Midterm #2

Sijan

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Load Packages

1. Start by loading any necessary packages, including "tidyverse" , "lm.beta" and "rstatix". Load these in a separate code chunk and add code to the chunk so that R doesn't print warnings and messages in your knitted file. Hint: you will add something to the {r } brackets to suppress those messages. (5 points)

```
tinytex::install_tinytex(force=TRUE)
```

```
## The directory /usr/local/bin is not writable. I recommend that you make it writable. See https://gitl

## tlmgr install tlgpg

## tlmgr update --self

## tlmgr install tlgpg

## tlmgr --repository http://www.preining.info/tlgpg/ install tlgpg

## tlmgr option repository 'https://ctan.math.washington.edu/tex-archive/systems/texlive/tlnet'

## tlmgr update --list
```

```
library(tinytex)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.2 --

## v ggplot2 3.3.6     v purrr   0.3.4
## v tibble  3.1.8     v dplyr   1.0.7
## v tidyr   1.2.1     v stringr 1.4.0
## v readr   2.1.3     v forcats 0.5.1
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(lm.beta)
library(rstatix)
```

```
##
## Attaching package: 'rstatix'
##
## The following object is masked from 'package:stats':
##
##     filter
```

Read data file

2. Read in the data file Tworek and Cimpian 2016 Study 1. (5 points)

```
mid_data <- read.csv("Tworek and Cimpian 2016 Study 1 - Tworek and Cimpian 2016 Study 1.csv")
```

Clean data

3. This data file includes some participants who were excluded from the data analysis because they live outside the United States, or because they failed an attention check. Using the filter() function, use the excluded variable to exclude those cases. Create a new data file that only contains those who were not excluded (excluded = 0). (5 points)

```
clean_data <- mid_data %>%
  filter(excluded == 0)
```

Correlation test

4. Perform an analysis to determine whether people's tendency to believe the status quo ought to be (Ought_Score) is correlated with their inherence bias (Inherence_Bias), their education level (educ), intelligence (RavensProgressiveMatrix_sum), conservatism (conserv), and belief in a just world (Belief_in_Just_World). You may use the cor_test() function in rstatix. Write a sentence in APA style describing which variables are significantly correlated with Ought_Score, including the correlation coefficient, confidence intervals and significance values. (20 points)

```
cor <- cor_test(clean_data, c(Ought_Score, Inherence_Bias, educ, RavensProgressiveMatrix_sum, conserv, B
knitr::kable(cor)
```

var1	var2	cor	statistic	p	conf.low	conf.high	method
Ought_Score	Ought_Score	1.000	Inf	0.000000	1.0000000	1.0000000	Pearson
Ought_Score	Inherence_Bias	0.300	3.501327e+00	0.000651	0.1339405	0.4574561	Pearson
Ought_Score	educ	-0.085	-9.344855e-01	0.352000	-0.2588477	0.0941863	Pearson
Ought_Score	RavensProgressiveMatrix_sum	-0.044	-4.808774e-01	0.631000	-0.2199023	0.1349574	Pearson

var1	var2	cor	statistic	p	conf.low	conf.high	method
Ought_Score	conserv	0.150	1.614969e+00	0.109000	-0.0327609	0.3154323	Pearson
Ought_Score	Belief_in_Just_World	0.025	2.774623e-01	0.782000	-0.1531296	0.2021716	Pearson
Inherence_Bias	Ought_Score	0.300	3.501327e+00	0.000651	0.1339405	0.4574561	Pearson
Inherence_Bias	Inherence_Bias	1.000	5.198230e+08	0.000000	1.0000000	1.0000000	Pearson
Inherence_Bias	educ	-0.071	7.766642e-01	0.439000	-0.2453978	0.1084018	Pearson
Inherence_Bias	RavensProgressiveMatrix_sum	-0.014	1.489923e-01	0.882000	-0.1908992	0.1645589	Pearson
Inherence_Bias	conserv	0.200	2.185697e+00	0.030800	0.0185535	0.3608778	Pearson
Inherence_Bias	Belief_in_Just_World	0.310	3.583236e+00	0.000491	0.1409205	0.4630634	Pearson
educ	Ought_Score	-0.085	9.344855e-01	0.352000	-0.2588477	0.0941863	Pearson
educ	Inherence_Bias	-0.071	7.766642e-01	0.439000	-0.2453978	0.1084018	Pearson
educ	educ	1.000	Inf	0.000000	1.0000000	1.0000000	Pearson
educ	RavensProgressiveMatrix_sum	0.180	2.019505e+00	0.045700	0.0036565	0.3478500	Pearson
educ	conserv	0.031	3.446562e-01	0.731000	-0.1471363	0.2080450	Pearson
educ	Belief_in_Just_World	-0.110	1.191644e+00	0.236000	-0.2805122	0.0709817	Pearson
RavensProgressiveMatrix_sum	Ought_Score	-0.044	4.808774e-01	0.631000	-0.2199023	0.1349574	Pearson
RavensProgressiveMatrix_sum	Inherence_Bias	-0.014	1.489923e-01	0.882000	-0.1908992	0.1645589	Pearson
RavensProgressiveMatrix_sum	educ	0.180	2.019505e+00	0.045700	0.0036565	0.3478500	Pearson
RavensProgressiveMatrix_sum	RavensProgressiveMatrix_sum	1.000	Inf	0.000000	1.0000000	1.0000000	Pearson
RavensProgressiveMatrix_sum	conserv	0.110	1.164184e+00	0.247000	-0.0734611	0.2782143	Pearson
RavensProgressiveMatrix_sum	Belief_in_Just_World	0.170	1.923278e+00	0.056800	-0.0049888	0.3402280	Pearson
conserv	Ought_Score	0.150	1.614969e+00	0.109000	-0.0327609	0.3154323	Pearson
conserv	Inherence_Bias	0.200	2.185697e+00	0.030800	0.0185535	0.3608778	Pearson
conserv	educ	0.031	3.446562e-01	0.731000	-0.1471363	0.2080450	Pearson
conserv	RavensProgressiveMatrix_sum	0.110	1.164184e+00	0.247000	-0.0734611	0.2782143	Pearson
conserv	conserv	1.000	Inf	0.000000	1.0000000	1.0000000	Pearson
conserv	Belief_in_Just_World	0.130	1.482051e+00	0.141000	-0.0447569	0.3045729	Pearson
Belief_in_Just_World	Ought_Score	0.025	2.774623e-01	0.782000	-0.1531296	0.2021716	Pearson
Belief_in_Just_World	Inherence_Bias	0.310	3.583236e+00	0.000491	0.1409205	0.4630634	Pearson

var1	var2	cor	statistic	p	conf.low	conf.high	method
Belief_in_Just_World	educ	-0.110	-1.191644e+00	0.236000	-0.2805122	0.0709817	Pearson
Belief_in_Just_World	RavensProgressiveMatrix_sum	0.170	1.923278e+00	0.056800	-0.0049888	0.3402280	Pearson
Belief_in_Just_World	conserv	0.130	1.482051e+00	0.141000	-0.0447569	0.3045729	Pearson
Belief_in_Just_World	Belief_in_Just_World	1.000	Inf	0.000000	1.0000000	1.0000000	Pearson

A Pearsaon correlation coefficient was computed to assess the linear relationship between the status quo ought to be and inherence bias, their education level, intelligence, conservitism and their belief in a just world. There was a medium significant positive correlation between Ought_score and Inherence bias, r(120) = 0.30, 95% CI = [.13, .46] p = 0.000651.

The rest of the variables were weakly correlated to the Ought_Score but none of them were significant correlation as p>.05

Prediction model

5. Now, you'll want to show that the relationship between Ought_Score and Inherence_Bias is robust, specifically whether their inherence bias predicts their ought score with other related variables in the model. First, mean-center the same predictor variables as above: inherence bias, intelligence (RavensProgressiveMatrix_sum), conservatism, inherence bias, education level, and belief in a just world (Belief_in_Just_World). Enter the mean-centered variables as predictors in a model with Ought_Score as an outcome. Use the lm() function to run your model and lm.beta to generate standardized coefficients. (20 points)

```
centre <- function(var){
  var - mean(var, na.rm = TRUE)
}

clean_data <- clean_data %>%
  mutate(
    across(c(Inherence_Bias, RavensProgressiveMatrix_sum, conserv, educ, Belief_in_Just_World), list(ce
)

model <- lm(Ought_Score ~ Inherence_Bias_cent + RavensProgressiveMatrix_sum_cent + conserv_cent + educ_
lm.beta(model)
```

```
##
## Call:
## lm(formula = Ought_Score ~ Inherence_Bias_cent + RavensProgressiveMatrix_sum_cent +
##     conserv_cent + educ_cent + Belief_in_Just_World_cent, data = clean_data)
##
## Standardized Coefficients::
##                       (Intercept)              Inherence_Bias_cent
##                                NA                       0.30625846
## RavensProgressiveMatrix_sum_cent                      conserv_cent
##                       -0.02231419                       0.10228103
##                         educ_cent        Belief_in_Just_World_cent
##                       -0.07197540                      -0.08753106
```

Extra Credit

Extra credit: explain why we mean-center the predictors. (5 points)

Centering a predictor means moving its means to 0. We do this by subtracting the mean from every value of the predictor variable. It helps us see the deviation/variance of the predictor variables from the mean more easily. It is particularly helpful in a linear regression analysis, as it prevents multicollinearity issues (high linear correaltion between predictor variables). It also helps in hierarchial regression analysis in the interpretation of simple slope as y-intercept will be based on the mean value. Extra credit: explain why the variables that are significant in the correlation matrix are no longer significant when added to a regression model. (5 points)

A correlation only tells us the strength and direction of a relationship. So a correlation is tested for two variables at a time. While on the other hand, a regression model help us predict a dependent variable (DV) using one or more independent varaibles (IV). Thus, with the addition of more independent variables in a model, one variable loses its effect (beta weight) on the DV as they all become partially correlated to the DV. As a result it changes the overall beta value which leads to some variables being insignificant (that was previously significant in pearson's r)

Gender recoded + added to regression model

6. Gender is currently coded as 1 = men, 2 = women. Recode women as 0 and men as 1 and enter your recoded variable as a predictor in the model above. Re-run the model. (10 points)

```
data_coded <- clean_data %>%
  mutate(gender = if_else(gender == "1",1 ,0 ) )

model <- lm(Ought_Score ~ Inherence_Bias_cent + RavensProgressiveMatrix_sum_cent + conserv_cent + educ_
lm.beta(model)
```

```
##
## Call:
## lm(formula = Ought_Score ~ Inherence_Bias_cent + RavensProgressiveMatrix_sum_cent +
##     conserv_cent + educ_cent + Belief_in_Just_World_cent + gender,
##     data = data_coded)
##
## Standardized Coefficients::
##                       (Intercept)              Inherence_Bias_cent
##                                NA                        0.30688469
## RavensProgressiveMatrix_sum_cent                      conserv_cent
##                       -0.02185346                        0.10155429
##                         educ_cent        Belief_in_Just_World_cent
##                       -0.07336057                       -0.08993119
##                            gender
##                       -0.01381474
```

APA-style analysis

7. Prepare an APA-style results section to describe the analysis above and results conducted above. Include an interpretation of these results (i.e., what do they say about human behavior?) (20 points)

```
summary(model)
```

```
##
## Call:
## lm(formula = Ought_Score ~ Inherence_Bias_cent + RavensProgressiveMatrix_sum_cent +
##     conserv_cent + educ_cent + Belief_in_Just_World_cent + gender,
##     data = data_coded)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.83071 -0.69932 -0.01841  0.67578  2.50290
##
## Coefficients:
##                                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      5.67546    0.11796  48.114  < 2e-16 ***
## Inherence_Bias_cent              0.29920    0.09179   3.260  0.00147 **
## RavensProgressiveMatrix_sum_cent -0.01214    0.05093  -0.238  0.81203
## conserv_cent                     0.05452    0.04855   1.123  0.26378
## educ_cent                       -0.09095    0.11252  -0.808  0.42060
## Belief_in_Just_World_cent       -0.12648    0.13542  -0.934  0.35225
## gender                          -0.03351    0.21696  -0.154  0.87754
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.081 on 115 degrees of freedom
## Multiple R-squared:  0.1132, Adjusted R-squared:  0.06696
## F-statistic: 2.447 on 6 and 115 DF,  p-value: 0.02903
```

A multiple linear regression was calculated to predict Ought_Score based on Inherence Bias, Intelligence, conservatism, education level, belief in a just world and gender. The results of the regression indicated the six predictors explained 11.32% of the variance (R^2 = 0.11, F(6,115) = 2.45, p <.05). It was found that only Inherence bias significantly predicted Ought_Score (ß = 0.30, p < .01). The results of the study suggests that the Inherence bias in participants' explanations accounts for the variance in their likelihood of inferring oughts. So Inherence bias is a significant predictor of the extent to which the participant view typical outcomes as good and desirable.

8. Create a table to depict the results of the regression analysis.

```
confint(model)
```

```
##                                      2.5 %     97.5 %
## (Intercept)                       5.44181103 5.90911312
## Inherence_Bias_cent               0.11739397 0.48101386
## RavensProgressiveMatrix_sum_cent -0.11302455 0.08874481
## conserv_cent                     -0.04164999 0.15069944
## educ_cent                        -0.31383883 0.13193725
## Belief_in_Just_World_cent        -0.39471387 0.14175320
## gender                           -0.46326007 0.39624891
```

The table is attached in a word document Link - https://docs.google.com/document/d/1iSgTpWhMNWo_gnENX6ShbzO3inuacncZ/edit?usp=share_link&ouid=110448297081662422472&rtpof=true&sd=true

Extra credit:

Trial 1

Conservatism is coded on a scale from 1-9. Consider those who score 1-3 as liberals, 4-6 as moderates and 7-9 as conservatives. Create a new variable that compares liberals and conservatives and a variable that compares liberals and moderates. Enter both into the regression model above and write up the results of the effect on political conservatism on ought scores. (10 points)

```
Conserv_recoded <- data_coded %>%
  mutate(liberals = if_else(conserv < 4, 1, 0),
         moderates = if_else(conserv > 3 & conserv < 7, 1, 0 ),
         conservatives = if_else(conserv > 7 & conserv < 10, 1, 0 ))

model1 <- lm(Ought_Score ~ liberals + conservatives, data = Conserv_recoded)
summary(model1)
```

```
##
## Call:
## lm(formula = Ought_Score ~ liberals + conservatives, data = Conserv_recoded)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.74510 -0.74510 -0.04197  0.84800  2.58824
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.62097    0.14039  40.040   <2e-16 ***
## liberals      -0.04254    0.20897  -0.204   0.8390
## conservatives  0.84200    0.39430   2.135   0.0348 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.105 on 119 degrees of freedom
## Multiple R-squared:  0.0411, Adjusted R-squared:  0.02499
## F-statistic: 2.551 on 2 and 119 DF,  p-value: 0.0823
```

```
lm.beta(model1)
```

```
##
## Call:
## lm(formula = Ought_Score ~ liberals + conservatives, data = Conserv_recoded)
##
## Standardized Coefficients::
##   (Intercept)      liberals conservatives
##            NA   -0.01881871    0.19741730
```

```
model2 <- lm(Ought_Score ~ liberals + moderates, data = Conserv_recoded)
summary(model2)
```

```
##
## Call:
```

```
## lm(formula = Ought_Score ~ liberals + moderates, data = Conserv_recoded)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.93137 -0.72531 -0.05864  0.77469  2.58824
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   6.2647     0.2673  23.438   <2e-16 ***
## liberals     -0.6863     0.3086  -2.224   0.0281 *
## moderates    -0.7061     0.3065  -2.304   0.0230 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.102 on 119 degrees of freedom
## Multiple R-squared:  0.04687,    Adjusted R-squared:  0.03085
## F-statistic: 2.926 on 2 and 119 DF,  p-value: 0.05749
```

```
lm.beta(model2)
```

```
##
## Call:
## lm(formula = Ought_Score ~ liberals + moderates, data = Conserv_recoded)
##
## Standardized Coefficients::
## (Intercept)    liberals   moderates
##          NA  -0.3036178  -0.3145650
```

Trial 2

Conservatism is coded on a scale from 1-9. Consider those who score 1-3 as liberals, 4-6 as moderates and 7-9 as conservatives. Create a new variable that compares liberals and conservatives and a variable that compares liberals and moderates. Enter both into the regression model above and write up the results of the effect on political conservatism on ought scores. (10 points)

```
Conserv_recoded1 <- data_coded %>%
  mutate(new_conserv1 = if_else(conserv < 4, "liberals",
                                if_else(conserv > 3 & conserv < 7,"moderates","conservatives")))

Conserv_recoded1$new_conserv1 = as_factor(Conserv_recoded1$new_conserv1)
contrast1 = c(1, 0, -1)
contrast2 = c(1, -1, 0)

contrasts(Conserv_recoded1$new_conserv1) = cbind(contrast1, contrast2)

contrasts(Conserv_recoded1$new_conserv1)
```

```
##              contrast1 contrast2
## conservatives         1         1
## moderates             0        -1
## liberals             -1         0
```

```r
m_contrasts <- lm(Ought_Score ~ new_conserv1, data = Conserv_recoded1)
summary(m_contrasts)
```

```
##
## Call:
## lm(formula = Ought_Score ~ new_conserv1, data = Conserv_recoded1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.93137 -0.72531 -0.05864  0.77469  2.58824
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)             5.8006     0.1144  50.712   <2e-16 ***
## new_conserv1contrast1   0.2222     0.1450   1.532   0.1281
## new_conserv1contrast2   0.2420     0.1435   1.687   0.0943 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.102 on 119 degrees of freedom
## Multiple R-squared:  0.04687,    Adjusted R-squared:  0.03085
## F-statistic: 2.926 on 2 and 119 DF,  p-value: 0.05749
```