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## EDUCATIONAL RESEARCH TECHNIQUES

Research techniques and education

### APA TABLES IN R

Anybody who has ever had to do any writing for academic purposes or in industry has had to deal with APA formatting. The rules and expectations seem to be endless and always changing. If you are able to maneuver the endless list of rules you still have to determine what to report and how when writing an article.

There is a package in R that can at least take away the mystery of how to report ANOVA, correlation, and regression tables. This package is called “apaTables”. In this post, we will look at how to use this package for making tables that are formatted according to APA.

We are going to create examples of ANOVA, correlation, and regression tables using the ‘mtcars’ dataset. Below is the initial code that we need to begin.

```
library(apaTables)
data("mtcars")
```

## ANOVA

We will begin with the results of ANOVA. In order for this to be successful, you have to use the “lm” function to create the model. If you are familiar with ANOVA and regression this should not be surprising as they both find the same answer using different approaches. After the “lm” function you must use the “filename” argument and give the output a name in quotations. This file will be saved in your R working directory. You can also provide other information such as the table number and confidence level if you desire.

There will be two outputs in our code. The output to the console is in R. A second output will be in a word doc. Below is the code.

```
apa.aov.table(lm(mpg~cyl,mtcars),filename = "Example1.doc",table.number = 1)
```

```
##
##
## Table 1
##
## ANOVA results using mpg as the dependent variable
##
##
## Predictor      SS df      MS      F      p partial_eta2
```

```
## (Intercept) 3429.84 1 3429.84 333.71 .000
##          cyl 817.71 1 817.71 79.56 .000          .73
##          Error 308.33 30 10.28
## CI_90_partial_eta2
##
##          [.56, .80]
##
##
## Note: Values in square brackets indicate the bounds of the 90% confidence interval for partial eta-squared
```

Here is the word doc output

**Table 1**

*Fixed-Effects ANOVA results using mpg as the criterion*

Predictor	Sum of Squares	df	Mean Square	F	p	partial $\eta^2$	partial $\eta^2$ 90% CI [LL, UL]
(Intercept)	3429.84	1	3429.84	333.71	.000		
cyl	817.71	1	817.71	79.56	.000	.73	[.56, .80]
Error	308.33	30	10.28				

*Note.* LL and UL represent the lower-limit and upper-limit of the partial  $\eta^2$  confidence interval, respectively.


Perhaps you are beginning to see the beauty of using this package and its functions. The “apa.aov.table” function provides a nice table that requires no formatting by the researcher.

You can even make a table of the means and standard deviations of ANOVA. This is similar to what you would get if you used the “aggregate” function. Below is the code.


```
apa.1way.table(cyl, mpg,mtcars,filename = "Example2.doc",table.number = 2)
```

```
##  
##  
## Table 2  
##  
## Descriptive statistics for mpg as a function of cyl.  
##  
## cyl      M    SD  
##    4 26.66 4.51  
##    6 19.74 1.45  
##    8 15.10 2.56  
##  
## Note. M and SD represent mean and standard deviation, respectively.  
##
```

Here is what it looks like in word

**Table 2***Descriptive statistics for mpg as a function of cyl.*


<i>cyl</i>	<i>M</i>	<i>SD</i>
4	26.66	4.51
6	19.74	1.45
8	15.10	2.56


*Note.* *M* and *SD* represent mean and standard deviation, respectively.

## Correlation

We will now look at an example of a correlation table. The function for this is “`apa.cor.table`”. This function works best with only a few variables. Otherwise, the table becomes bigger than a single sheet of paper. In addition, you probably will want to suppress the confidence intervals to save space. There are other arguments that you can explore on your own. Below is the code

```
apa.cor.table(mtcars,filename = "Example3.doc",table.number = 3,show.conf.interval = F)
```

```
##
```

```
##
```

```

## Table 3
##
## Means, standard deviations, and correlations
##
##
## Variable M      SD      1      2      3      4      5      6      7
## 1. mpg    20.09   6.03
##
## 2. cyl     6.19   1.79   -.85**
##
## 3. disp   230.72 123.94  -.85** .90**
##
## 4. hp     146.69 68.56   -.78** .83** .79**
##
## 5. drat    3.60   0.53   .68** -.70** -.71** -.45**
##
## 6. wt      3.22   0.98   -.87** .78** .89** .66** -.71**
##
## 7. qsec   17.85   1.79   .42*  -.59** -.43*  -.71** .09   -.17
##
## 8. vs      0.44   0.50   .66** -.81** -.71** -.72** .44*  -.55** .74**
##
## 9. am      0.41   0.50   .60** -.52** -.59** -.24   .71** -.69** -.23
##
## 10. gear   3.69   0.74   .48** -.49** -.56** -.13   .70** -.58** -.21
##
## 11. carb   2.81   1.62   -.55** .53** .39*   .75** -.09   .43*  -.66**
##
##
## 8      9      10
##
##
##

```

Here is the word doc results

Table 3

*Means, standard deviations, and correlations*

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
1. mpg	20.09	6.03										
2. cyl	6.19	1.79	-.85**									
3. disp	230.72	123.94	-.85**	.90**								
4. hp	146.69	68.56	-.78**	.83**	.79**							
5. drat	3.60	0.53	.68**	-.70**	-.71**	-.45**						
6. wt	3.22	0.98	-.87**	.78**	.89**	.66**	-.71**					
7. qsec	17.85	1.79	.42*	-.59**	-.43*	-.71**	.09	-.17				
8. vs	0.44	0.50	.66**	-.81**	-.71**	-.72**	.44*	-.55**	.74**			
9. am	0.41	0.50	.60**	-.52**	-.59**	-.24	.71**	-.69**	-.23	.17		
10. gear	3.69	0.74	.48**	-.49**	-.56**	-.13	.70**	-.58**	-.21	.21	.79**	
11. carb	2.81	1.62	-.55**	.53**	.39*	.75**	-.09	.43*	-.66**	-.57**	.06	.27

Note. \* indicates  $p < .05$ ; \*\* indicates  $p < .01$ . M and SD are used to represent mean and standard deviation, respectively.

If you run this code at home and open the word doc in Word you will not see variables 9 and 10 because the table is too big by itself for a single page. I had to resize it manually. One way to get around this is to delete the M and SD column and place those as rows below the table.

## Regression

Our final example will be a regression table. The code is as follows

```
apa.reg.table(lm(mpg~disp,mtcars),filename = "Example4",table.number = 4)
```

```
##
##
## Table 4
```



```
##
## Regression results using mpg as the criterion
##
##
## Predictor      b      b_95%_CI  beta   beta_95%_CI sr2 sr2_95%_CI
## (Intercept) 29.60** [27.09, 32.11]
##      disp -0.04** [-0.05, -0.03] -0.85 [-1.05, -0.65] .72 [.51, .81]
##
##
##
##
##      r      Fit
##
## -.85**
##
##      R2 = .718**
##      95% CI[.51,.81]
##
##
## Note. * indicates p < .05; ** indicates p < .01.
## A significant b-weight indicates the beta-weight and semi-partial correlation are also significant.
## b represents unstandardized regression weights; beta indicates the standardized regression weights;
## sr2 represents the semi-partial correlation squared; r represents the zero-order correlation.
## Square brackets are used to enclose the lower and upper limits of a confidence interval.
##
```

Here are the results in word

Table 4

Regression results using mpg as the criterion

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> <sup>2</sup>	<i>sr</i> <sup>2</sup> 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	29.60**	[27.09, 32.11]						
disp	-0.04**	[-0.05, -0.03]	-0.85	[-1.05, -0.65]	.72	[.51, .81]	-.85**	
								<i>R</i> <sup>2</sup> = .718** 95% CI[.51,.81]

Note. \* indicates  $p < .05$ ; \*\* indicates  $p < .01$ . A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights; *beta* indicates the standardized regression weights; *sr*<sup>2</sup> represents the semi-partial correlation squared; *r* represents the zero-order correlation. LL and UL indicate the lower and upper limits of a confidence interval, respectively.

You can also make regression tables that have multiple blocks or models. Below is an example

```
apa.reg.table(lm(mpg~disp,mtcars),lm(mpg~disp+hp,mtcars),filename = "Example5",table.number = 5)
```

```
##
##
## Table 5
##
## Regression results using mpg as the criterion
##
##
## Predictor      b      b_95%_CI  beta   beta_95%_CI sr2   sr2_95%_CI
## (Intercept) 29.60** [27.09, 32.11]
##      disp -0.04** [-0.05, -0.03] -0.85 [-1.05, -0.65] .72  [.51, .81]
##
```

```
##
##
## (Intercept) 30.74** [28.01, 33.46]
##      disp -0.03** [-0.05, -0.02] -0.62 [-0.94, -0.31] .15  [.00, .29]
##      hp   -0.02 [-0.05, 0.00] -0.28 [-0.59, 0.03] .03 [-.03, .09]
##
##
##
##      r          Fit      Difference
##
## -.85**
##
##      R2 = .718**
##      95% CI[.51, .81]
##
##
##
## -.85**
## -.78**
##
##      R2 = .748**      Delta R2 = .03
##      95% CI[.54, .83] 95% CI[-.03, .09]
##
##
## Note. * indicates p < .05; ** indicates p < .01.
## A significant b-weight indicates the beta-weight and semi-partial correlation are also significant.
## b represents unstandardized regression weights; beta indicates the standardized regression weights;
## sr2 represents the semi-partial correlation squared; r represents the zero-order correlation.
## Square brackets are used to enclose the lower and upper limits of a confidence interval.
##
```

Here is the word doc version

Table 5

*Regression results using mpg as the criterion*

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> <sup>2</sup>	<i>sr</i> <sup>2</sup> 95% CI [LL, UL]	<i>r</i>	Fit	Difference
(Intercept)	29.60**	[27.09, 32.11]							
disp	-0.04**	[-0.05, -0.03]	-0.85	[-1.05, -0.65]	.72	[.51, .81]	-.85**	<i>R</i> <sup>2</sup> = .718** 95% CI[.51,.81]	
(Intercept)	30.74**	[28.01, 33.46]							
disp	-0.03**	[-0.05, -0.02]	-0.62	[-0.94, -0.31]	.15	[.00, .29]	-.85**		
hp	-0.02	[-0.05, 0.00]	-0.28	[-0.59, 0.03]	.03	[-.03, .09]	-.78**	<i>R</i> <sup>2</sup> = .748** 95% CI[.54,.83]	$\Delta R^2$ = .03 95% CI[-.03, .09]

Note. \* indicates  $p < .05$ ; \*\* indicates  $p < .01$ . A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights; *beta* indicates the standardized regression weights; *sr*<sup>2</sup> represents the semi-partial correlation squared; *r* represents the zero-order correlation. LL and UL indicate the lower and upper limits of a confidence interval, respectively.

## Conculsion

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