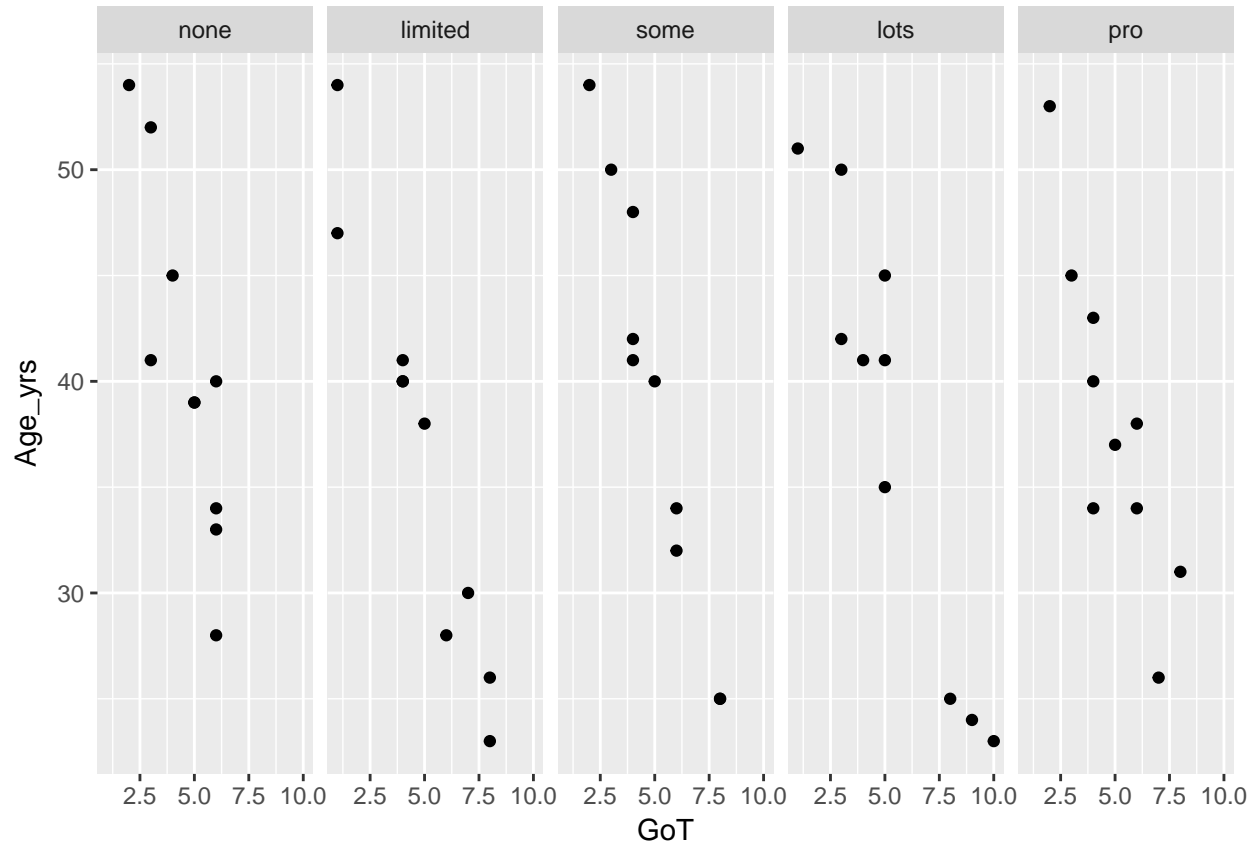
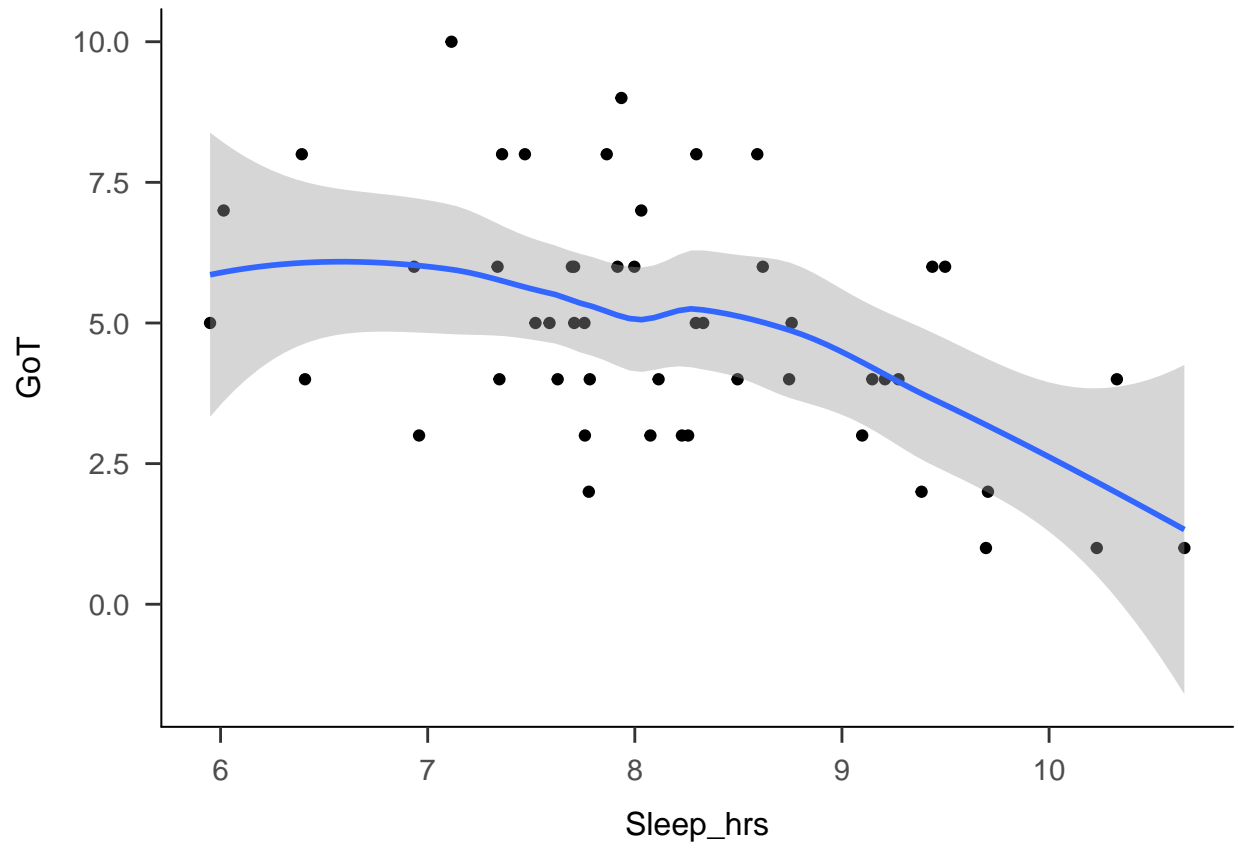*Figure 1*. Game of Thrones enthusiasm by age and R experience

Figure 2. Game of Thrones enthusiasm by preferred hours of sleep