Office of Research Ethics
4500 ARISE Building | 1125 Colonel By Drive
Ottawa, Ontario K1S 5B6
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CERTIFICATION OF INSTITUTIONAL ETHICS CLEARANCE

The following research has been granted clearance by the Carleton University Research Ethics Board-B (CUREB-B). CUREB-B is constituted and operates in compliance with the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2).

Ethics Clearance ID: Project # 114747

Project Team Members: Sanyar Sohrabi (Primary Investigator)
Dr. Myrto Mylopoulos (Co-Investigator)
Andrew Brook (Research Supervisor)

Study Title: Studies on Free Will Belief May Be Going Down a Rabbit Hole

Funding Source: (If applicable):

Effective: December 09, 2020 **Expires:** December 31, 2021

This certification is subject to the following conditions:

1. Clearance is granted only for the research and purposes described in the application.
2. Any modification to the approved research must be submitted to CUREB-B via a Change to Protocol Form. All changes must be cleared prior to the continuance of the research.
3. An Annual Status Report for the renewal or closure of ethics clearance must be submitted and cleared by the renewal date listed above. Failure to submit the Annual Status Report will result in the closure of the file. If funding is associated, funds will be frozen.
4. During the course of the study, if you encounter an adverse event, material incidental finding, protocol deviation or other unanticipated problem, you must complete and submit a Report of Adverse Events and Unanticipated Problems Form.
5. It is the responsibility of the student to notify their supervisor of any adverse events, changes to their application, or requests to renew/close the protocol.
6. Failure to conduct the research in accordance with the principles of the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans 2nd edition* and the *Carleton*

University Policies and Procedures for the Ethical Conduct of Research may result in the suspension or termination of the research project.

IMPORTANT: Special requirements for COVID-19:

If this study involves **in-person research interactions with human participants,** whether on- or off-campus, the following rules apply:

1. Upon receiving clearance from CUREB, please seek the approval of the relevant Dean for your research. Provide a copy of your CUREB clearance to the Dean for their records. See Principles and Procedures for On-campus Research at Carleton University and note that this document applies both to on- and off-campus research that involves human participants. Please contact your Dean's Office for more information about obtaining their approval.
2. Provide a copy of the Dean's approval to the Office of Research Ethics prior to starting any in-person research activities.
3. If the Dean's approval requires any significant change(s) to any element of the study, you must notify the Office of Research Ethics of such change(s).

Upon reasonable request, it is the policy of CUREB, for cleared protocols, to release the name of the PI, the title of the project, and the date of clearance and any renewal(s).

Please email the Research Compliance Coordinators at ethics@carleton.ca if you have any questions.

CLEARED BY: **Date: December 09, 2020**

Bernadette Campbell, PhD, Chair, CUREB-B

Natasha Artemeva, Co-Chair, PhD, Vice Chair, CUREB-B

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CERTIFICATION OF INSTITUTIONAL ETHICS CLEARANCE

The Carleton University Research Ethics Board-B (CUREB-B) has granted ethics clearance for the changes to protocol to research project described below and research may now proceed. CUREB-B is constituted and operates in compliance with the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (TCPS2).

Ethics Clearance ID: Project # 112740

Principal Investigator: Sanyar Sohrabi

Co-Investigator(s) (If applicable): **Sanyar Sohrabi (Primary Investigator)**
Prof. Andrew Brook (Co-Investigator)

Project Title: **The Implications of Classical Belief in Free Will**

Funding Source:

Effective: **December 14, 2020** Expires: **May 31, 2021**.

This certification is subject to the following conditions:

1. Clearance is granted only for the research and purposes described in the application.
2. Any modification to the approved research must be submitted to CUREB-B via a Change to Protocol Form. All changes must be cleared prior to the continuance of the research.
3. An Annual Status Report for the renewal or closure of ethics clearance must be submitted and cleared by the renewal date listed above. Failure to submit the Annual Status Report will result in the closure of the file. If funding is associated, funds will be frozen.
4. During the course of the study, if you encounter an adverse event, material incidental finding, protocol deviation or other unanticipated problem, you must complete and submit a Report of Adverse Events and Unanticipated Problems Form.
5. It is the responsibility of the student to notify their supervisor of any adverse events, changes to their application, or requests to renew/close the protocol.

6. Failure to conduct the research in accordance with the principles of the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans 2nd edition* and the *Carleton University Policies and Procedures for the Ethical Conduct of Research* may result in the suspension or termination of the research project.

Special requirements for COVID-19:

If this study involves in-person research interactions with human participants, whether on- or off-campus, the following rules apply:

1. Upon receiving clearance from CUREB, please seek the approval of the relevant Dean for your research. Provide a copy of your CUREB clearance to the Dean for their records. See Principles and Procedures for On-campus Research at Carleton University and note that this document applies both to on- and off-campus research that involves human participants. Please contact your Dean's Office for more information about obtaining their approval.
2. Provide a copy of the Dean's approval to the Office of Research Ethics prior to starting any in-person research activities.
3. If the Dean's approval requires any significant change(s) to any element of the study, you must notify the Office of Research Ethics of such change(s).

Upon reasonable request, it is the policy of CUREB, for cleared protocols, to release the name of the PI, the title of the project, and the date of clearance and any renewal(s).

Please email the Research Compliance Coordinators at ethics@carleton.ca if you have any questions.

CLEARED BY: **Date: December 14, 2020**

[redacted]

Bernadette Campbell, PhD, Chair, CUREB-B

[redacted]

Natasha Artemeva, PhD, Chair, CUREB-B

Please enter your Amazon Worker ID.

What is your age?

With which gender do you identify most?

- Female
- Male
- Not listed/Other
- Prefer not to say

What is your religion?

- Christianity
- Judaism
- Islam
- Hinduism
- Buddhism
- Taoism/Confucianism

- No religion/Atheism
- No religion/Agnosticism
- Not listed/Other
- Prefer not to say

What is your highest level of education?

- Grade school
- High school
- Some college, no degree
- Bachelor's degree/Associate degree
- Master's degree
- PhD

I identify my ethnicity as:

- Caucasian
- Black/African American
- Asian/Asian Indian
- Hispanic/Latino/Spanish
- Middle Eastern
- Indigenous
- Mixed Race
- Other
- Prefer not to say

→

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1) Please read the scenario carefully and then provide your response to the following questions.

A man named Bill has become attracted to one of his colleagues. The attraction is mutual, so he decides to leave his wife. Before leaving on a business trip, Bill asks his lawyer to prepare divorce papers and deliver them to his wife.

1a) Thinking of the whole of a person's life, could Bill have made a different decision?

- Strongly disagree
- Disagree
- Somewhat disagree
- Somewhat agree
- Agree
- Strongly agree

1b) Does Bill and everyone else who does not suffer from mental illness, extreme poverty, or the like, mostly have control over their decisions?

- Strongly disagree
- Disagree
- Somewhat disagree
- Somewhat agree
- Agree
- Strongly agree

1c) In general, we do what we want, please select somewhat disagree so that we know you are paying attention?

- ○ Strongly disagree
- ○ Disagree
- ○ Somewhat disagree
- ○ Somewhat agree
- ○ Agree
- ○ Strongly agree

1d) Are Bill's decisions, like most people's, completely up to him?

- ○ Strongly disagree
- ○ Disagree
- ○ Somewhat disagree
- ○ Somewhat agree
- ○ Agree
- ○ Strongly agree

Thank you for completing the survey! Once you click submit, you will not be able to change your answers.

- ☐ Submit

→

Powered by Qualtrics

Please enter your Amazon Worker ID.

What is your age?

With which gender do you identify most?

- Female
- Male
- Not listed/Other
- Prefer not to say

What is your religion?

- Christianity
- Judaism
- Islam
- Hinduism
- Buddhism
- Taoism/Confucianism
- No religion/Atheism
- No religion/Agnosticism
- Not listed/Other
- Prefer not to say

What is your highest level of education?

- Grade school
- High school
- Some college, no degree
- Bachelor's degree/Associate degree
- Master's degree
- PhD

I identify my ethnicity as:

- Caucasian
- Black/African American
- Asian/Asian Indian
- Hispanic/Latino/Spanish
- Middle Eastern
- Indigenous
- Mixed Race
- Other
- Prefer not to say

1a) Optional $1.50 bonus item: Please go to the following link and fill out the 3 minute survey for an additional $1.50.
Open in New Tab

www.docs.google.com/forms

1b) Follow-up: If you completed the short survey above, the researchers have offered you the opportunity to donate your $1.50 bonus earning to the Save the Children Fund.

We expect to survey a total of 270 people. Therefore, depending on your donations, we can potentially raise up to $405. For more information on Save the Children visit: https://www.savethechildren.net/

	No: $0	$0.25	$0.50	$0.75	$1	$1.25	$1.50
Would you like to donate some of your bonus to Save the Children?	○	○	○	○	○	○	○

2) A man named Bill has become attracted to one of his colleagues. The attraction is mutual, so he decides to leave his wife. Before leaving on a business trip, Bill asks his lawyer to prepare divorce papers and deliver them to his wife.

2a) Thinking of the whole of a person's life, could Bill have made a different decision?

- ○ Strongly disagree
- ○ Disagree
- ○ Somewhat disagree
- ○ Somewhat agree
- ○ Agree
- ○ Strongly agree

2b) Does Bill and everyone else who does not suffer from mental illness, extreme poverty, or the like, mostly have control over their decisions?

- ○ Strongly disagree
- ○ Disagree
- ○ Somewhat disagree
- ○ Somewhat agree
- ○ Agree
- ○ Strongly agree

2c) In general, we do what we want, please select somewhat disagree so that we know you are paying attention?

- ○ Strongly disagree
- ○ Disagree
- ○ Somewhat disagree
- ○ Somewhat agree
- ○ Agree
- ○ Strongly agree

2d) Are Bill's decisions, like most people's, completely up to him?

- ○ Strongly disagree
- ○ Disagree
- ○ Somewhat disagree
- ○ Somewhat agree
- ○ Agree
- ○ Strongly agree

3a) Secondary optional bonus item: min $0.50 and max $1.75:

The aim of this item is to see how lottery winners and non-winners compare in their level of enthusiasm.

Go to Google.com, search "dice roller", and report your roll below. You will be paid according to your roll. *Open In New Tab*

Since we will not know the number you roll, please answer truthfully.

	1=$0.50	2=$0.75	3=$1	4=$1.25	5=$1.50	6=$1.75
Number Rolled	○	○	○	○	○	○

3b)

Level of enthusiasm for number rolled

0 1 2 3 4 5

4) A 23-year-old, William, is at a party with his friends. He sees a really attractive 22-year-old named Elena. He approaches her several times only to get rejected each time. Not knowing what to do, he gets frustrated and decides to follow Elena home and rape her. William is later arrested and sentenced to 25 years.

Why should William be locked up?

-2	-1	-2 & 2	+ 1	+2
To be punished	← More toward left	Equally Both ↔	More toward right →	To be rehabilitated and protect society

-2 -1 0 1 2

Once you click submit, you will not be able to change your answers. The researchers will send the bonus payments once we have reviewed the responses (max 7 days).

Thank you for completing the survey!

Submit

→

Powered by Qualtrics

Nature of the Future

Please fill out the following 3-4 minute survey for an additional $1.50.

* Required

Please enter your Amazon Worker ID. *

Your answer

How well can you speak English? *

- Not very well
- Well
- Very well
- Native speaker/ Native-like speaker

1. Churches should not change indigenous people's beliefs. *

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

2. Teachers who are transsexuals can be good role models for our children, just like anyone else. *

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

3. Abortion information should be made available to the public at large. *

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

4. Transsexuals probably shouldn't be hired for jobs requiring considerable contact with the public since they could carry sexually transmitted diseases. *

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

5. Welfare assistance should be limited to those who are really needy and not given to unemployed counter-culture dropouts. Please select somewhat disagree in response to this item so that we know you are paying attention. *

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

6. A terminally ill and suffering patient should be able to have a physician-assisted death. *

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

7. Abortion is any woman's right. *

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

8. If we let Muslims teach in our schools they will try to indoctrinate our children. *

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

Submit

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Google Forms

Implications of Degrees of Belief in Free Will: Study 1

Sanyar Sohrabi

03/02/2021

Load the packages

```
if(!"pacman" %in% installed.packages()) install.packages("pacman")
library(pacman)
p_load(tidyverse, moderndive, umx, infer, lattice, Hmisc, PerformanceAnalytics, readxl, gridExtr
a, nortest, mvnormtest)
```

Change pathway to where you have saved the Excel file OR delete this chunk and import the dataset manually.

```
Rabbit <- read_excel("D:/ReadyToSendRabbit/Rabbit.xlsx")
```

#Creat the CBFW scale

```
Rabbit$FWscale <- Rabbit$FW1 + Rabbit$FW2 + Rabbit$FW3
Rabbit$FWscale <- Rabbit$FWscale/3
```

Change variables into numeric and categorical.

```
Rabbit$Age <- as.numeric(Rabbit$Age)
Rabbit$Education <- as.numeric(Rabbit$Education)
Rabbit$FW1 <- as.numeric(Rabbit$FW1)
Rabbit$FW2 <- as.numeric(Rabbit$FW2)
Rabbit$FW3 <- as.numeric(Rabbit$FW3)
Rabbit$BillOlivia <- as.character(Rabbit$BillOlivia)
```

Filter out the dataset to only females and males.

```
RabbitOG <- filter(Rabbit, Sex < 3)
```

```
RabbitOG$Age <- as.numeric(RabbitOG$Age)
RabbitOG$Education <- as.numeric(RabbitOG$Education)
RabbitOG$FW1 <- as.numeric(RabbitOG$FW1)
RabbitOG$FW2 <- as.numeric(RabbitOG$FW2)
RabbitOG$FW3 <- as.numeric(RabbitOG$FW3)
RabbitOG$BillOlivia <- as.character(RabbitOG$BillOlivia)
RabbitOG$Sex <- as.numeric(RabbitOG$Sex)
```

Change education into factor

```
RabbitOG$CatEducation <- factor(RabbitOG$Education, levels=c(1, 2,3, 4, 5, 6), labels=c("Grade s
chool","High school", "Some college, no degree", "Bachelor's degree/Associate degree", "Master's
degree", "PhD"))
```

```
Rabbit$CatFW1 <- factor(Rabbit$FW1, levels=c(1, 2, 3, 4, 5, 6), labels=c("Strongly disagree","Di
sagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agree"))
```

```
Rabbit$CatFW2 <- factor(Rabbit$FW2, levels=c(1, 2, 3, 4, 5, 6), labels=c("Strongly disagree","Di
sagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agree"))
```

```
Rabbit$CatFW3 <- factor(Rabbit$FW3, levels=c(1, 2, 3, 4, 5, 6), labels=c("Strongly disagree","Di
sagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agree"))
```

New facet label names for Sex and BillOlivia.

```
RabbitOG$Sex <- factor(RabbitOG$Sex, levels=c(1, 2), labels=c("Female","Male"))
Rabbit$Sex <- factor(Rabbit$Sex, levels=c(1, 2, 3, 4), labels=c("Female","Male", "Not listed/Oth
er", "Prefer not to say"))
RabbitOG$BillOlivia <- factor(RabbitOG$BillOlivia, levels=c(1, 2), labels=c("Bill","Olivia"))
Rabbit$BillOlivia <- factor(Rabbit$BillOlivia, levels=c(1, 2), labels=c("Bill","Olivia"))
str(RabbitOG)
```

```
## tibble [748 x 12] (S3: tbl_df/tbl/data.frame)
##  $ BillOlivia  : Factor w/ 2 levels "Bill","Olivia": 2 2 2 2 2 1 2 1 2 2 ...
##  $ Sex         : Factor w/ 2 levels "Female","Male": 1 1 1 2 2 2 2 1 2 2 ...
##  $ Religion    : chr [1:748] "Christianity" "No religion/Agnosticism" "Judaism" "Christianit
y" ...
##  $ Ethnicity   : chr [1:748] "Caucasian" "Caucasian" "Caucasian" "Caucasian" ...
##  $ Time        : num [1:748] 51 51 51 51 52 52 52 52 52 52 ...
##  $ Education   : num [1:748] 4 4 5 4 4 4 4 5 4 4 ...
##  $ Age         : num [1:748] 25 32 42 50 34 18 26 39 38 54 ...
##  $ FW1         : num [1:748] 4 5 6 4 6 6 5 6 5 4 ...
##  $ FW2         : num [1:748] 5 5 6 4 6 6 5 6 6 5 ...
##  $ FW3         : num [1:748] 5 6 6 5 6 6 5 6 6 5 ...
##  $ FWscale     : num [1:748] 4.67 5.33 6 4.33 6 ...
##  $ CatEducation: Factor w/ 6 levels "Grade school",..: 4 4 5 4 4 4 4 5 4 4 ...
```

Seperate the Bill-Olivia datasets

```
DemoRabbitOGBill <- subset(RabbitOG, BillOlivia=="Bill")

glimpse(DemoRabbitOGBill)
```

```
## Rows: 363
## Columns: 12
## $ BillOlivia   <fct> Bill, Bill, Bill, Bill, Bill, Bill, Bill, Bill, Bill, ...
## $ Sex          <fct> Male, Female, Male, Male, Female, Female, Male, Male, ...
## $ Religion     <chr> "Christianity", "No religion/Agnosticism", "Christiani...
## $ Ethnicity    <chr> "Caucasian", "Caucasian", "Caucasian", "Caucasian", "A...
## $ Time         <dbl> 52, 52, 53, 53, 54, 54, 55, 55, 56, 57, 57, 58, 58, 58...
## $ Education    <dbl> 4, 5, 4, 4, 4, 4, 4, 5, 4, 5, 4, 4, 4, 5, 5, 4, 4, 4, ...
## $ Age          <dbl> 18, 39, 25, 30, 32, 33, 43, 55, 43, 65, 38, 28, 46, 33...
## $ FW1          <dbl> 6, 6, 5, 4, 6, 4, 4, 5, 4, 5, 6, 5, 6, 5, 5, 5, 5, 5, ...
## $ FW2          <dbl> 6, 6, 4, 6, 6, 5, 4, 5, 3, 6, 6, 6, 6, 4, 5, 6, 4, 6, ...
## $ FW3          <dbl> 6, 6, 6, 6, 6, 5, 4, 5, 3, 6, 6, 5, 6, 4, 5, 6, 4, 6, ...
## $ FWscale      <dbl> 6.000000, 6.000000, 5.000000, 5.333333, 6.000000, 4.66...
## $ CatEducation <fct> "Bachelor's degree/Associate degree", "Master's degree...
```

```
DemoRabbitOGOlivia <- subset(RabbitOG, BillOlivia=="Olivia")
glimpse(DemoRabbitOGOlivia)
```

```
## Rows: 385
## Columns: 12
## $ BillOlivia   <fct> Olivia, Olivia, Olivia, Olivia, Olivia, Olivia, Olivia...
## $ Sex          <fct> Female, Female, Female, Male, Male, Male, Male, Male, ...
## $ Religion     <chr> "Christianity", "No religion/Agnosticism", "Judaism", ...
## $ Ethnicity    <chr> "Caucasian", "Caucasian", "Caucasian", "Caucasian", "C...
## $ Time         <dbl> 51, 51, 51, 51, 52, 52, 52, 52, 53, 53, 53, 54, 54, 54...
## $ Education    <dbl> 4, 4, 5, 4, 4, 4, 4, 4, 4, 4, 4, 5, 4, 4, 4, 4, 4, 3, ...
## $ Age          <dbl> 25, 32, 42, 50, 34, 26, 38, 54, 39, 32, 25, 40, 33, 25...
## $ FW1          <dbl> 4, 5, 6, 4, 6, 5, 5, 4, 6, 1, 1, 5, 6, 4, 4, 6, 3, 6, ...
## $ FW2          <dbl> 5, 5, 6, 4, 6, 5, 6, 5, 4, 2, 5, 4, 6, 3, 2, 5, 4, 6, ...
## $ FW3          <dbl> 5, 6, 6, 5, 6, 5, 6, 5, 5, 5, 4, 3, 6, 5, 5, 4, 2, 6, ...
## $ FWscale      <dbl> 4.666667, 5.333333, 6.000000, 4.333333, 6.000000, 5.00...
## $ CatEducation <fct> "Bachelor's degree/Associate degree", "Bachelor's degr...
```

```
DemoRabbitOGBill$CatEducation <- factor(DemoRabbitOGBill$Education, levels=c(1, 2,3, 4, 5, 6), l
abels=c("Grade school","High school", "Some college, no degree", "Bachelor's degree/Associate de
gree", "Master's degree", "PhD"))
```

```
DemoRabbitOGBill$CatFW1 <- factor(DemoRabbitOGBill$FW1, levels=c(1, 2, 3, 4, 5, 6), labels=c("St
rongly disagree","Disagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agree"))
```

```
DemoRabbitOGBill$CatFW2 <- factor(DemoRabbitOGBill$FW2, levels=c(1, 2, 3, 4, 5, 6), labels=c("St
rongly disagree","Disagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agree"))
```

```
DemoRabbitOGBill$CatFW3 <- factor(DemoRabbitOGBill$FW3, levels=c(1, 2, 3, 4, 5, 6), labels=c("St
rongly disagree","Disagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agree"))
```

```
DemoRabbitOGOlivia$CatEducation <- factor(DemoRabbitOGOlivia$Education, levels=c(1, 2,3, 4, 5, 6
), labels=c("Grade school","High school", "Some college, no degree", "Bachelor's degree/Associat
e degree", "Master's degree", "PhD"))
```

```
DemoRabbitOGOlivia$CatFW1 <- factor(DemoRabbitOGOlivia$FW1, levels=c(1, 2, 3, 4, 5, 6), labels=c
("Strongly disagree","Disagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agre
e"))
```

```
DemoRabbitOGOlivia$CatFW2 <- factor(DemoRabbitOGOlivia$FW2, levels=c(1, 2, 3, 4, 5, 6), labels=c
("Strongly disagree","Disagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agre
e"))
```

```
DemoRabbitOGOlivia$CatFW3 <- factor(DemoRabbitOGOlivia$FW3, levels=c(1, 2, 3, 4, 5, 6), labels=c
("Strongly disagree","Disagree", "Somewhat disagree", "Somewhat agree", "Agree", "Strongly agre
e"))
```

View the datas

```
glimpse(Rabbit)
```

```
## Rows: 753
## Columns: 14
## $ BillOlivia <fct> Olivia, Olivia, Olivia, Olivia, Olivia, Bill, Olivia, Bi...
## $ Sex        <fct> Female, Female, Female, Male, Male, Male, Male, Female, ...
## $ Religion   <chr> "Christianity", "No religion/Agnosticism", "Judaism", "C...
## $ Ethnicity  <chr> "Caucasian", "Caucasian", "Caucasian", "Caucasian", "Cau...
## $ Time       <dbl> 51, 51, 51, 51, 52, 52, 52, 52, 52, 52, 53, 53, 53, 53, ...
## $ Education  <dbl> 4, 4, 5, 4, 4, 4, 4, 5, 4, 4, 4, 4, 4, 4, 4, 5, 4, 4, 4,...
## $ Age        <dbl> 25, 32, 42, 50, 34, 18, 26, 39, 38, 54, 25, 39, 30, 32, ...
## $ FW1        <dbl> 4, 5, 6, 4, 6, 6, 5, 6, 5, 4, 5, 6, 4, 1, 1, 5, 6, 4, 6,...
## $ FW2        <dbl> 5, 5, 6, 4, 6, 6, 5, 6, 6, 5, 4, 4, 6, 2, 5, 4, 6, 5, 6,...
## $ FW3        <dbl> 5, 6, 6, 5, 6, 6, 5, 6, 6, 5, 6, 5, 6, 5, 4, 3, 6, 5, 6,...
## $ FWscale    <dbl> 4.666667, 5.333333, 6.000000, 4.333333, 6.000000, 6.0000...
## $ CatFW1     <fct> Somewhat agree, Agree, Strongly agree, Somewhat agree, S...
## $ CatFW2     <fct> Agree, Agree, Strongly agree, Somewhat agree, Strongly a...
## $ CatFW3     <fct> Agree, Strongly agree, Strongly agree, Agree, Strongly a...
```

```
glimpse(RabbitOG)
```

```
## Rows: 748
## Columns: 12
## $ BillOlivia   <fct> Olivia, Olivia, Olivia, Olivia, Olivia, Bill, Olivia, ...
## $ Sex          <fct> Female, Female, Female, Male, Male, Male, Male, Female...
## $ Religion     <chr> "Christianity", "No religion/Agnosticism", "Judaism", ...
## $ Ethnicity    <chr> "Caucasian", "Caucasian", "Caucasian", "Caucasian", "C...
## $ Time         <dbl> 51, 51, 51, 51, 52, 52, 52, 52, 52, 52, 53, 53, 53, 53...
## $ Education    <dbl> 4, 4, 5, 4, 4, 4, 4, 5, 4, 4, 4, 4, 4, 4, 4, 5, 4, 4, ...
## $ Age          <dbl> 25, 32, 42, 50, 34, 18, 26, 39, 38, 54, 25, 39, 30, 32...
## $ FW1          <dbl> 4, 5, 6, 4, 6, 6, 5, 6, 5, 4, 5, 6, 4, 1, 1, 5, 6, 4, ...
## $ FW2          <dbl> 5, 5, 6, 4, 6, 6, 5, 6, 6, 5, 4, 4, 6, 2, 5, 4, 6, 5, ...
## $ FW3          <dbl> 5, 6, 6, 5, 6, 6, 5, 6, 6, 5, 6, 5, 6, 5, 4, 3, 6, 5, ...
## $ FWscale      <dbl> 4.666667, 5.333333, 6.000000, 4.333333, 6.000000, 6.00...
## $ CatEducation <fct> Bachelor's degree/Associate degree, Bachelor's degree/...
```

Check to see if there is missing observations.

```
colSums(is.na(Rabbit))
```

```
## BillOlivia        Sex   Religion  Ethnicity       Time  Education        Age
##          0          0          0          0          0          0          0
##        FW1        FW2        FW3    FWscale     CatFW1     CatFW2     CatFW3
##          0          0          0          0          0          0          0
```

```
colSums(is.na(RabbitOG))
```

```
##   BillOlivia          Sex     Religion    Ethnicity         Time    Education
##            0            0            0            0            0            0
##          Age          FW1          FW2          FW3      FWscale CatEducation
##            0            0            0            0            0            0
```

Get demographic information

```
table(Rabbit$BillOlivia, Rabbit$Education)
```

```
##
##            1   2   3   4   5   6
##   Bill     1  32  67 198  63   5
##   Olivia   0  30  54 213  86   4
```

```
table(Rabbit$BillOlivia, Rabbit$Religion)
```

```
##
##          Buddhism Christianity Hinduism Islam Judaism No religion/Agnosticism
##   Bill          5          250        7     5       3                      39
##   Olivia        5          250        7     3       5                      45
##
##          No religion/Atheism Not listed/Other Prefer not to say
##   Bill                    41               10                 6
##   Olivia                  44               20                 8
```

```
table(Rabbit$BillOlivia, Rabbit$Ethnicity)
```

```
##
##          Asian/Asian Indian Black/African American Caucasian
##   Bill                   19                      39       269
##   Olivia                 21                      47       280
##
##          Hispanic/Latino/Spanish Indigenous Middle Eastern Mixed Race Other
##   Bill                        16          1              3          5    11
##   Olivia                      17          0              1          3    14
##
##          Prefer not to say
##   Bill                   3
##   Olivia                 4
```

```
table(Rabbit$BillOlivia, Rabbit$Sex)
```

```
##
##          Female Male Not listed/Other Prefer not to say
##   Bill      168  195                2                 1
##   Olivia    173  212                0                 2
```

```
Rabbit %>%
    expss::tab_cells(Education, Age, Time) %>%
    expss::tab_cols(expss::total(), BillOlivia) %>%
    expss::tab_stat_mean_sd_n() %>%
    expss::tab_last_sig_means(subtable_marks = "both") %>%
    expss::tab_pivot() %>%
    expss::set_caption("Table with summary statistics and significance marks.")
```

```
## Registered S3 methods overwritten by 'expss':
##   method                 from
##   [.labelled             Hmisc
##   as.data.frame.labelled base
##   print.labelled         Hmisc
```

Table with summary statistics and significance marks.

	#Total	BillOlivia	
		Bill	Olivia

Table with summary statistics and significance marks.

	#Total	BillOlivia	
		Bill	Olivia
		A	B
Education			
Mean	3.9	3.8	3.9
Std. dev.	0.9	0.9	0.8
Unw. valid N	753.0	366.0	387.0
Age			
Mean	40.8	40.9	40.7
Std. dev.	12.1	11.4	12.7
Unw. valid N	753.0	366.0	387.0
Time			
Mean	173.7	172.5	174.9
Std. dev.	173.6	177.2	170.3
Unw. valid N	753.0	366.0	387.0

```
ObsTableSex <- with(RabbitOG, table(BillOlivia, Sex))
prop.table(ObsTableSex, margin = 1)*100
```

```
##           Sex
## BillOlivia   Female     Male
##     Bill   46.28099 53.71901
##     Olivia 44.93506 55.06494
```

```
ObsTableEthnicity <- with(Rabbit, table(BillOlivia, Ethnicity))
prop.table(ObsTableEthnicity, margin = 1)*100
```

```
##           Ethnicity
## BillOlivia Asian/Asian Indian Black/African American  Caucasian
##     Bill            5.1912568             10.6557377 73.4972678
##     Olivia          5.4263566             12.1447028 72.3514212
##           Ethnicity
## BillOlivia Hispanic/Latino/Spanish Indigenous Middle Eastern Mixed Race
##     Bill                 4.3715847  0.2732240      0.8196721  1.3661202
##     Olivia               4.3927649  0.0000000      0.2583979  0.7751938
##           Ethnicity
## BillOlivia      Other Prefer not to say
##     Bill    3.0054645         0.8196721
##     Olivia  3.6175711         1.0335917
```

```
ObsTableReligion <- with(Rabbit, table(BillOlivia, Religion))
prop.table(ObsTableReligion, margin = 1)*100
```

```
##           Religion
## BillOlivia   Buddhism Christianity   Hinduism      Islam    Judaism
##     Bill    1.3661202   68.3060109  1.9125683  1.3661202  0.8196721
##     Olivia  1.2919897   64.5994832  1.8087855  0.7751938  1.2919897
##           Religion
## BillOlivia No religion/Agnosticism No religion/Atheism Not listed/Other
##     Bill                10.6557377          11.2021858        2.7322404
##     Olivia              11.6279070          11.3695090        5.1679587
##           Religion
## BillOlivia Prefer not to say
##     Bill           1.6393443
##     Olivia         2.0671835
```

##Degrees of classical beliefs in free will.

```
Plot1a<- ggplot(DemoRabbitOGBill, aes(x = (CatFW1))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("CBFW1") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~BillOlivia) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
Plot1b<- ggplot(DemoRabbitOGOlivia, aes(x = (CatFW1))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("CBFW1") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~BillOlivia) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
Plot2a<- ggplot(DemoRabbitOGBill, aes(x = (CatFW2))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("CBFW2") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~BillOlivia) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

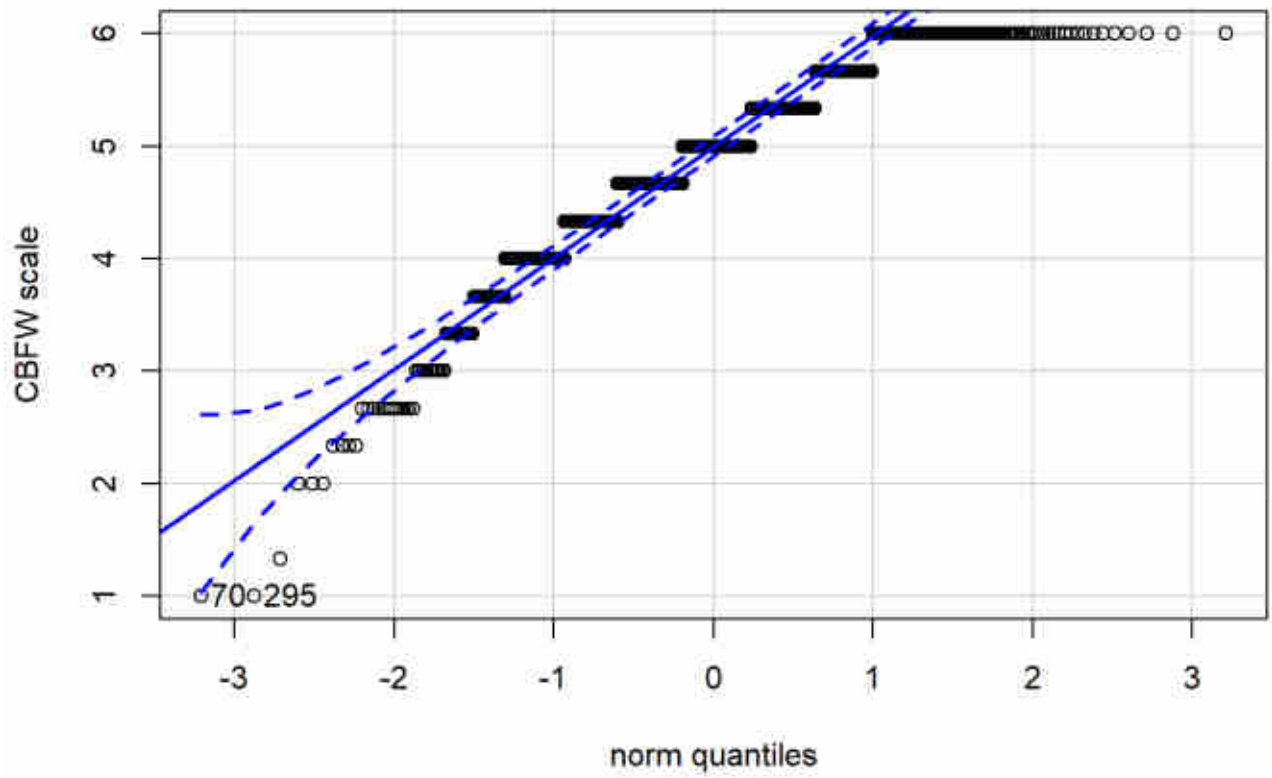
```
Plot2b<- ggplot(DemoRabbitOGOlivia, aes(x = (CatFW2))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("CBFW2") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~BillOlivia) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
Plot3a<- ggplot(DemoRabbitOGBill, aes(x = (CatFW3))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("CBFW3") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~BillOlivia) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
Plot3b<- ggplot(DemoRabbitOGOlivia, aes(x = (CatFW3))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("CBFW3") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~BillOlivia) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

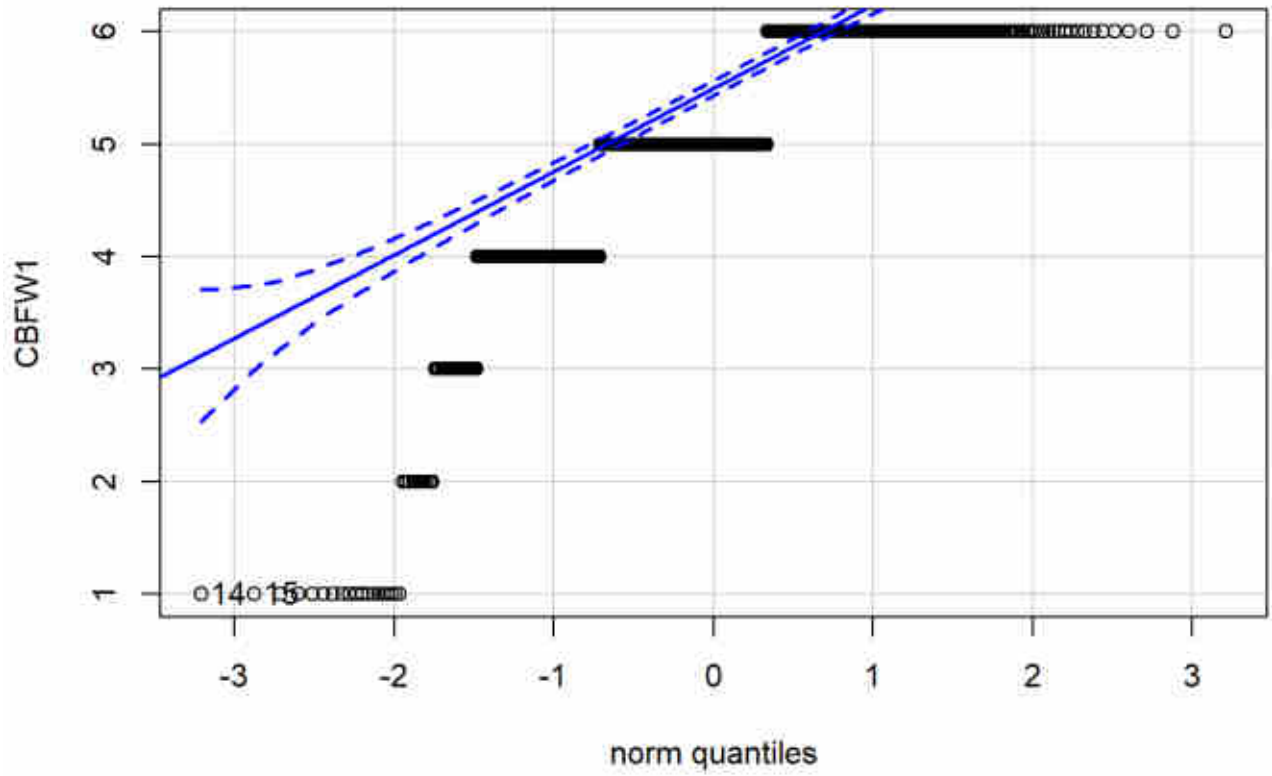
Assumption violation

```
car::qqPlot(Rabbit$FWscale, ylab="CBFW scale")
```



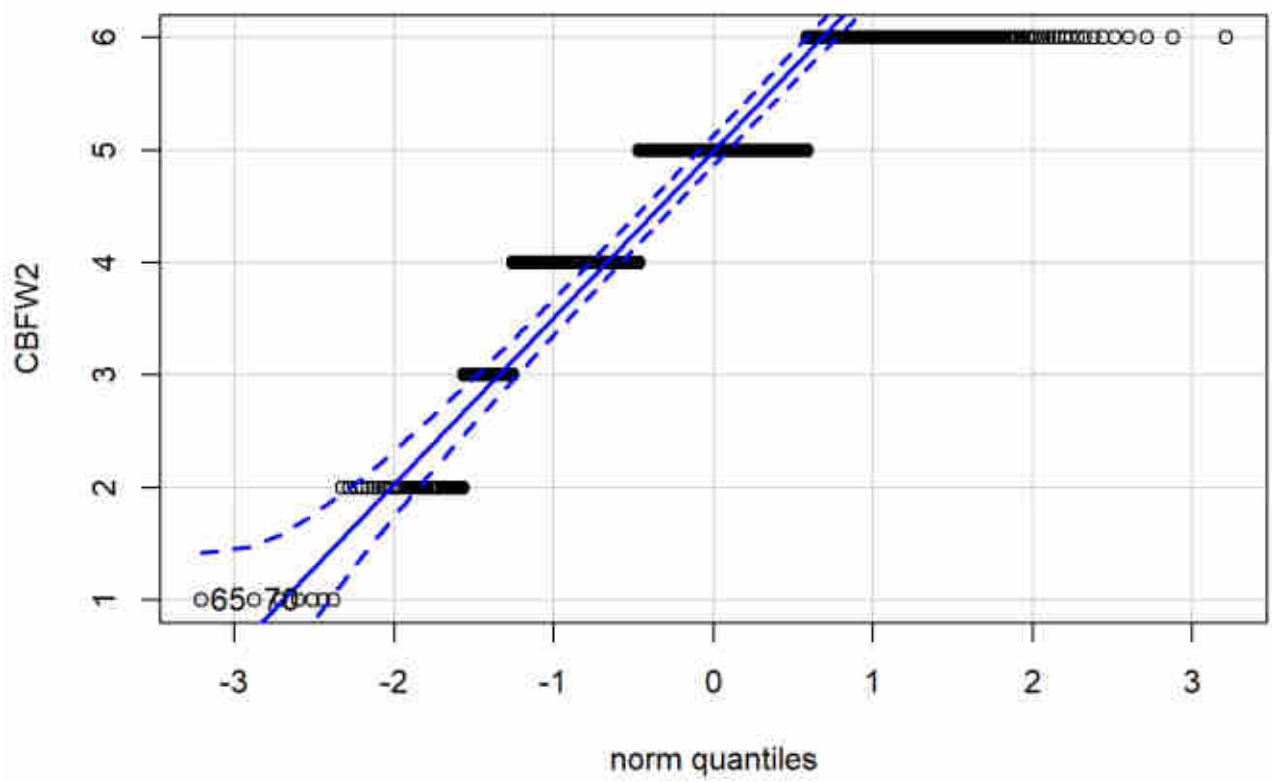

```
## [1]  70 295
```

```
car::qqPlot(Rabbit$FW1, , ylab="CBFW1")
```



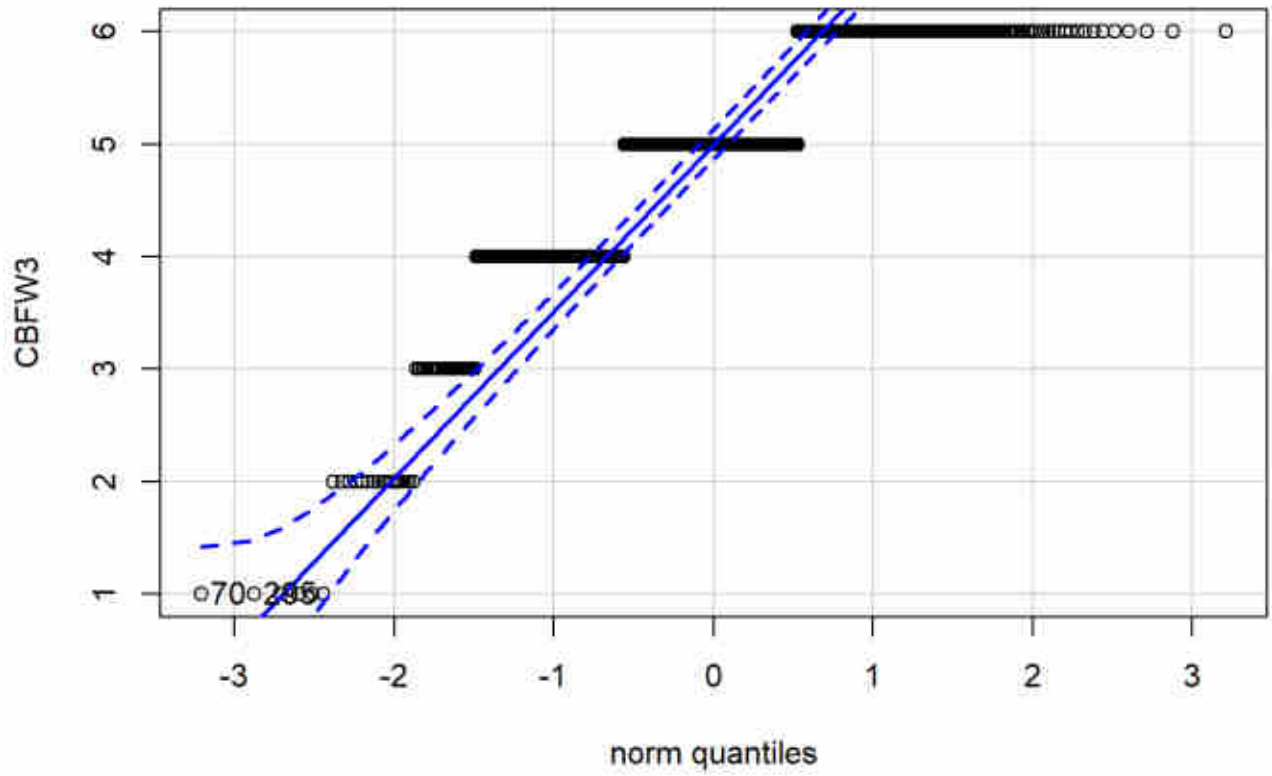

```
## [1] 14 15
```

```
car::qqPlot(Rabbit$FW2, ylab="CBFW2")
```




```
## [1] 65 70
```

```
car::qqPlot(Rabbit$FW3, ylab="CBFW3")
```




```
## [1]  70 295
```

```
shapiro.test(DemoRabbitOGBill$FWscale)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  DemoRabbitOGBill$FWscale
## W = 0.92451, p-value = 1.463e-12
```

```
shapiro.test(DemoRabbitOGBill$FW1)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  DemoRabbitOGBill$FW1
## W = 0.78409, p-value < 2.2e-16
```

```
shapiro.test(DemoRabbitOGBill$FW2)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  DemoRabbitOGBill$FW2
## W = 0.85343, p-value < 2.2e-16
```

```
shapiro.test(DemoRabbitOGBill$FW3)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  DemoRabbitOGBill$FW3
## W = 0.84378, p-value < 2.2e-16
```

```
shapiro.test(DemoRabbitOGOlivia$FWscale)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  DemoRabbitOGOlivia$FWscale
## W = 0.92467, p-value = 5.383e-13
```

```
shapiro.test(DemoRabbitOGOlivia$FW1)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  DemoRabbitOGOlivia$FW1
## W = 0.78379, p-value < 2.2e-16
```

```
shapiro.test(DemoRabbitOGOlivia$FW2)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  DemoRabbitOGOlivia$FW2
## W = 0.83469, p-value < 2.2e-16
```

```
shapiro.test(DemoRabbitOGOlivia$FW3)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  DemoRabbitOGOlivia$FW3
## W = 0.83287, p-value < 2.2e-16
```

```
FWqDF <- data.frame(Rabbit$FW1, Rabbit$FW2, Rabbit$FW3)

FWqDF.t <- t(FWqDF)

mvnormtest::mshapiro.test(FWqDF.t)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  Z
## W = 0.88122, p-value < 2.2e-16
```

Test of homogeneity of variance

```
aggregate(Rabbit$FWscale ~ Rabbit$BillOlivia, FUN = var)
```

```
##   Rabbit$BillOlivia Rabbit$FWscale
## 1              Bill      0.7405544
## 2            Olivia      0.7606539
```

```
aggregate(Rabbit$FW1 ~ Rabbit$BillOlivia, FUN = var)
```

```
##   Rabbit$BillOlivia Rabbit$FW1
## 1              Bill   1.071547
## 2            Olivia   1.302459
```

```
aggregate(Rabbit$FW2 ~ Rabbit$BillOlivia, FUN = var)
```

```
##   Rabbit$BillOlivia Rabbit$FW2
## 1              Bill   1.151112
## 2            Olivia   1.298403
```

```
aggregate(Rabbit$FW3 ~ Rabbit$BillOlivia, FUN = var)
```

```
##   Rabbit$BillOlivia Rabbit$FW3
## 1              Bill  1.0324500
## 2            Olivia  0.9538499
```

Demographic visualization

```
DemoRabbitBill <- subset(Rabbit, BillOlivia=="Bill")

glimpse(DemoRabbitBill)
```

```
## Rows: 366
## Columns: 14
## $ BillOlivia <fct> Bill, Bill, Bill, Bill, Bill, Bill, Bill, Bill, Bill, Bi...
## $ Sex        <fct> Male, Female, Male, Male, Female, Female, Male, Male, Ma...
## $ Religion   <chr> "Christianity", "No religion/Agnosticism", "Christianity...
## $ Ethnicity  <chr> "Caucasian", "Caucasian", "Caucasian", "Caucasian", "Asi...
## $ Time       <dbl> 52, 52, 53, 53, 54, 54, 55, 55, 56, 57, 57, 58, 58, 58, ...
## $ Education  <dbl> 4, 5, 4, 4, 4, 4, 4, 5, 4, 5, 4, 4, 4, 5, 5, 4, 4, 4, 3,...
## $ Age        <dbl> 18, 39, 25, 30, 32, 33, 43, 55, 43, 65, 38, 28, 46, 33, ...
## $ FW1        <dbl> 6, 6, 5, 4, 6, 4, 4, 5, 4, 5, 6, 5, 6, 5, 5, 5, 5, 5, 5,...
## $ FW2        <dbl> 6, 6, 4, 6, 6, 5, 4, 5, 3, 6, 6, 6, 6, 4, 5, 6, 4, 6, 4,...
## $ FW3        <dbl> 6, 6, 6, 6, 6, 5, 4, 5, 3, 6, 6, 5, 6, 4, 5, 6, 4, 6, 4,...
## $ FWscale    <dbl> 6.000000, 6.000000, 5.000000, 5.333333, 6.000000, 4.6666...
## $ CatFW1     <fct> Strongly agree, Strongly agree, Agree, Somewhat agree, S...
## $ CatFW2     <fct> Strongly agree, Strongly agree, Somewhat agree, Strongly...
## $ CatFW3     <fct> Strongly agree, Strongly agree, Strongly agree, Strongly...
```

```
DemoRabbitOlivia <- subset(Rabbit, BillOlivia=="Olivia")
glimpse(DemoRabbitOlivia)
```

```
## Rows: 387
## Columns: 14
## $ BillOlivia <fct> Olivia, Olivia, Olivia, Olivia, Olivia, Olivia, Olivia, ...
## $ Sex        <fct> Female, Female, Female, Male, Male, Male, Male, Male, Fe...
## $ Religion   <chr> "Christianity", "No religion/Agnosticism", "Judaism", "C...
## $ Ethnicity  <chr> "Caucasian", "Caucasian", "Caucasian", "Caucasian", "Cau...
## $ Time       <dbl> 51, 51, 51, 51, 52, 52, 52, 52, 53, 53, 53, 54, 54, 54, ...
## $ Education  <dbl> 4, 4, 5, 4, 4, 4, 4, 4, 4, 4, 4, 5, 4, 4, 4, 4, 4, 3, 5,...
## $ Age        <dbl> 25, 32, 42, 50, 34, 26, 38, 54, 39, 32, 25, 40, 33, 25, ...
## $ FW1        <dbl> 4, 5, 6, 4, 6, 5, 5, 4, 6, 1, 1, 5, 6, 4, 4, 6, 3, 6, 6,...
## $ FW2        <dbl> 5, 5, 6, 4, 6, 5, 6, 5, 4, 2, 5, 4, 6, 3, 2, 5, 4, 6, 5,...
## $ FW3        <dbl> 5, 6, 6, 5, 6, 5, 6, 5, 5, 5, 4, 3, 6, 5, 5, 4, 2, 6, 5,...
## $ FWscale    <dbl> 4.666667, 5.333333, 6.000000, 4.333333, 6.000000, 5.0000...
## $ CatFW1     <fct> Somewhat agree, Agree, Strongly agree, Somewhat agree, S...
## $ CatFW2     <fct> Agree, Agree, Strongly agree, Somewhat agree, Strongly a...
## $ CatFW3     <fct> Agree, Strongly agree, Strongly agree, Agree, Strongly a...
```

```
Plot4a<- ggplot(DemoRabbitOGBill, aes(x = (Religion))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab(" ") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(BillOlivia ~ Sex) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
Plot4b<- ggplot(DemoRabbitOGOlivia, aes(x = (Religion))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Religion") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(BillOlivia ~ Sex) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
Plot5a<- ggplot(DemoRabbitOGBill, aes(x = (Ethnicity))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab(" ") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(BillOlivia ~ Sex) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
Plot5b<- ggplot(DemoRabbitOGOlivia, aes(x = (Ethnicity))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Ethnicity") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(BillOlivia ~ Sex) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

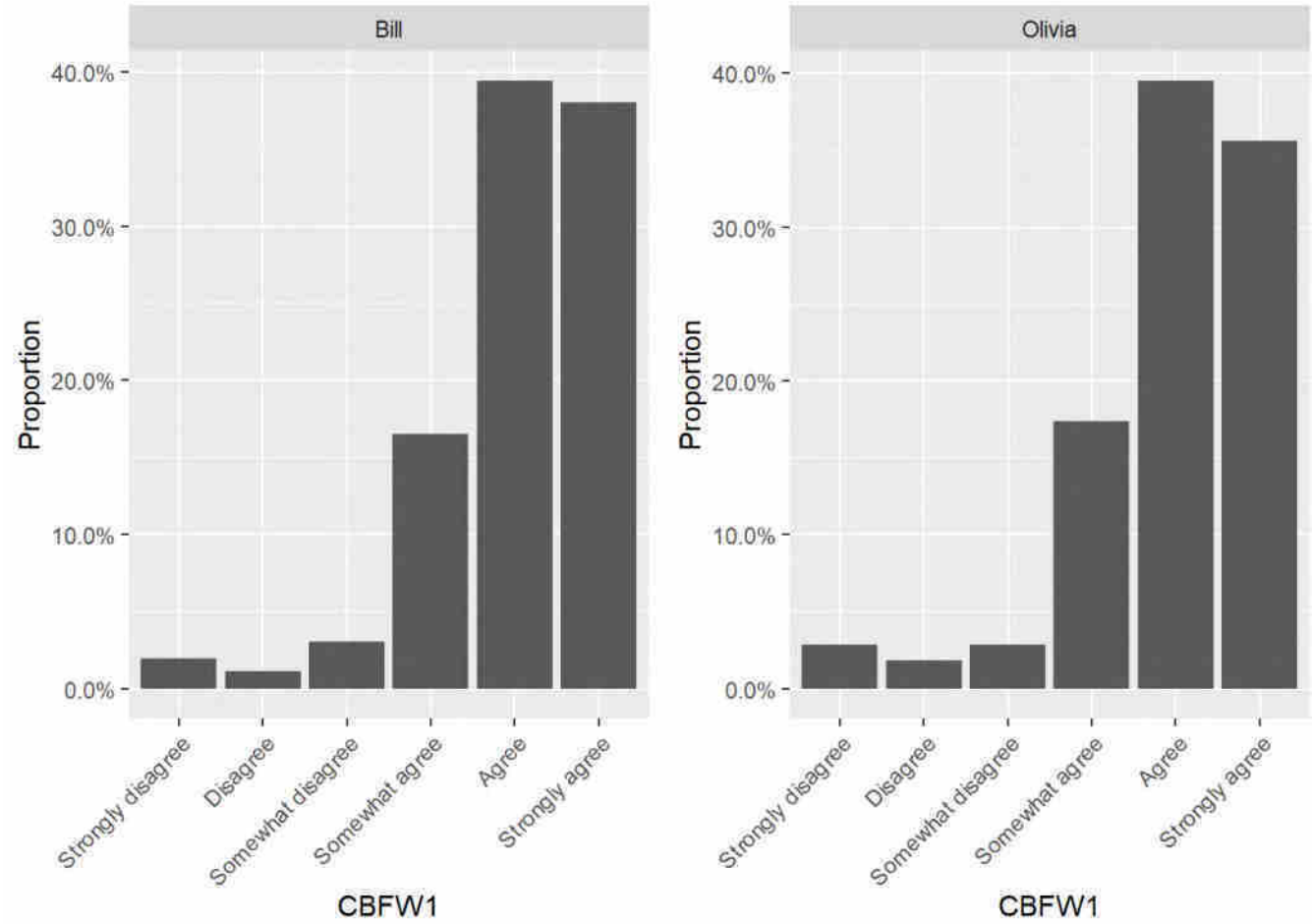
```
Plot6a<- ggplot(DemoRabbitBill, aes(x = (Sex))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Sex") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~BillOlivia) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
Plot6b<- ggplot(DemoRabbitOlivia, aes(x = (Sex))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Sex") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~BillOlivia) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

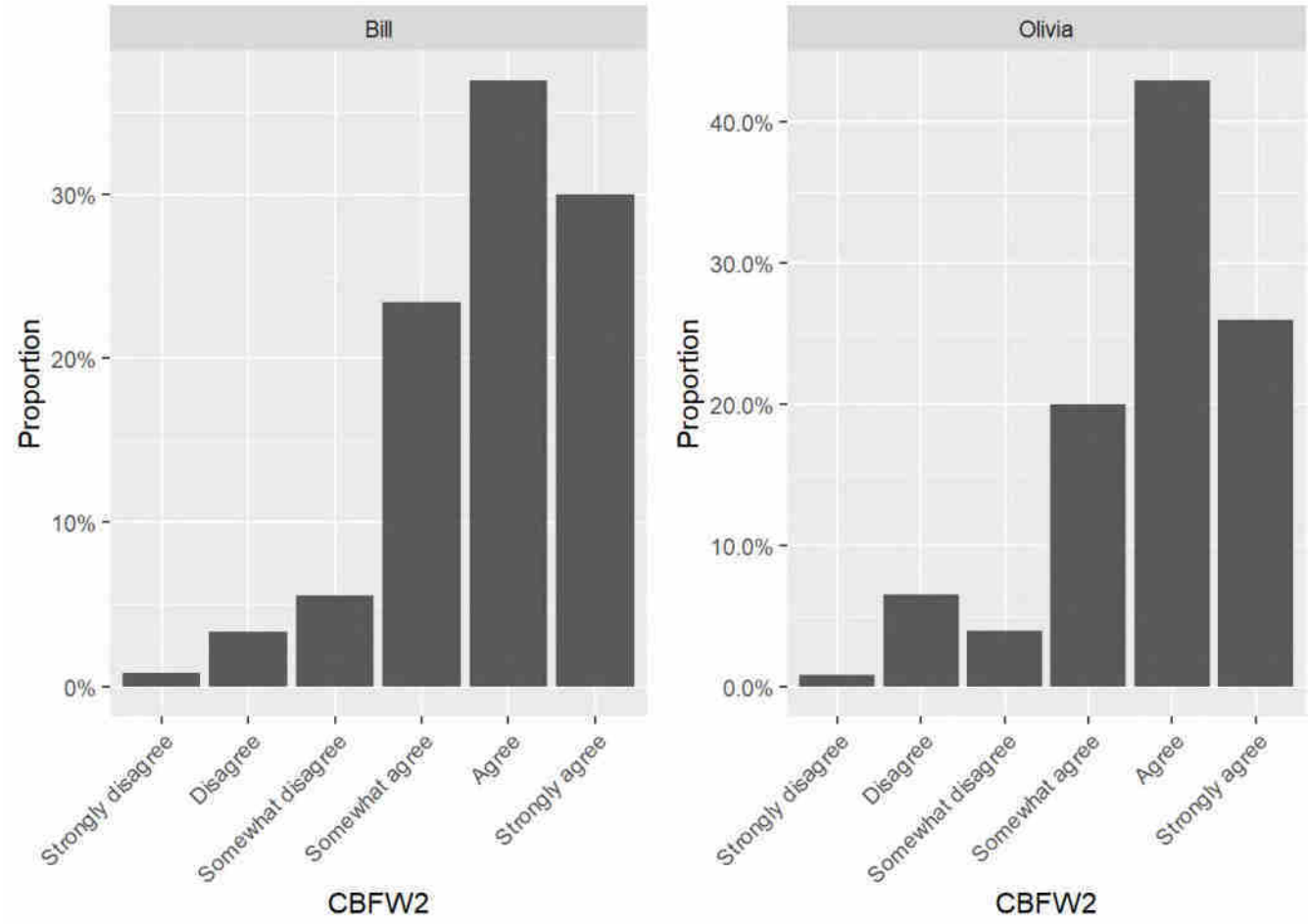
```
Plot7a<- ggplot(DemoRabbitOGBill, aes(x = (CatEducation))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Education") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(BillOlivia~Sex) +
        theme(axis.text.x = element_text(angle = 50, hjust = 1))
```

```
Plot7b<- ggplot(DemoRabbitOGOlivia, aes(x = (CatEducation))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Education") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(BillOlivia~Sex) +
        theme(axis.text.x = element_text(angle = 50, hjust = 1))
```

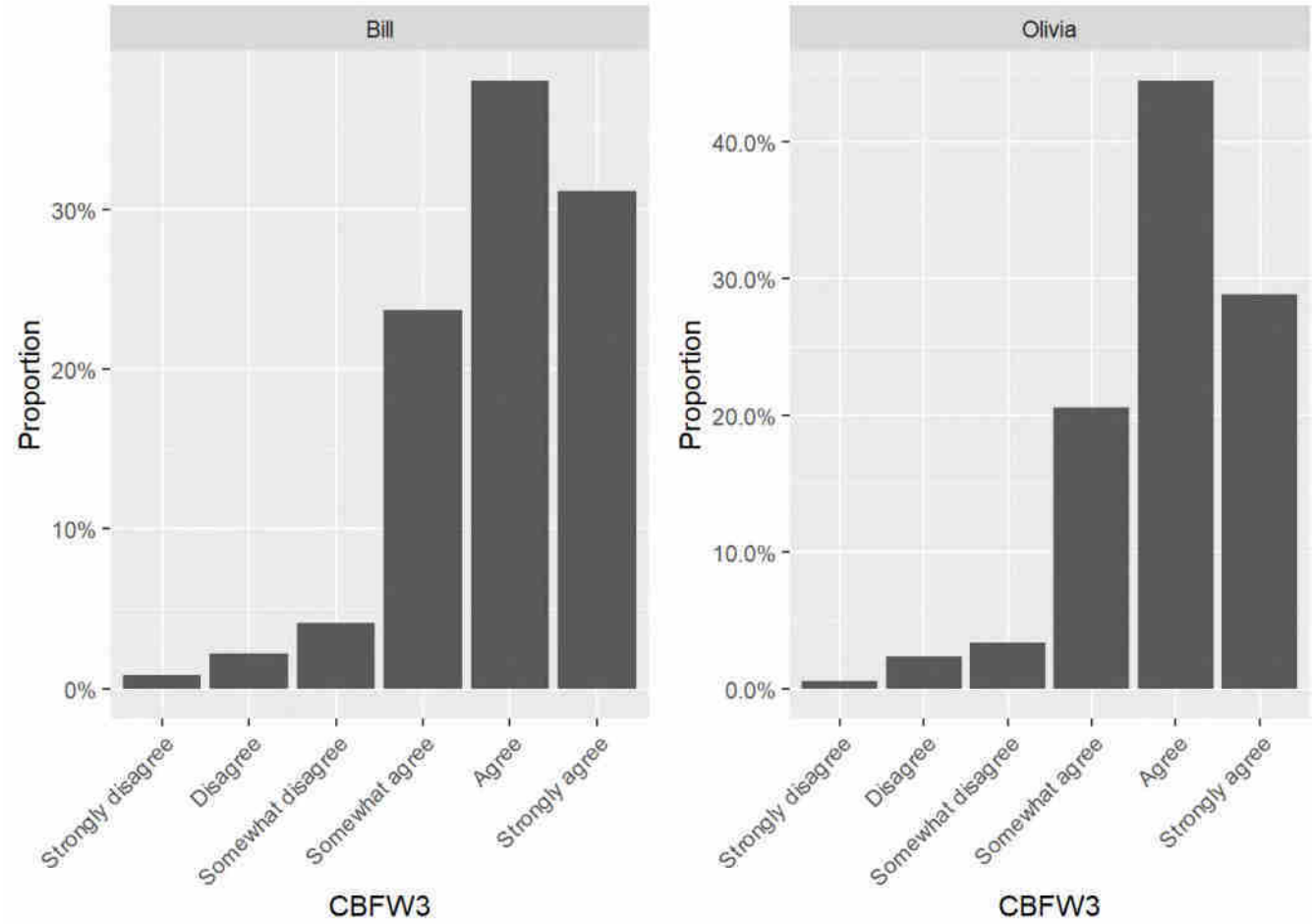
```
grid.arrange(Plot1a,Plot1b, nrow=1, ncol=2)
```



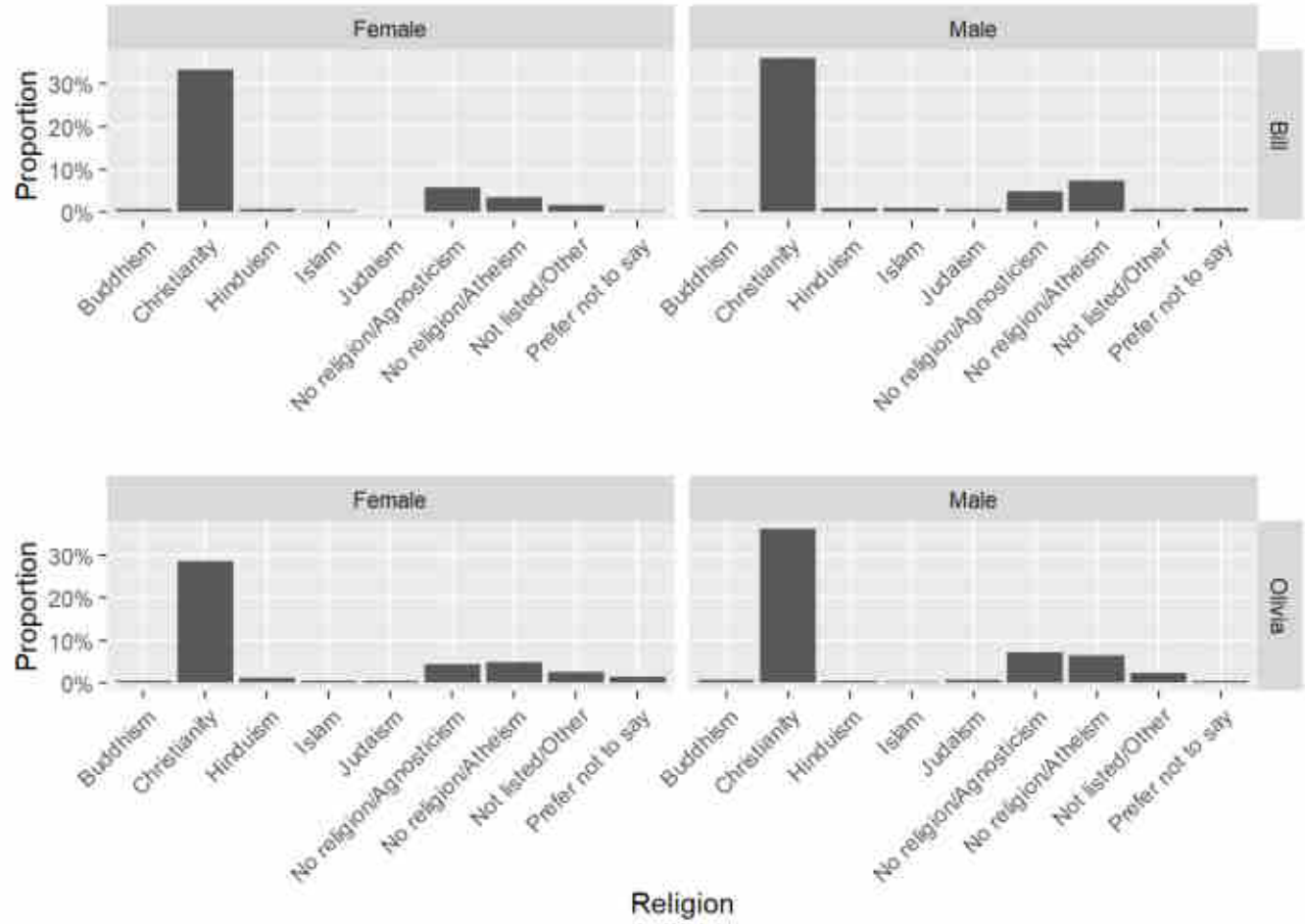

```
grid.arrange(Plot2a, Plot2b, nrow=1, ncol=2)
```



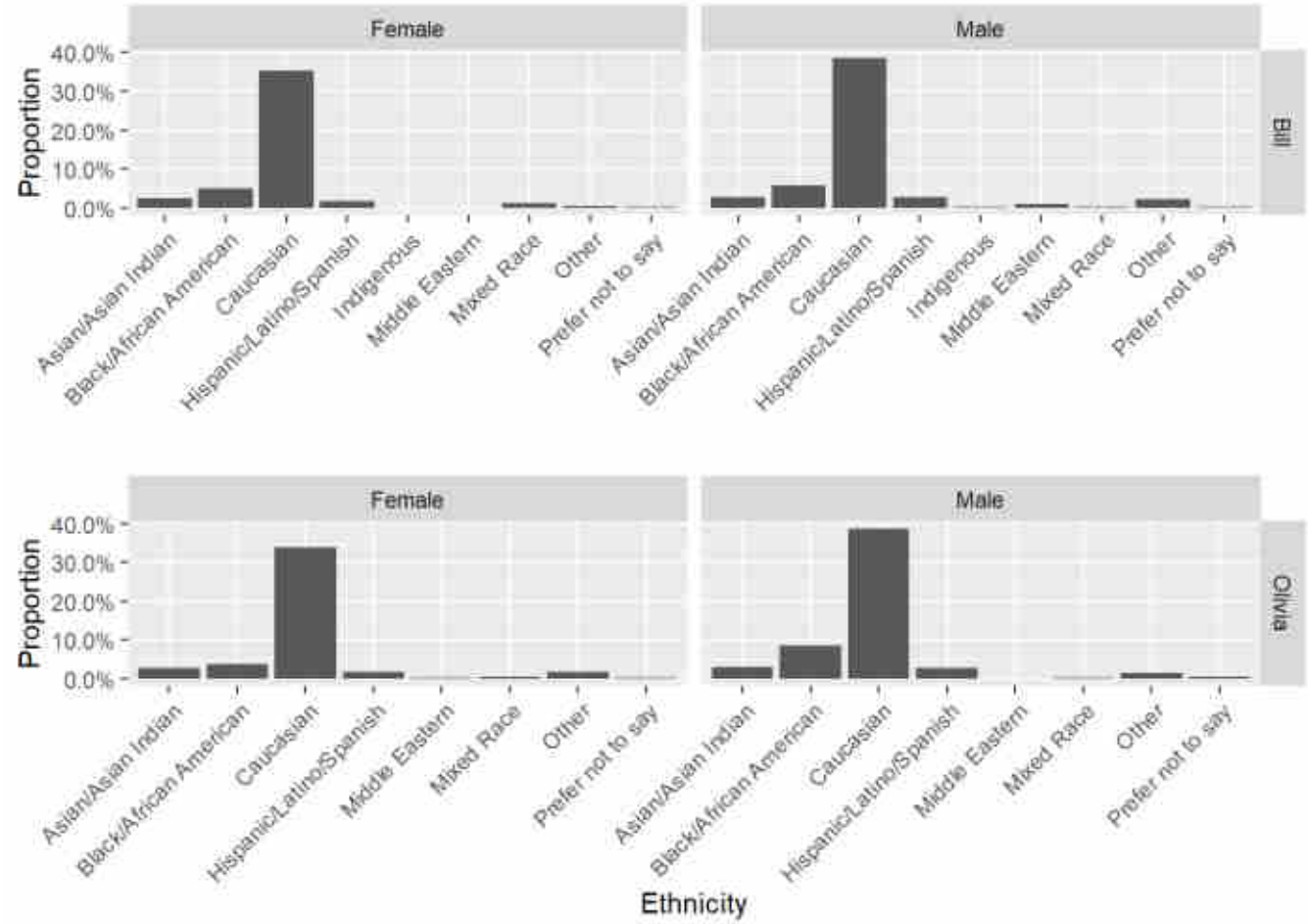

```
grid.arrange(Plot3a, Plot3b, nrow=1, ncol=2)
```



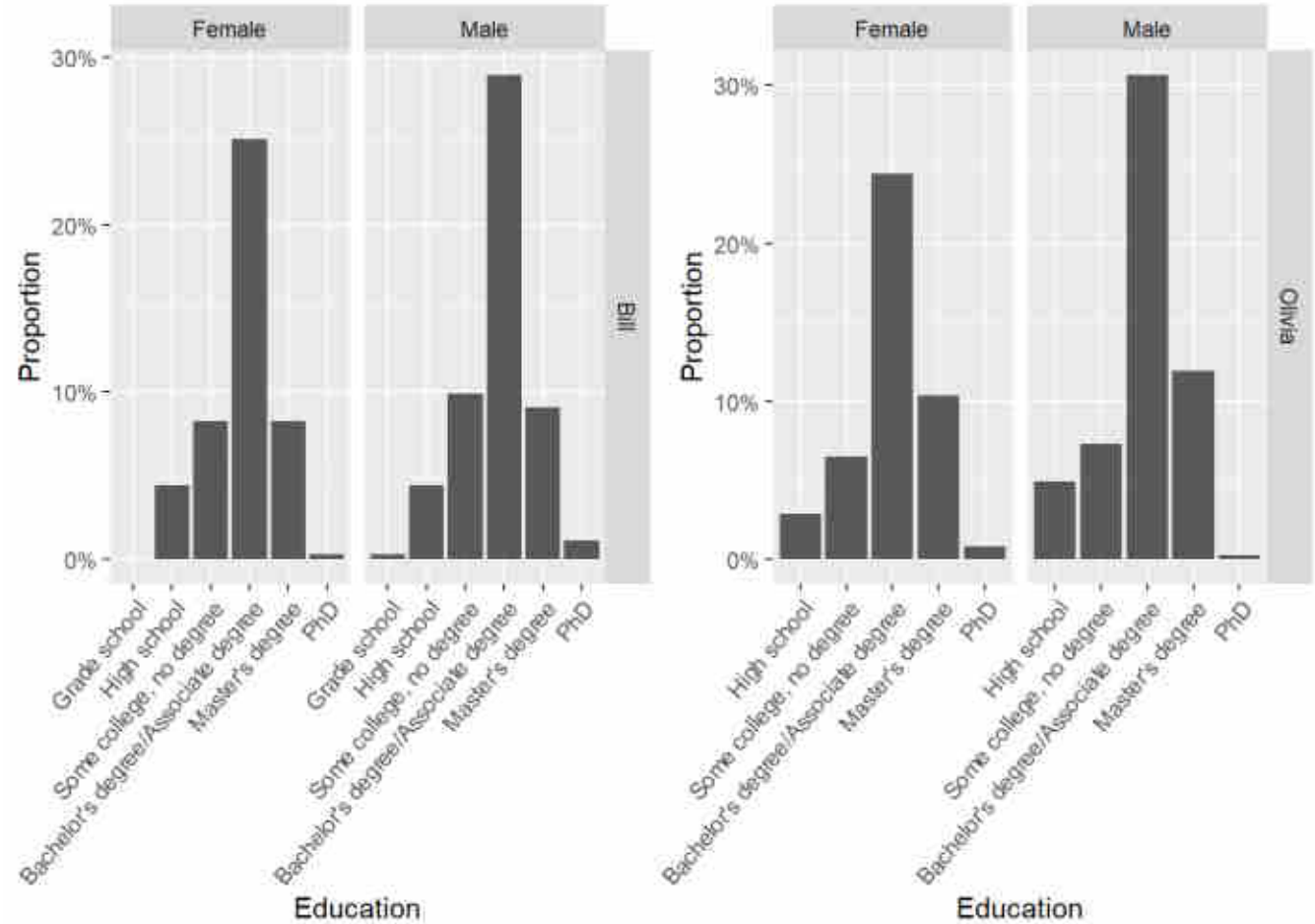

```
Plotxx <- grid.arrange(Plot4a,Plot4b, nrow=2, ncol=1)
```



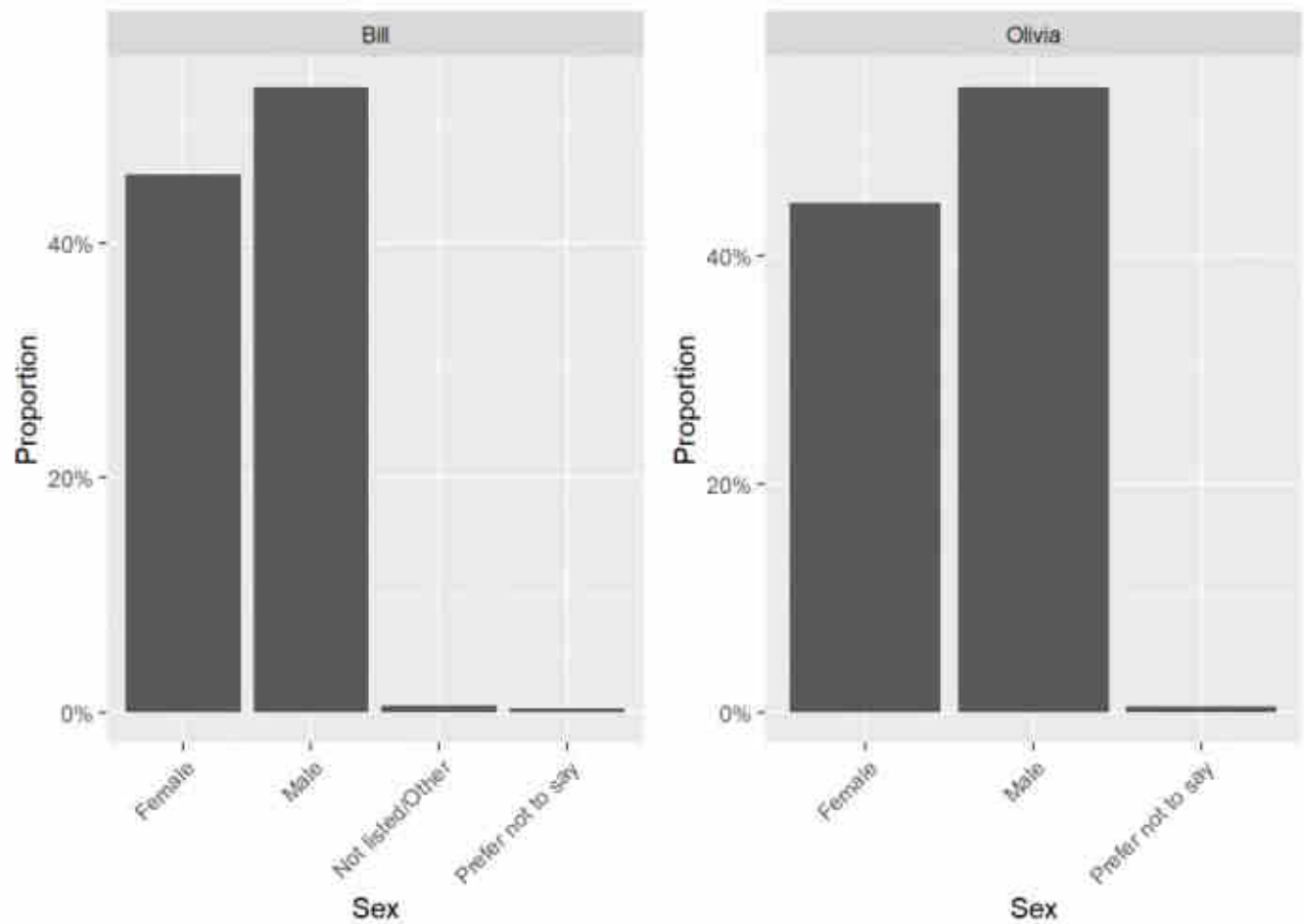

```
Plotyy <- grid.arrange(Plot5a, Plot5b, nrow=2, ncol=1)
```




```
Plotzz<- grid.arrange(Plot7a, Plot7b, nrow=1, ncol=2)
```




```
Plotii <- grid.arrange(Plot6a, Plot6b, nrow=1, ncol=2)
```




```
if (!"skimr" %in% installed.packages()) install.packages("skimr")
my_skim <- skimr::skim_with(numeric =
                       skimr::sfl(mean, sd, median, min, max), append = FALSE)

 Rabbit %>%
   select(Age, Education,FW1, FW2, FW3, FWscale) %>%
  my_skim()
```

Data summary

Name	Piped data
Number of rows	753
Number of columns	6
_____	
Column type frequency:	
numeric	6
_____	
Group variables	None

Variable type: numeric

skim_variable	n_missing	complete_rate	mean	sd	median	min	max
Age	0	1	40.79	12.10	38	18	78
Education	0	1	3.89	0.86	4	1	6
FW1	0	1	4.99	1.09	5	1	6
FW2	0	1	4.79	1.11	5	1	6
FW3	0	1	4.90	1.00	5	1	6
FWscale	0	1	4.90	0.87	5	1	6

Create the CBFW data frame

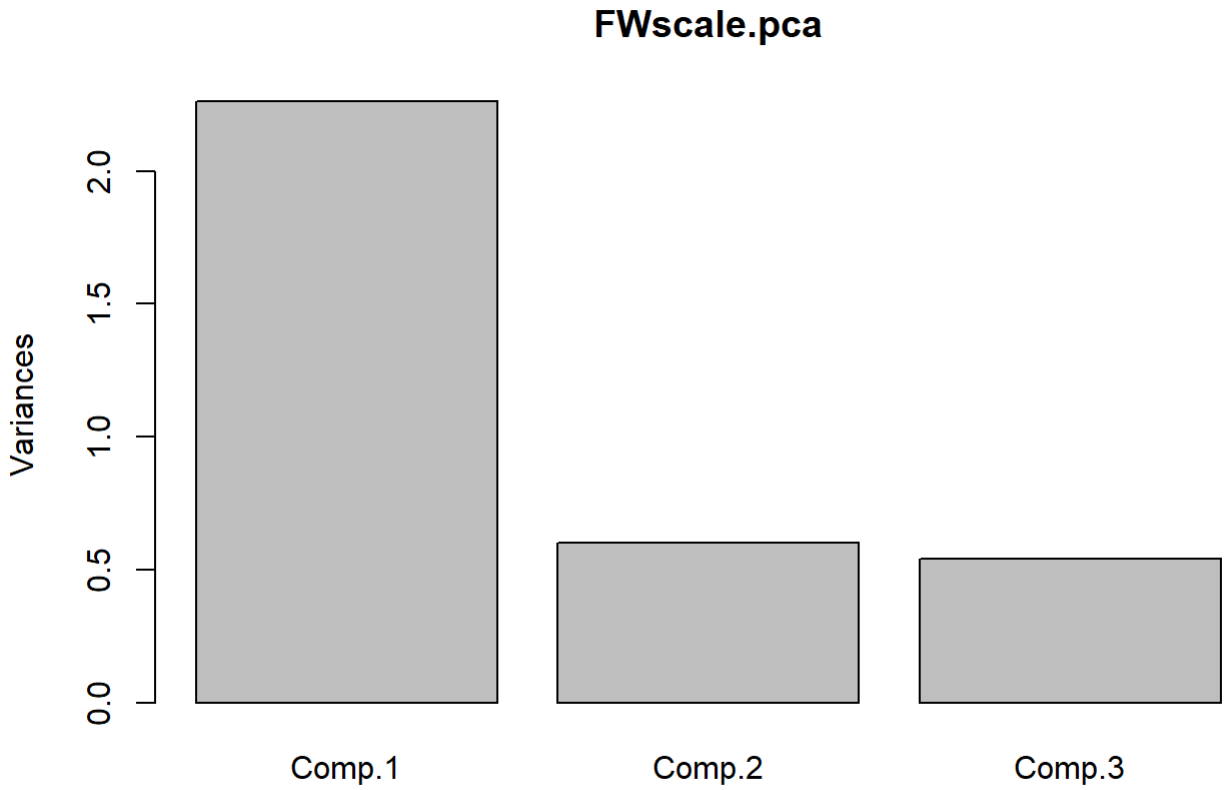
```
FWscale.data <- data.frame(Rabbit$FW1, Rabbit$FW2, Rabbit$FW3)
```

Plot the principle component analysis and factor analysis for CBFW scale

```
FWscale.pca <- princomp(FWscale.data)
summary(FWscale.pca)
```

```
## Importance of components:
##                           Comp.1    Comp.2    Comp.3
## Standard deviation     1.5043214 0.7758981 0.7345803
## Proportion of Variance 0.6646822 0.1768244 0.1584935
## Cumulative Proportion  0.6646822 0.8415065 1.0000000
```

```
plot(FWscale.pca)
```




```
FWscale.pca.fa <- factanal(FWscale.data, factors=1, rotation="varimax")
FWscale.pca.fa
```

```
##
## Call:
## factanal(x = FWscale.data, factors = 1, rotation = "varimax")
##
## Uniquenesses:
## Rabbit.FW1 Rabbit.FW2 Rabbit.FW3
##      0.534      0.429      0.556
##
## Loadings:
##            Factor1
## Rabbit.FW1 0.683
## Rabbit.FW2 0.756
## Rabbit.FW3 0.666
##
##                Factor1
## SS loadings      1.481
## Proportion Var   0.494
##
## The degrees of freedom for the model is 0 and the fit was 0
```

Observe the reliability of the CBFW scale

```
FWscale.Mat <- data.matrix(FWscale.data)
reliability(cov(FWscale.Mat))
```

```
## Alpha reliability =  0.7431
## Standardized alpha =  0.7436
##
## Reliability deleting each item in turn:
##             Alpha Std.Alpha r(item, total)
## Rabbit.FW1 0.6674    0.6699         0.5614
## Rabbit.FW2 0.6234    0.6253         0.5979
## Rabbit.FW3 0.6807    0.6807         0.5507
```

Pearson and Spearman Correlation

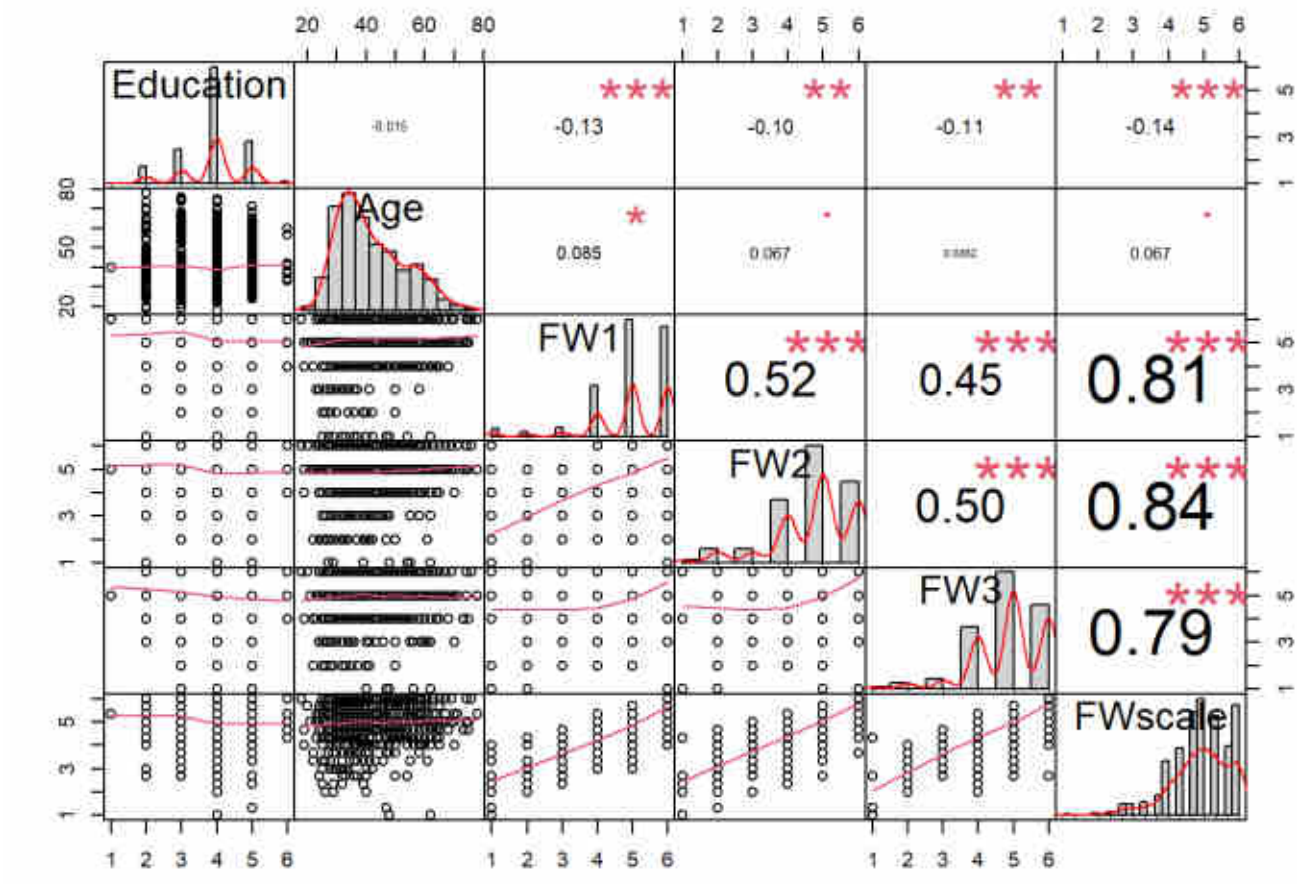
```
Cor_Hmisc=rcorr(as.matrix(Rabbit[,6:11]), type="pearson")
Cor_Hmisc
```

```
##           Education   Age   FW1   FW2   FW3 FWscale
## Education      1.00 -0.02 -0.13 -0.10 -0.11   -0.14
## Age           -0.02  1.00  0.09  0.07  0.01    0.07
## FW1           -0.13  0.09  1.00  0.52  0.45    0.81
## FW2           -0.10  0.07  0.52  1.00  0.50    0.84
## FW3           -0.11  0.01  0.45  0.50  1.00    0.79
## FWscale       -0.14  0.07  0.81  0.84  0.79    1.00
##
## n= 753
##
##
## P
##           Education Age    FW1    FW2    FW3    FWscale
## Education           0.6793 0.0003 0.0043 0.0022 0.0000
## Age       0.6793           0.0195 0.0657 0.8655 0.0674
## FW1       0.0003    0.0195        0.0000 0.0000 0.0000
## FW2       0.0043    0.0657 0.0000        0.0000 0.0000
## FW3       0.0022    0.8655 0.0000 0.0000        0.0000
## FWscale   0.0000    0.0674 0.0000 0.0000 0.0000
```

```
Cor_Hmisc=rcorr(as.matrix(Rabbit[,6:11]), type="spearman")
Cor_Hmisc
```

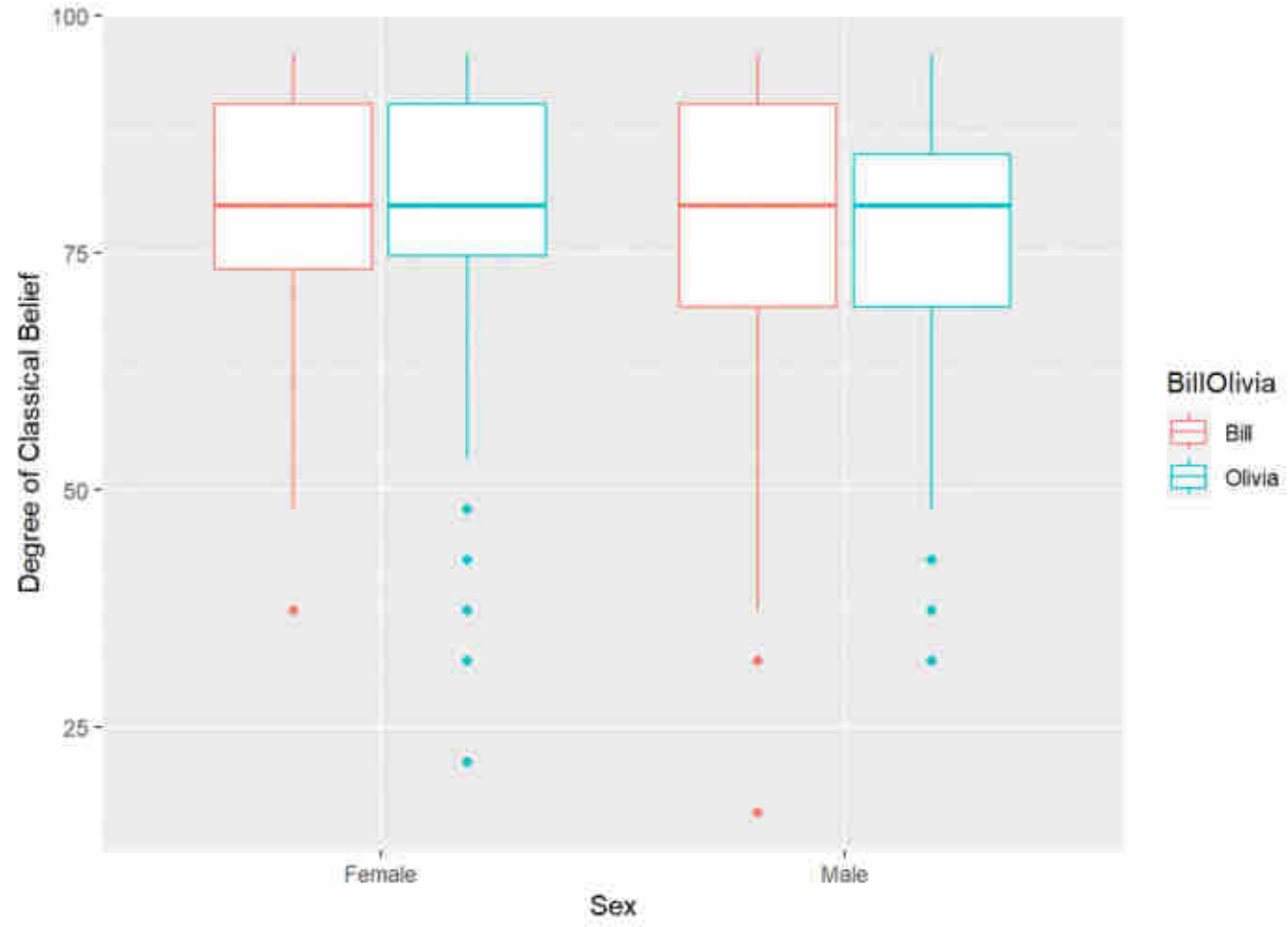
```
##           Education  Age   FW1   FW2   FW3 FWscale
## Education      1.00 0.01 -0.15 -0.12 -0.13   -0.16
## Age            0.01 1.00  0.06  0.04  0.01    0.05
## FW1           -0.15 0.06  1.00  0.49  0.50    0.78
## FW2           -0.12 0.04  0.49  1.00  0.58    0.84
## FW3           -0.13 0.01  0.50  0.58  1.00    0.82
## FWscale       -0.16 0.05  0.78  0.84  0.82    1.00
##
## n= 753
##
##
## P
##           Education Age    FW1    FW2    FW3    FWscale
## Education           0.7666 0.0000 0.0013 0.0004 0.0000
## Age       0.7666           0.1097 0.2803 0.8157 0.1853
## FW1       0.0000    0.1097        0.0000 0.0000 0.0000
## FW2       0.0013    0.2803 0.0000        0.0000 0.0000
## FW3       0.0004    0.8157 0.0000 0.0000        0.0000
## FWscale   0.0000    0.1853 0.0000 0.0000 0.0000
```

```
my_data <- Rabbit[, c(6:11)]
chart.Correlation(my_data, histogram=TRUE, pch=1)
```



ANCOVA

```
ggplot(RabbitOG, aes(x=Sex, y=FWscale*16, color=BillOlivia)) + geom_boxplot() +
  ylab("Degree of Classical Belief")
```




```
Cor_Hmisc=rcorr(as.matrix(Rabbit[,6:11]), type="pearson")
Cor_Hmisc
```

```
##           Education   Age   FW1   FW2   FW3 FWscale
## Education      1.00 -0.02 -0.13 -0.10 -0.11   -0.14
## Age           -0.02  1.00  0.09  0.07  0.01    0.07
## FW1           -0.13  0.09  1.00  0.52  0.45    0.81
## FW2           -0.10  0.07  0.52  1.00  0.50    0.84
## FW3           -0.11  0.01  0.45  0.50  1.00    0.79
## FWscale       -0.14  0.07  0.81  0.84  0.79    1.00
##
## n= 753
##
##
## P
##           Education Age    FW1    FW2    FW3    FWscale
## Education           0.6793 0.0003 0.0043 0.0022 0.0000
## Age       0.6793           0.0195 0.0657 0.8655 0.0674
## FW1       0.0003    0.0195        0.0000 0.0000 0.0000
## FW2       0.0043    0.0657 0.0000        0.0000 0.0000
## FW3       0.0022    0.8655 0.0000 0.0000        0.0000
## FWscale   0.0000    0.0674 0.0000 0.0000 0.0000
```

```
Rabbit_scores_factorial<- aov(FWscale~Education + Age + Time + BillOlivia + Sex + BillOlivia:Se
x, data=RabbitOG)
broom::tidy(Rabbit_scores_factorial)
```

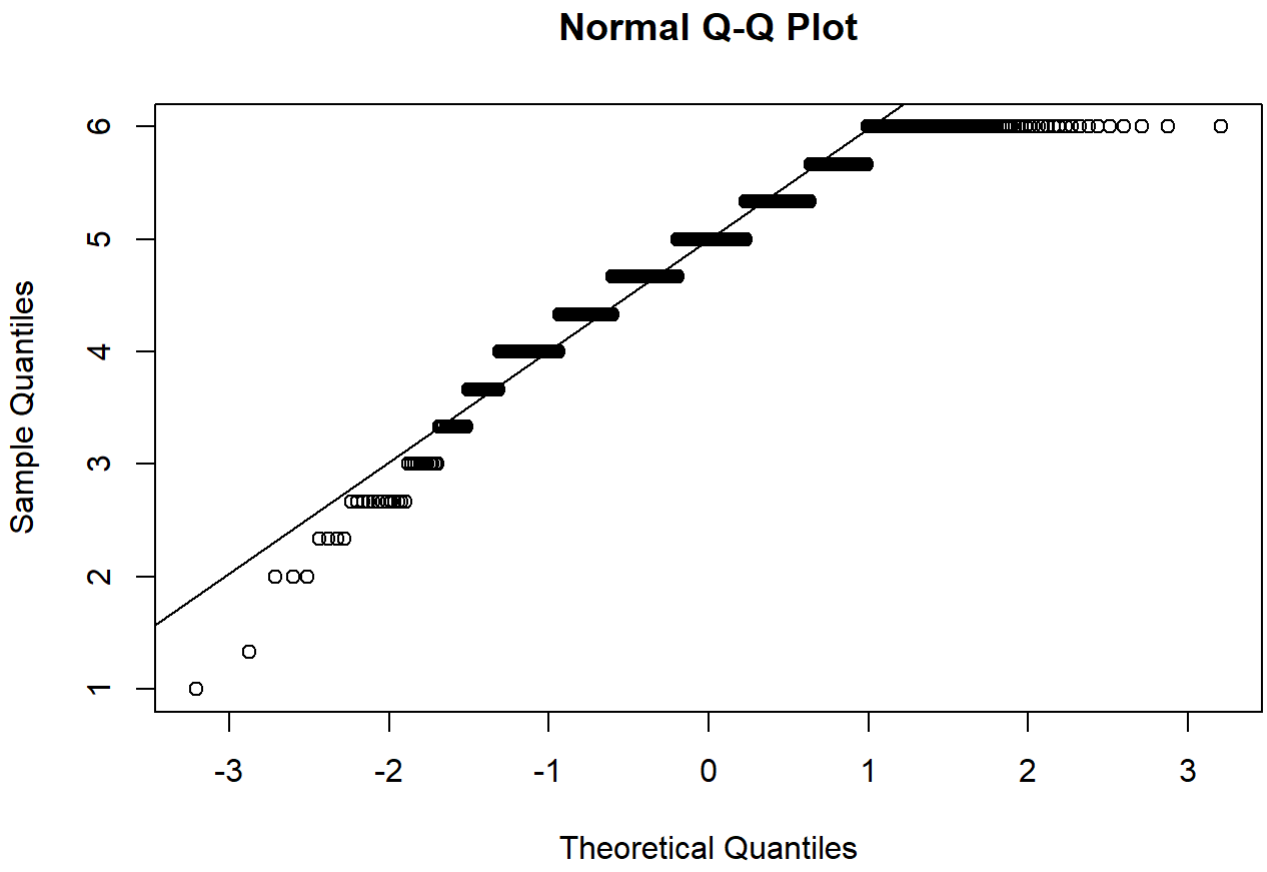
```
## # A tibble: 7 x 6
##   term              df    sumsq  meansq statistic    p.value
##   <chr>          <dbl>    <dbl>   <dbl>     <dbl>      <dbl>
## 1 Education          1  11.4    11.4       15.9    0.0000720
## 2 Age                1   2.83    2.83       3.96   0.0469
## 3 Time               1   2.41    2.41       3.37   0.0666
## 4 BillOlivia         1   0.0991  0.0991     0.139  0.710
## 5 Sex                1   1.70    1.70       2.37   0.124
## 6 BillOlivia:Sex     1   0.231   0.231      0.323  0.570
## 7 Residuals        741 529.      0.714     NA     NA
```

```
DescTools::EtaSq(Rabbit_scores_factorial)
```

```
##                      eta.sq  eta.sq.part
## Education      0.0205017750 0.0207831341
## Age            0.0044627543 0.0045987716
## Time           0.0040022677 0.0041262081
## BillOlivia     0.0001607684 0.0001664060
## Sex            0.0030949692 0.0031938003
## BillOlivia:Sex 0.0004210602 0.0004357081
```

Normality of ANCOVA

```
qqnorm(RabbitOG$FWscale)
qqline(RabbitOG$FWscale)
```




```
shapiro.test(RabbitOG$FWscale)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  RabbitOG$FWscale
## W = 0.92551, p-value < 2.2e-16
```

```
bartlett.test(FWscale~BillOlivia, data=RabbitOG)
```

```
##
##  Bartlett test of homogeneity of variances
##
## data:  FWscale by BillOlivia
## Bartlett's K-squared = 0.056, df = 1, p-value = 0.8129
```

MANCOVA

```
Rabbit_MANCOVA <- jmv::mancova(data=RabbitOG, deps= vars(FW1,FW2,FW3), factors= c(Sex,BillOlivi
a), covs=c(Age,Education,Time), boxM= TRUE, multivar = list("pillai", "wilks", "hotel", "roy"))
Rabbit_MANCOVA
```

```
##
##  MANCOVA
##
##  Multivariate Tests
##  ---------------------------------------------------------------------------------------------
---
##                                          value          F            df1    df2    p
##  ---------------------------------------------------------------------------------------------
---
##    Sex               Pillai's Trace        0.004902011    1.2134773      3    739    0.303800
4
##                      Wilks' Lambda           0.9950980    1.2134773      3    739    0.303800
4
##                      Hotelling's Trace     0.004926160    1.2134773      3    739    0.303800
4
##                      Roy's Largest Root    0.004926160    1.2134773      3    739    0.303800
4
##
##    BillOlivia        Pillai's Trace        0.003911636    0.9673502      3    739    0.407568
5
##                      Wilks' Lambda           0.9960884    0.9673502      3    739    0.407568
5
##                      Hotelling's Trace     0.003926997    0.9673502      3    739    0.407568
5
##                      Roy's Largest Root    0.003926997    0.9673502      3    739    0.407568
5
##
##    Sex:BillOlivia    Pillai's Trace        0.003154692    0.7795652      3    739    0.505549
1
##                      Wilks' Lambda           0.9968453    0.7795652      3    739    0.505549
1
##                      Hotelling's Trace     0.003164676    0.7795652      3    739    0.505549
1
##                      Roy's Largest Root    0.003164676    0.7795652      3    739    0.505549
1
##
##    Age               Pillai's Trace        0.010751363    2.6772027      3    739    0.046142
6
##                      Wilks' Lambda           0.9892486    2.6772027      3    739    0.046142
6
##                      Hotelling's Trace     0.010868211    2.6772027      3    739    0.046142
6
##                      Roy's Largest Root    0.010868211    2.6772027      3    739    0.046142
6
##
##    Education         Pillai's Trace        0.021810431    5.4924284      3    739    0.000980
8
##                      Wilks' Lambda           0.9781896    5.4924284      3    739    0.000980
8
##                      Hotelling's Trace     0.022296732    5.4924284      3    739    0.000980
8
##                      Roy's Largest Root    0.022296732    5.4924284      3    739    0.000980
8
```

```
##
##    Time              Pillai's Trace        0.012900661    3.2193953      3    739    0.022269
6
##                      Wilks' Lambda           0.9870993    3.2193953      3    739    0.022269
6
##                      Hotelling's Trace     0.013069264    3.2193953      3    739    0.022269
6
##                      Roy's Largest Root    0.013069264    3.2193953      3    739    0.022269
6
##  ------------------------------------------------------------------------------------------
---
##
##
##  Univariate Tests
##  ------------------------------------------------------------------------------------------
----------------
##                      Dependent Variable    Sum of Squares    df     Mean Square    F
p
##  ------------------------------------------------------------------------------------------
----------------
##    Sex               FW1                       2.48110742      1     2.48110742     2.1592490
0    0.1421384
##                      FW2                       1.06079566      1     1.06079566     0.8846758
0    0.3472307
##                      FW3                       2.85107395      1     2.85107395     2.9930812
6    0.0840373
##    BillOlivia        FW1                       1.40393995      1     1.40393995     1.2218156
7    0.2693634
##                      FW2                       0.83460878      1     0.83460878     0.6960418
6    0.4043858
##                      FW3                       0.21325992      1     0.21325992     0.2238820
4    0.6362371
##    Sex:BillOlivia    FW1                       0.14774192      1     0.14774192     0.1285762
9    0.7200149
##                      FW2                       0.61613438      1     0.61613438     0.5138399
3    0.4737072
##                      FW3                       1.08266366      1     1.08266366     1.1365893
6    0.2867214
##    Age               FW1                       6.64751709      1     6.64751709     5.7851766
0    0.0164060
##                      FW2                       4.20114516      1     4.20114516     3.5036450
4    0.0616276
##                      FW3                       0.04209125      1     0.04209125     0.0441877
5    0.8335625
##    Education         FW1                      14.78265482      1    14.78265482    12.8649941
9    0.0003568
##                      FW2                       9.45453344      1     9.45453344     7.8848332
8    0.0051162
##                      FW3                       9.81997565      1     9.81997565    10.3090925
3    0.0013809
##    Time              FW1                       0.08197696      1     0.08197696     0.0713426
1    0.7894662
##                      FW2                       1.94134080      1     1.94134080     1.6190273
8    0.2036266
```

```
##                      FW3                       7.96600486      1     7.96600486     8.3627785
0    0.0039420
##    Residuals         FW1                     851.45372494    741     1.14906036
##                      FW2                     888.51711024    741     1.19907842
##                      FW3                     705.84311253    741     0.95255481
##  ---------------------------------------------------------------------------------------------
----------------
##
##
##  ASSUMPTION CHECKS
##
##  Box's Homogeneity of Covariance Matrices Test
##  ---------------------------------------------
##    <U+03C7>²          df    p
##  ---------------------------------------------
##    47.52727    18    0.0001769
##  ---------------------------------------------
```

Hypothesis test on the relationship between CBFW3 and Sex

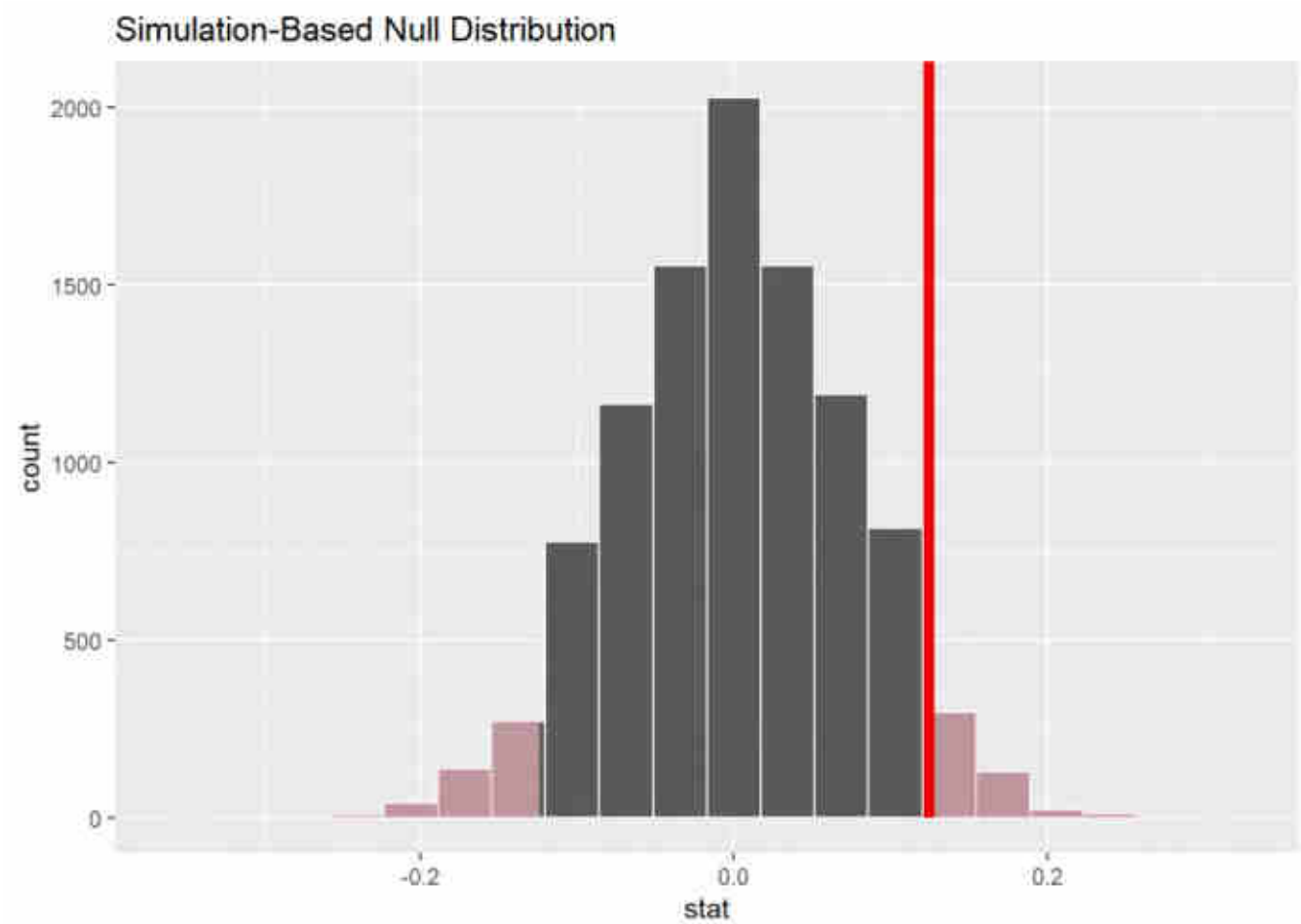
```
null_distribution_FW3sex <- RabbitOG %>%
  specify(formula = FW3 ~ Sex) %>%
hypothesize(null = "independence") %>%
  generate(reps = 10000, type = "permute") %>%
  calculate(stat= "diff in means", order = c("Female", "Male"))
null_distribution_FW3sex
```

```
## # A tibble: 10,000 x 2
##    replicate    stat
##        <int>   <dbl>
##  1         1 -0.0377
##  2         2 -0.0108
##  3         3 -0.0647
##  4         4  0.0755
##  5         5  0.0593
##  6         6  0.0539
##  7         7  0.0216
##  8         8  0.0162
##  9         9 -0.140
## 10        10 -0.0108
## # ... with 9,990 more rows
```

```
obs_diff_meansFW3sex <- RabbitOG %>%
  specify(formula = FW3 ~ Sex) %>%
  calculate(stat= "diff in means", order = c("Female", "Male"))
obs_diff_meansFW3sex
```

```
## # A tibble: 1 x 1
##    stat
##   <dbl>
## 1 0.124
```

```
visualize(null_distribution_FW3sex, bins = 20) +
  shade_p_value(obs_stat = obs_diff_meansFW3sex, direction = "both")
```




```
null_distribution_FW3sex %>%
  get_p_value(obs_stat = obs_diff_meansFW3sex, direction = "both")
```

```
## # A tibble: 1 x 1
##   p_value
##     <dbl>
## 1   0.091
```

Check to see whether CBFW1 and Age are mediated by Education

```
modAgeFW1 <- lm(formula=Rabbit$FW1~Rabbit$Age)
summary(modAgeFW1)
```

```
##
## Call:
## lm(formula = Rabbit$FW1 ~ Rabbit$Age)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.1575 -0.1958  0.0651  0.9730  1.1802
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 4.681599   0.139537   33.55   <2e-16 ***
## Rabbit$Age  0.007675   0.003280    2.34   0.0195 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.088 on 751 degrees of freedom
## Multiple R-squared:  0.00724,    Adjusted R-squared:  0.005918
## F-statistic: 5.477 on 1 and 751 DF,  p-value: 0.01953
```

```
modAgeEduFW1 <- lm(formula=Rabbit$FW1~Rabbit$Age+Rabbit$Education)
summary(modAgeEduFW1)
```

```
##
## Call:
## lm(formula = Rabbit$FW1 ~ Rabbit$Age + Rabbit$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.4063 -0.3311  0.0890  0.9238  1.4043
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)       5.331687   0.227506  23.435  < 2e-16 ***
## Rabbit$Age        0.007499   0.003254   2.304 0.021481 *
## Rabbit$Education -0.165160   0.045867  -3.601 0.000338 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.08 on 750 degrees of freedom
## Multiple R-squared:  0.02411,    Adjusted R-squared:  0.02151
## F-statistic: 9.265 on 2 and 750 DF,  p-value: 0.0001059
```

Implications of Degrees of Belief in Free Will: Study 2

Sanyar Sohrabi

03/02/2021

Load the packages

```
if(!"pacman" %in% installed.packages()) install.packages("pacman")
library(pacman)
p_load(tidyverse, moderndive, umx, infer, lattice, Hmisc, PerformanceAnalytics, readxl, semPlot,
lavaan)
```

Change pathway to where you have saved the Excel file OR delete this chunk and import the dataset manually.

```
Imp <- read_excel("D:/ReadyToSend/Imp.xlsx")
```

Change variables into numeric and categorical.

```
Imp$Age <- as.numeric(Imp$Age)
Imp$Education <- as.numeric(Imp$Education)
Imp$FW1 <- as.numeric(Imp$FW1)
Imp$FW2 <- as.numeric(Imp$FW2)
Imp$FW3 <- as.numeric(Imp$FW3)
```

New facet label names for Sex and BillOlivia.

```
Imp$Sex <- factor(Imp$Sex, levels=c(1, 2), labels=c("Female","Male"))
```

Create the CBFW and Revised Personal Liberties scales

```
Imp$FWscale <- Imp$FW1 + Imp$FW2 + Imp$FW3
```

```
Imp$PersonalScale <- Imp$Personal1 + Imp$Personal2 + Imp$Personal3 + Imp$Personal4 + Imp$Persona
l5 + Imp$Personal6 + Imp$Personal7
```

Change Education into factors

```
Imp$CatEducation <- factor(Imp$Education, levels=c(1, 2, 3, 4, 5, 6), labels=c("Grade school","H
igh school", "Some college, no degree", "Bachelor's degree/Associate degree", "Master's degree",
"PhD"))
```

View the data

```
glimpse(Imp)
```

```
## Rows: 197
## Columns: 22
## $ Religion      <chr> "Christianity", "Christianity", "Christianity", "Chri...
## $ Sex           <fct> Female, Male, Male, Male, Male, Female, Female, Femal...
## $ Ethnicity     <chr> "Caucasian", "Caucasian", "Black/African American", "...
## $ Personal1     <dbl> 5, 4, 6, 7, 5, 5, 6, 7, 6, 1, 6, 7, 6, 6, 5, 7, 6, 7,...
## $ Personal2     <dbl> 4, 5, 7, 4, 4, 6, 6, 3, 6, 7, 6, 3, 5, 6, 6, 1, 6, 7,...
## $ Personal3     <dbl> 7, 6, 6, 7, 5, 6, 6, 4, 4, 7, 6, 7, 6, 6, 4, 2, 5, 7,...
## $ Personal4     <dbl> 4, 4, 1, 2, 2, 3, 2, 7, 6, 7, 2, 7, 3, 2, 3, 3, 2, 7,...
## $ Personal5     <dbl> 5, 6, 6, 7, 5, 4, 6, 6, 4, 7, 6, 2, 5, 6, 5, 1, 6, 7,...
## $ Personal6     <dbl> 4, 4, 6, 6, 4, 5, 6, 4, 2, 7, 6, 2, 6, 5, 4, 6, 4, 7,...
## $ Personal7     <dbl> 1, 1, 2, 3, 2, 3, 2, 3, 6, 7, 2, 7, 1, 4, 3, 2, 1, 7,...
## $ Time          <dbl> 125, 156, 189, 230, 256, 257, 338, 352, 410, 431, 481...
## $ Age           <dbl> 28, 28, 34, 44, 37, 43, 35, 39, 38, 38, 30, 67, 30, 3...
## $ Education     <dbl> 4, 5, 4, 4, 4, 4, 5, 3, 5, 3, 5, 4, 5, 4, 4, 4, 4, 4,...
## $ Donate        <dbl> 7, 7, 7, 1, 7, 7, 7, 1, 1, 1, 7, 4, 7, 7, 3, 3, 4, 1,...
## $ Cheat         <dbl> 4, 5, 5, 1, 6, 6, 5, 2, 2, 5, 5, 5, 5, 5, 2, 6, 5, 6,...
## $ Incarceration <dbl> 2, 1, 1, 2, 2, 1, 2, 0, -2, 2, 2, 2, 2, 2, 1, 2, 1, 1...
## $ FW1           <dbl> 4, 5, 5, 6, 5, 4, 6, 6, 2, 1, 5, 5, 6, 5, 4, 6, 4, 6,...
## $ FW2           <dbl> 6, 3, 5, 5, 4, 4, 5, 6, 5, 6, 5, 6, 5, 5, 3, 6, 5, 6,...
## $ FW3           <dbl> 4, 6, 5, 5, 4, 5, 6, 6, 5, 6, 5, 6, 5, 5, 4, 6, 4, 6,...
## $ FWscale       <dbl> 14, 14, 15, 16, 13, 13, 17, 18, 12, 13, 15, 17, 16, 1...
## $ PersonalScale <dbl> 30, 30, 34, 36, 27, 32, 34, 34, 34, 43, 34, 35, 32, 3...
## $ CatEducation  <fct> "Bachelor's degree/Associate degree", "Master's degre...
```

Check to see if there is missing observations.

```
colSums(is.na(Imp))
```

```
##      Religion           Sex     Ethnicity     Personal1     Personal2
##             0             0             0             0             0
##     Personal3     Personal4     Personal5     Personal6     Personal7
##             0             0             0             0             0
##          Time           Age     Education        Donate         Cheat
##             0             0             0             0             0
## Incarceration           FW1           FW2           FW3       FWscale
##             0             0             0             0             0
## PersonalScale  CatEducation
##             0             0
```

Get demographic information

```
Imp %>%
    expss::tab_cells(Education, Age, Time) %>%
    expss::tab_cols(expss::total()) %>%
    expss::tab_stat_mean_sd_n() %>%
    expss::tab_last_sig_means(subtable_marks = "both") %>%
    expss::tab_pivot() %>%
    expss::set_caption("Demographic Information")
```

```
## Registered S3 methods overwritten by 'expss':
##   method                 from
##   [.labelled             Hmisc
##   as.data.frame.labelled base
##   print.labelled         Hmisc
```

Demographic Information

	#Total
Education	
Mean	3.8
Std. dev.	0.8
Unw. valid N	197.0
Age	
Mean	37.4
Std. dev.	9.7
Unw. valid N	197.0
Time	
Mean	498.4
Std. dev.	564.6
Unw. valid N	197.0

```
ObsTableEthnicity <- with(Imp, table(Sex, Ethnicity))
prop.table(ObsTableEthnicity, margin = 1)*100
```

```
##         Ethnicity
## Sex      Asian/Asian Indian Black/African American Caucasian
##   Female           2.409639               9.638554 83.132530
##   Male             3.508772              12.280702 78.947368
##         Ethnicity
## Sex      Hispanic/Latino/Spanish Mixed Race
##   Female                2.409639   2.409639
##   Male                  3.508772   1.754386
```

```
ObsTableReligion <- with(Imp, table(Sex, Religion))
prop.table(ObsTableReligion, margin = 1)*100
```

```
##         Religion
## Sex       Buddhism Christianity  Hinduism     Islam   Judaism
##   Female  0.000000    60.240964  1.204819  1.204819  1.204819
##   Male    3.508772    63.157895  0.000000  0.000000  0.000000
##         Religion
## Sex      No religion/Agnosticism No religion/Atheism Not listed/Other
##   Female               15.662651           12.048193         7.228916
##   Male                 14.912281           16.666667         0.877193
##         Religion
## Sex      Prefer not to say Taoism/Confucianism
##   Female          0.000000            1.204819
##   Male            0.877193            0.000000
```

```
table(Imp$Sex, Imp$Education)
```

```
##
##           1  2  3  4  5
##   Female  1  7  7 50 18
##   Male    1  9 23 65 16
```

```
table(Imp$Sex, Imp$Religion)
```

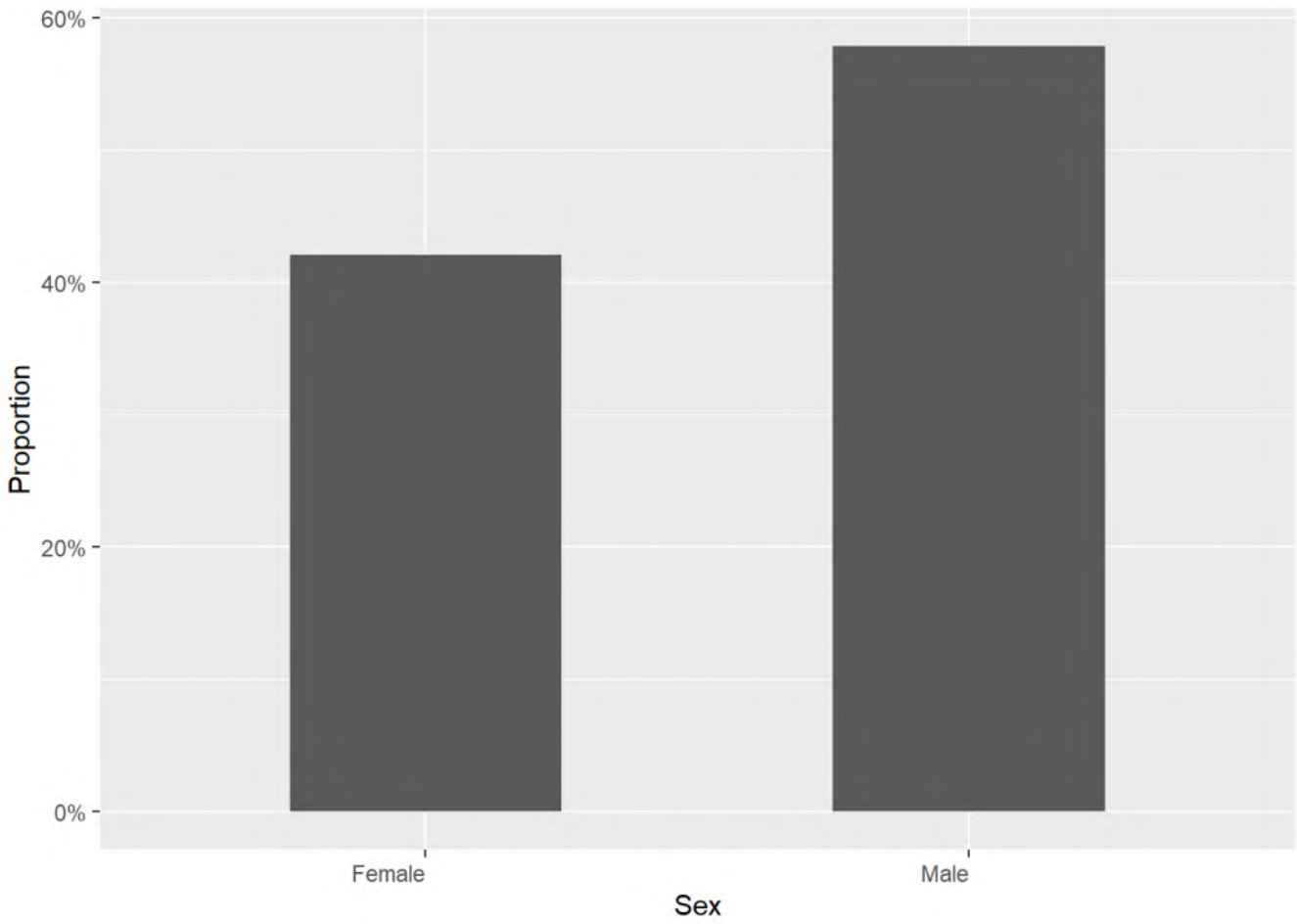
```
##
##          Buddhism Christianity Hinduism Islam Judaism No religion/Agnosticism
##   Female        0           50        1     1       1                      13
##   Male          4           72        0     0       0                      17
##
##          No religion/Atheism Not listed/Other Prefer not to say
##   Female                  10                6                 0
##   Male                    19                1                 1
##
##          Taoism/Confucianism
##   Female                   1
##   Male                     0
```

```
table(Imp$Sex, Imp$Ethnicity)
```

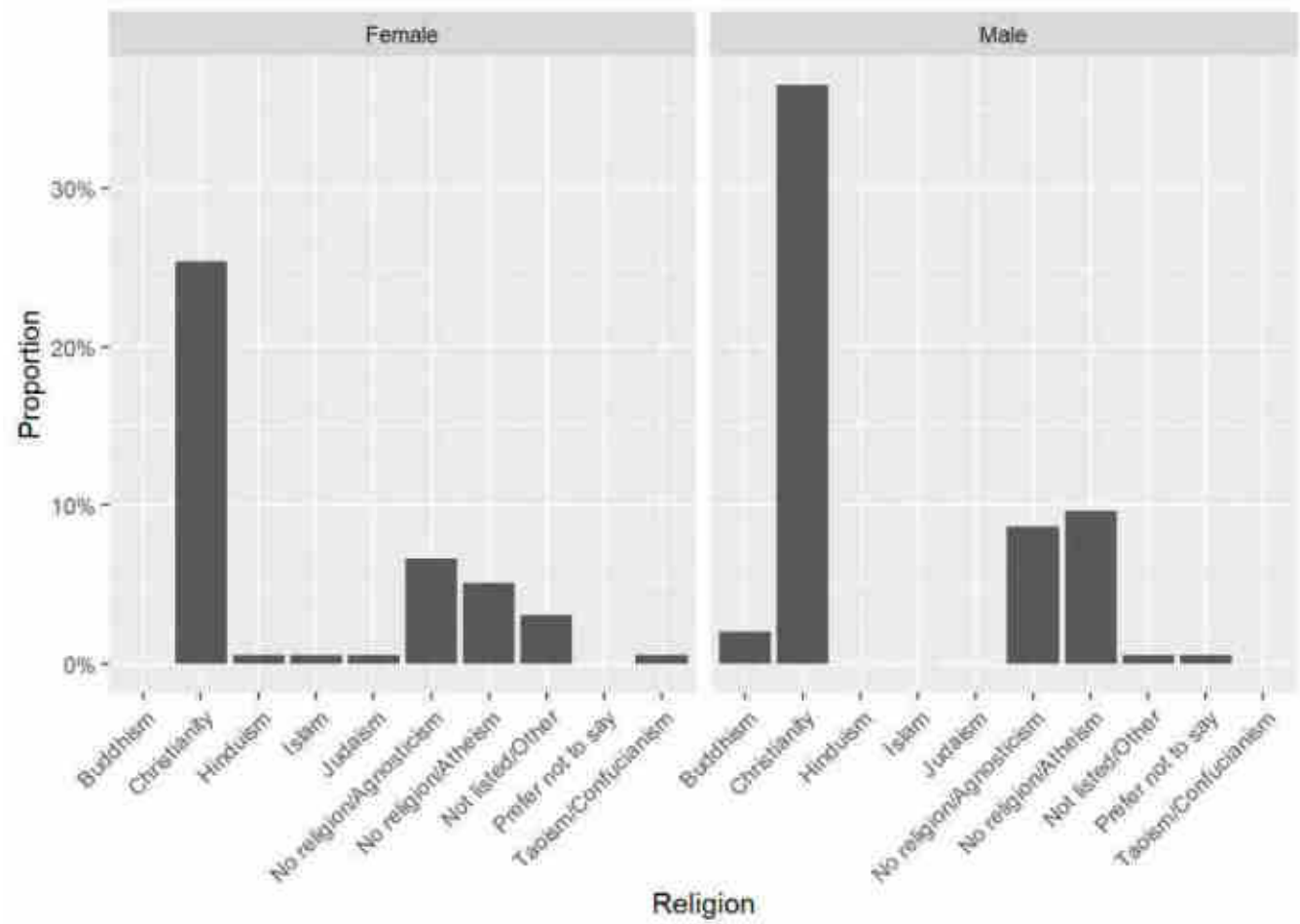
```
##
##          Asian/Asian Indian Black/African American Caucasian
##   Female                  2                      8        69
##   Male                    4                     14        90
##
##          Hispanic/Latino/Spanish Mixed Race
##   Female                       2          2
##   Male                         4          2
```

##Demographic visualization

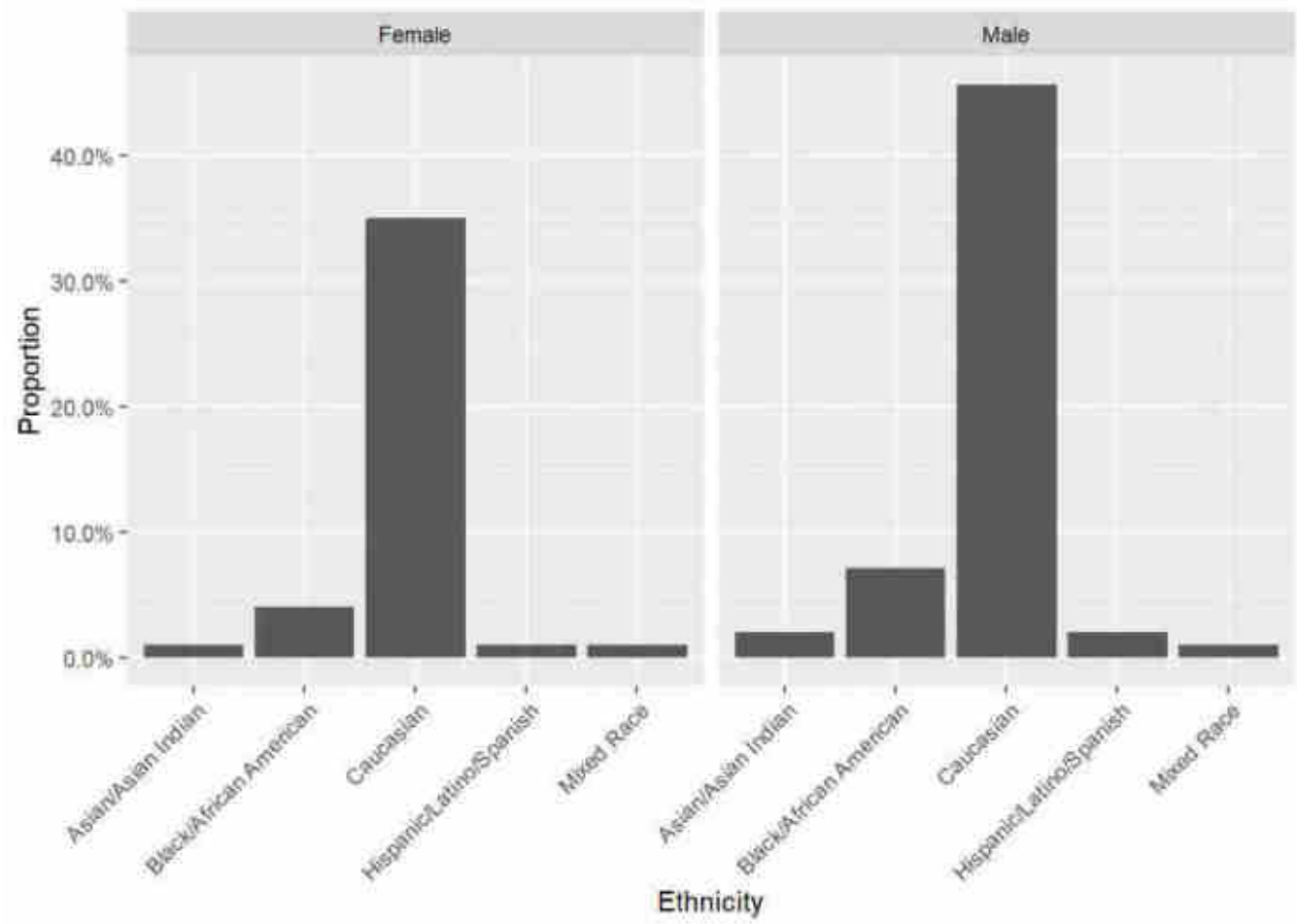
```
ggplot(Imp, aes(x = (Sex))) +
        geom_bar(aes(y = (..count..)/sum(..count..)), width = 0.5) +
        xlab("Sex") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        theme(axis.text.x = element_text(angle = 0, hjust = 1))
```



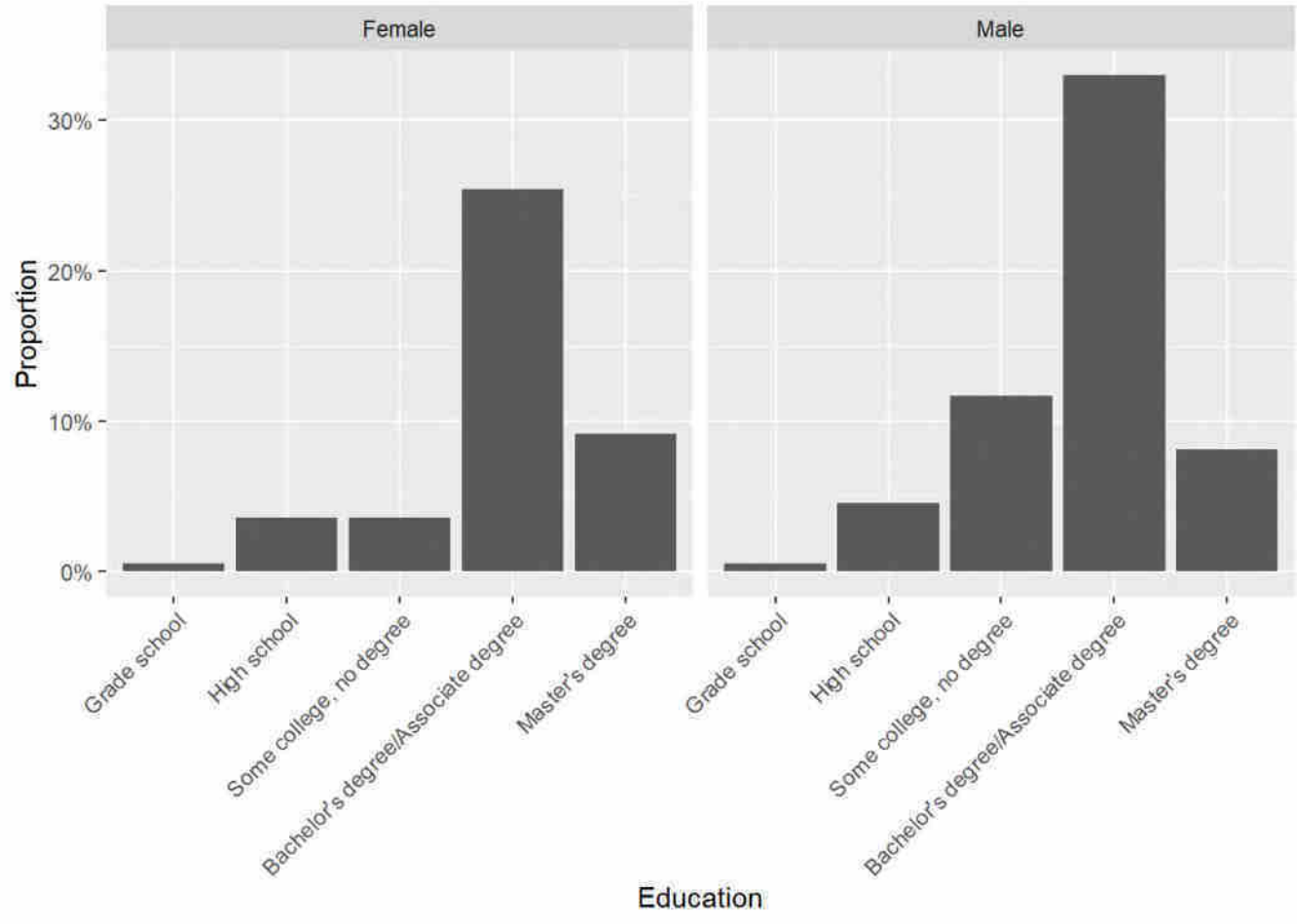

```
ggplot(Imp, aes(x = (Religion))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Religion") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~ Sex) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```




```
ggplot(Imp, aes(x = (Ethnicity))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Ethnicity") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~ Sex) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```




```
ggplot(Imp, aes(x = (CatEducation))) +
        geom_bar(aes(y = (..count..)/sum(..count..))) +
        xlab("Education") +
        scale_y_continuous(labels = scales::percent, name = "Proportion") +
        facet_grid(~Sex) +
        theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



Create the CBFW and Revised Personal Liberties data frames

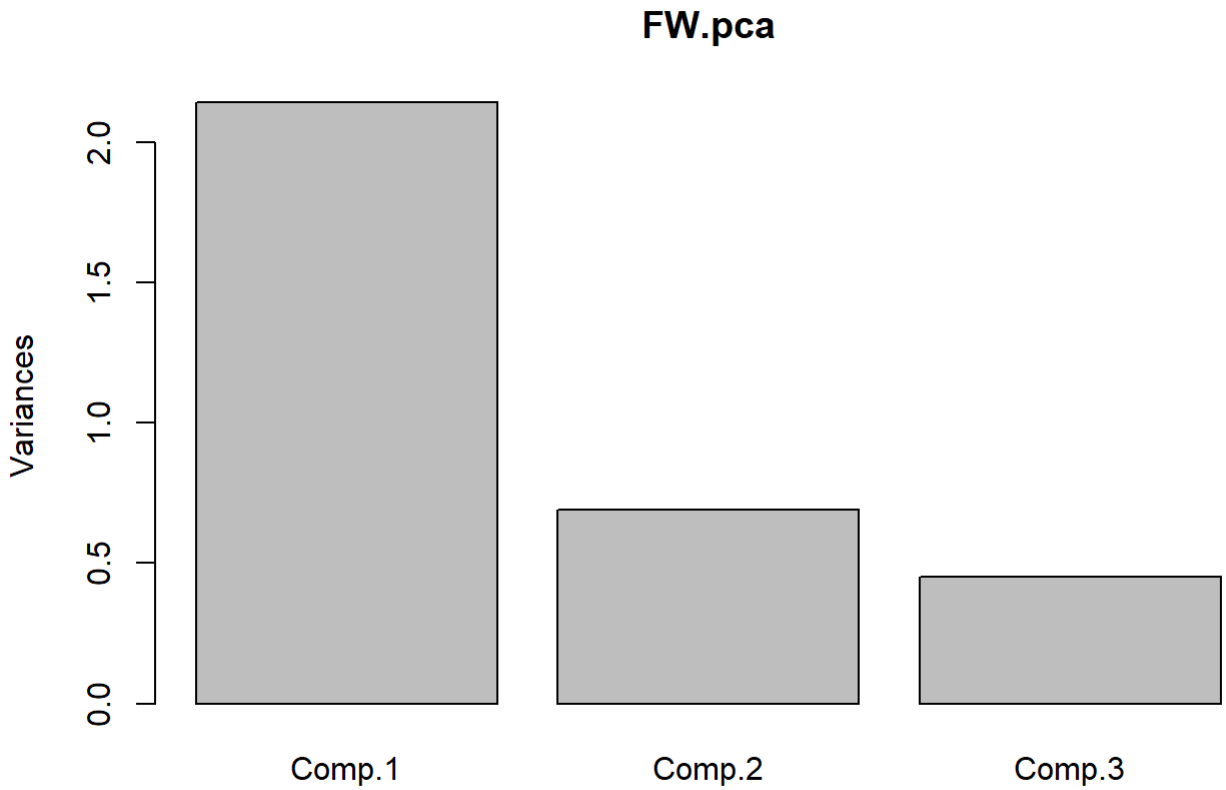
```
FW.data <- data.frame(Imp$FW1, Imp$FW2, Imp$FW3)
Personal.data <- data.frame(Imp$Personal1, Imp$Personal2, Imp$Personal3, Imp$Personal4, Imp$Pers
onal5, Imp$Personal6, Imp$Personal7)
```

Plot the principle component analysis and factor analysis for the CBFW and Revised Personal Liberties scales

```
FW.pca <- princomp(FW.data)
summary(FW.pca)
```

```
## Importance of components:
##                           Comp.1    Comp.2    Comp.3
## Standard deviation     1.463466 0.8311799 0.6725054
## Proportion of Variance 0.652002 0.2103167 0.1376814
## Cumulative Proportion  0.652002 0.8623186 1.0000000
```

```
plot(FW.pca)
```



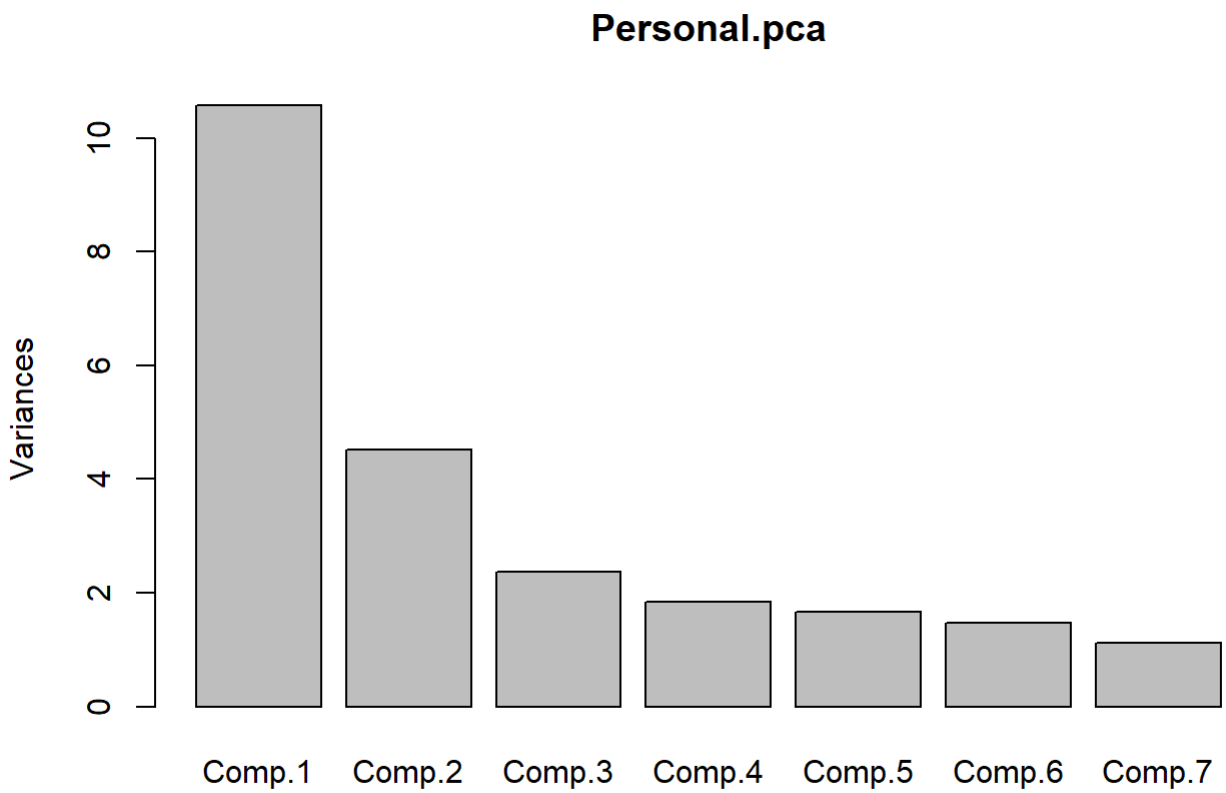

```
FW.pca.fa <- factanal(FW.data, factors=1, rotation="varimax")
FW.pca.fa
```

```
##
## Call:
## factanal(x = FW.data, factors = 1, rotation = "varimax")
##
## Uniquenesses:
## Imp.FW1 Imp.FW2 Imp.FW3
##   0.640   0.391   0.510
##
## Loadings:
##         Factor1
## Imp.FW1 0.600
## Imp.FW2 0.781
## Imp.FW3 0.700
##
##                Factor1
## SS loadings      1.460
## Proportion Var   0.487
##
## The degrees of freedom for the model is 0 and the fit was 0
```

```
Personal.pca <- princomp(Personal.data)
summary(Personal.pca)
```

```
## Importance of components:
##                           Comp.1    Comp.2    Comp.3     Comp.4     Comp.5
## Standard deviation     3.2523352 2.1241316 1.5387441 1.35710339 1.29424490
## Proportion of Variance 0.4487177 0.1914015 0.1004420 0.07812831 0.07105841
## Cumulative Proportion  0.4487177 0.6401192 0.7405612 0.81868950 0.88974791
##                            Comp.6    Comp.7
## Standard deviation     1.21527460 1.0592901
## Proportion of Variance 0.06265149 0.0476006
## Cumulative Proportion  0.95239940 1.0000000
```

```
plot(Personal.pca)
```




```
Personal.pca.fa <- factanal(Personal.data, factors=1, rotation="varimax")
Personal.pca.fa
```

```
##
## Call:
## factanal(x = Personal.data, factors = 1, rotation = "varimax")
##
## Uniquenesses:
## Imp.Personal1 Imp.Personal2 Imp.Personal3 Imp.Personal4 Imp.Personal5
##         0.740         0.557         0.703         0.611         0.842
## Imp.Personal6 Imp.Personal7
##         0.605         0.624
##
## Loadings:
##               Factor1
## Imp.Personal1 0.510
## Imp.Personal2 0.665
## Imp.Personal3 0.545
## Imp.Personal4 0.624
## Imp.Personal5 0.398
## Imp.Personal6 0.628
## Imp.Personal7 0.613
##
##                Factor1
## SS loadings      2.318
## Proportion Var   0.331
##
## Test of the hypothesis that 1 factor is sufficient.
## The chi square statistic is 110.51 on 14 degrees of freedom.
## The p-value is 4.46e-17
```

Observe the reliability of the CBFW and Revised Personal Liberties scales

```
FW.Mat <- data.matrix(FW.data)
reliability(cov(FW.Mat))
```

```
## Alpha reliability =  0.7295
## Standardized alpha =  0.7334
##
## Reliability deleting each item in turn:
##          Alpha Std.Alpha r(item, total)
## Imp.FW1 0.7066    0.7068         0.5056
## Imp.FW2 0.5878    0.5917         0.5984
## Imp.FW3 0.6355    0.6378         0.5601
```

```
Personal.Mat <- data.matrix(Personal.data)
reliability(cov(Personal.Mat))
```

```
## Alpha reliability =  0.7703
## Standardized alpha =  0.769
##
## Reliability deleting each item in turn:
##                Alpha Std.Alpha r(item, total)
## Imp.Personal1 0.7514    0.7483         0.4463
## Imp.Personal2 0.7221    0.7199         0.5817
## Imp.Personal3 0.7463    0.7435         0.4718
## Imp.Personal4 0.7315    0.7353         0.5387
## Imp.Personal5 0.7690    0.7692         0.3409
## Imp.Personal6 0.7300    0.7256         0.5453
## Imp.Personal7 0.7366    0.7384         0.5185
```

Pearson Correlation

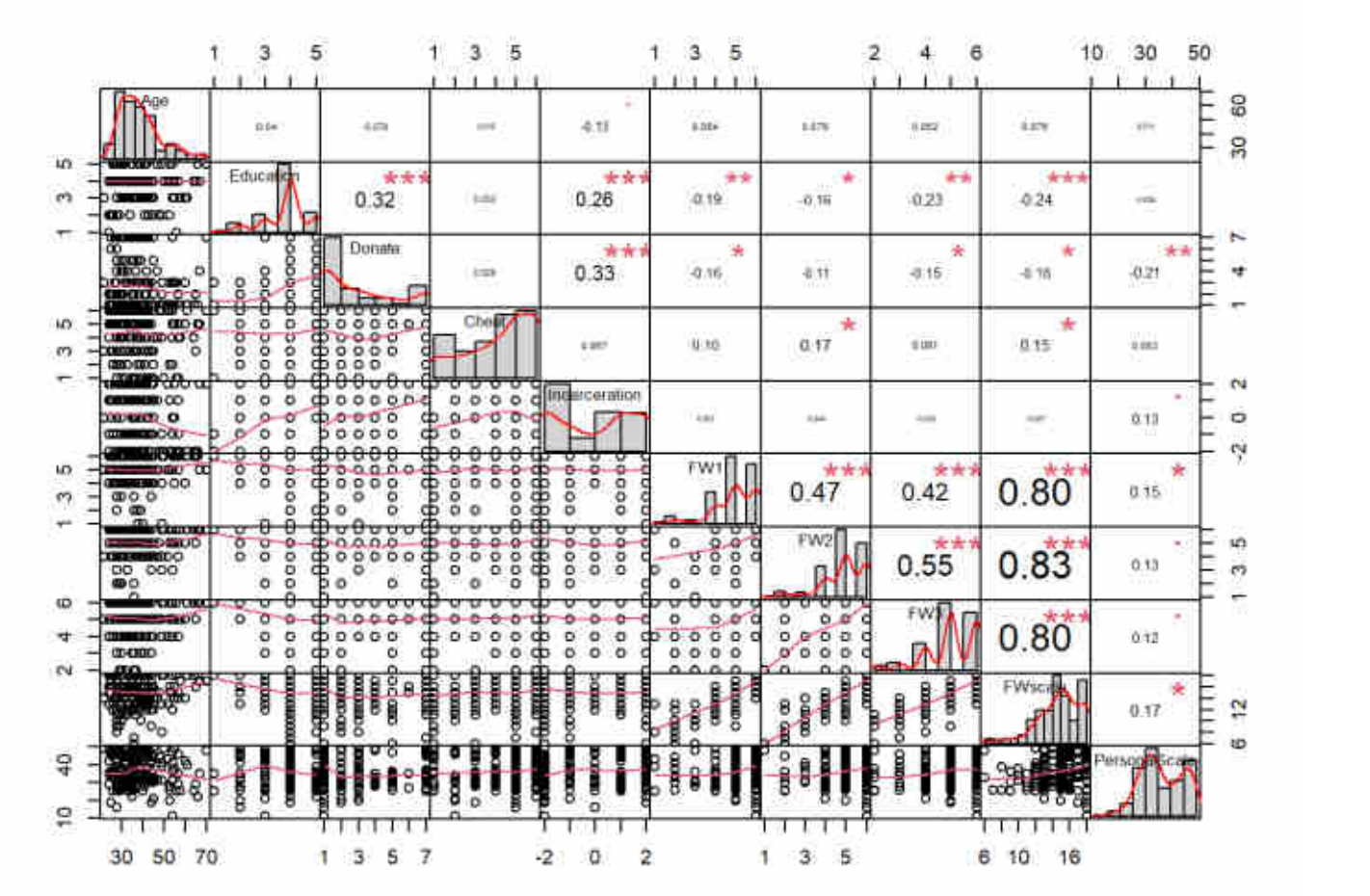
```
Cor_Hmisc=rcorr(as.matrix(Imp[,12:21]), type="pearson")
Cor_Hmisc
```

```
##                 Age Education Donate Cheat Incarceration   FW1   FW2   FW3
## Age            1.00     -0.04  -0.08 -0.02         -0.13  0.05  0.08  0.05
## Education     -0.04      1.00   0.32  0.03          0.26 -0.19 -0.16 -0.23
## Donate        -0.08      0.32   1.00  0.03          0.33 -0.16 -0.11 -0.15
## Cheat         -0.02      0.03   0.03  1.00          0.07  0.10  0.17  0.09
## Incarceration -0.13      0.26   0.33  0.07          1.00  0.01 -0.04 -0.03
## FW1            0.05     -0.19  -0.16  0.10          0.01  1.00  0.47  0.42
## FW2            0.08     -0.16  -0.11  0.17         -0.04  0.47  1.00  0.55
## FW3            0.05     -0.23  -0.15  0.09         -0.03  0.42  0.55  1.00
## FWscale        0.08     -0.24  -0.18  0.15         -0.03  0.80  0.83  0.80
## PersonalScale -0.01     -0.04  -0.21  0.08          0.13  0.15  0.13  0.12
##               FWscale PersonalScale
## Age              0.08         -0.01
## Education       -0.24         -0.04
## Donate          -0.18         -0.21
## Cheat            0.15          0.08
## Incarceration   -0.03          0.13
## FW1              0.80          0.15
## FW2              0.83          0.13
## FW3              0.80          0.12
## FWscale          1.00          0.17
## PersonalScale    0.17          1.00
##
## n= 197
##
##
## P
##               Age    Education Donate Cheat  Incarceration FW1    FW2    FW3
## Age                  0.5760    0.2673 0.7930 0.0589        0.4501 0.2702 0.4687
## Education     0.5760           0.0000 0.6442 0.0002        0.0071 0.0223 0.0011
## Donate        0.2673 0.0000           0.6924 0.0000        0.0216 0.1126 0.0342
## Cheat         0.7930 0.6442    0.6924        0.3500        0.1601 0.0156 0.2044
## Incarceration 0.0589 0.0002    0.0000 0.3500               0.9225 0.5410 0.6451
## FW1           0.4501 0.0071    0.0216 0.1601 0.9225               0.0000 0.0000
## FW2           0.2702 0.0223    0.1126 0.0156 0.5410        0.0000        0.0000
## FW3           0.4687 0.0011    0.0342 0.2044 0.6451        0.0000 0.0000
## FWscale       0.2872 0.0006    0.0125 0.0359 0.7024        0.0000 0.0000 0.0000
## PersonalScale 0.8824 0.6219    0.0037 0.2520 0.0620        0.0310 0.0615 0.0806
##               FWscale PersonalScale
## Age           0.2872  0.8824
## Education     0.0006  0.6219
## Donate        0.0125  0.0037
## Cheat         0.0359  0.2520
## Incarceration 0.7024  0.0620
## FW1           0.0000  0.0310
## FW2           0.0000  0.0615
## FW3           0.0000  0.0806
## FWscale               0.0162
## PersonalScale 0.0162
```

```
Cor_Hmisc=rcorr(as.matrix(Imp[,12:21]), type="spearman")
Cor_Hmisc
```

```
##                 Age Education Donate Cheat Incarceration   FW1   FW2   FW3
## Age            1.00     -0.06  -0.06 -0.03         -0.10  0.03  0.00 -0.01
## Education     -0.06      1.00   0.33  0.03          0.22 -0.19 -0.17 -0.24
## Donate        -0.06      0.33   1.00 -0.05          0.31 -0.28 -0.19 -0.20
## Cheat         -0.03      0.03  -0.05  1.00          0.03  0.08  0.13  0.12
## Incarceration -0.10      0.22   0.31  0.03          1.00 -0.05 -0.07 -0.07
## FW1            0.03     -0.19  -0.28  0.08         -0.05  1.00  0.50  0.51
## FW2            0.00     -0.17  -0.19  0.13         -0.07  0.50  1.00  0.56
## FW3           -0.01     -0.24  -0.20  0.12         -0.07  0.51  0.56  1.00
## FWscale        0.01     -0.23  -0.27  0.14         -0.07  0.84  0.80  0.78
## PersonalScale  0.06     -0.08  -0.25  0.08          0.15  0.20  0.17  0.14
##               FWscale PersonalScale
## Age              0.01          0.06
## Education       -0.23         -0.08
## Donate          -0.27         -0.25
## Cheat            0.14          0.08
## Incarceration   -0.07          0.15
## FW1              0.84          0.20
## FW2              0.80          0.17
## FW3              0.78          0.14
## FWscale          1.00          0.20
## PersonalScale    0.20          1.00
##
## n= 197
##
##
## P
##               Age    Education Donate Cheat  Incarceration FW1    FW2    FW3
## Age                  0.3719    0.3922 0.6271 0.1720        0.6705 0.9937 0.8615
## Education     0.3719           0.0000 0.6913 0.0015        0.0077 0.0178 0.0008
## Donate        0.3922 0.0000           0.5025 0.0000        0.0000 0.0085 0.0058
## Cheat         0.6271 0.6913    0.5025        0.6539        0.2900 0.0636 0.1042
## Incarceration 0.1720 0.0015    0.0000 0.6539               0.5031 0.3356 0.3078
## FW1           0.6705 0.0077    0.0000 0.2900 0.5031               0.0000 0.0000
## FW2           0.9937 0.0178    0.0085 0.0636 0.3356        0.0000        0.0000
## FW3           0.8615 0.0008    0.0058 0.1042 0.3078        0.0000 0.0000
## FWscale       0.9361 0.0011    0.0001 0.0566 0.3197        0.0000 0.0000 0.0000
## PersonalScale 0.3920 0.2703    0.0004 0.2624 0.0378        0.0041 0.0179 0.0550
##               FWscale PersonalScale
## Age           0.9361  0.3920
## Education     0.0011  0.2703
## Donate        0.0001  0.0004
## Cheat         0.0566  0.2624
## Incarceration 0.3197  0.0378
## FW1           0.0000  0.0041
## FW2           0.0000  0.0179
## FW3           0.0000  0.0550
## FWscale               0.0046
## PersonalScale 0.0046
```

```
my_data <- Imp[, c(12:21)]
chart.Correlation(my_data, histogram=TRUE, pch=1)
```



ANCOVA

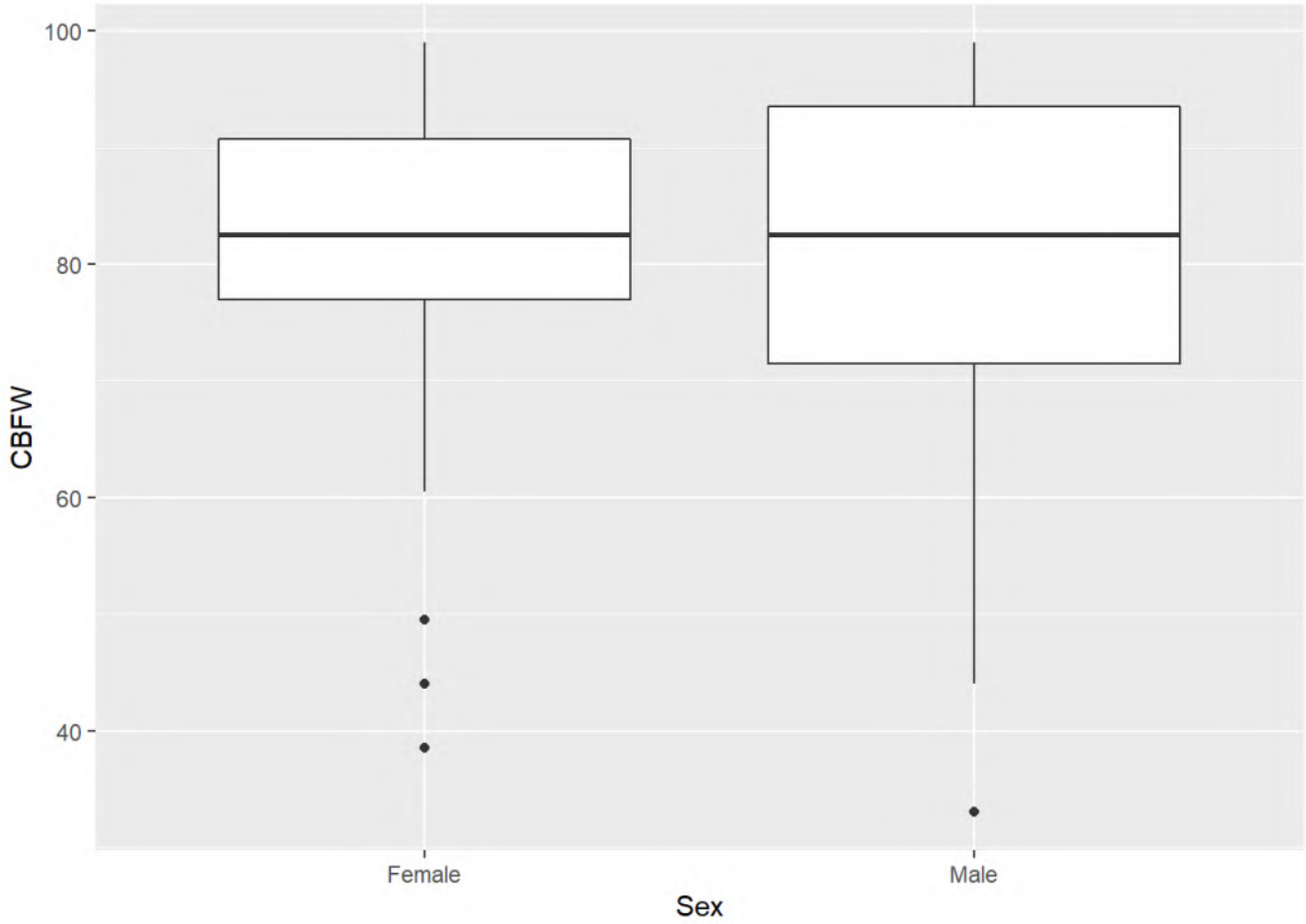
```
Imp_scores_factorial<- aov(FWscale~Education + Age + Time + Sex, data=Imp)
broom::tidy(Imp_scores_factorial)
```

```
## # A tibble: 5 x 6
##   term         df   sumsq meansq statistic   p.value
##   <chr>     <dbl>   <dbl>  <dbl>     <dbl>     <dbl>
## 1 Education     1   73.3   73.3     12.0    0.000659
## 2 Age           1    5.59   5.59     0.915  0.340
## 3 Time          1    3.78   3.78     0.618  0.433
## 4 Sex           1    4.29   4.29     0.702  0.403
## 5 Residuals   192 1173.     6.11    NA     NA
```

```
DescTools::EtaSq(Imp_scores_factorial)
```

```
##                eta.sq eta.sq.part
## Education 0.057385988 0.058059062
## Age       0.003984604 0.004261582
## Time      0.003672325 0.003928908
## Sex       0.003405010 0.003643958
```

```
ggplot(Imp, aes(x=Sex, y=FWscale*5.5)) + geom_boxplot() + ylab("CBFW")
```



MANCOVA

```
Imp_MANCOVA <- jmv::mancova(data=Imp, deps= vars(FW1,FW2,FW3), factors= c(Sex), covs=c(Age,Educa
tion,Time), boxM= TRUE, multivar = list("pillai", "wilks", "hotel", "roy"))
Imp_MANCOVA
```

```
##
##  MANCOVA
##
##  Multivariate Tests
##  ---------------------------------------------------------------------------------------
##                                      value          F            df1    df2    p
##  ---------------------------------------------------------------------------------------
##    Sex          Pillai's Trace        0.029130018    1.9002556      3    190    0.1309743
##                 Wilks' Lambda           0.9708700    1.9002556      3    190    0.1309743
##                 Hotelling's Trace     0.030004036    1.9002556      3    190    0.1309743
##                 Roy's Largest Root    0.030004036    1.9002556      3    190    0.1309743
##
##    Age          Pillai's Trace        0.006466413    0.4122050      3    190    0.7444211
##                 Wilks' Lambda           0.9935336    0.4122050      3    190    0.7444211
##                 Hotelling's Trace     0.006508500    0.4122050      3    190    0.7444211
##                 Roy's Largest Root    0.006508500    0.4122050      3    190    0.7444211
##
##    Education    Pillai's Trace        0.064196345    4.3446812      3    190    0.0054852
##                 Wilks' Lambda           0.9358037    4.3446812      3    190    0.0054852
##                 Hotelling's Trace     0.068600229    4.3446812      3    190    0.0054852
##                 Roy's Largest Root    0.068600229    4.3446812      3    190    0.0054852
##
##    Time         Pillai's Trace        0.015011736    0.9652331      3    190    0.4102760
##                 Wilks' Lambda           0.9849883    0.9652331      3    190    0.4102760
##                 Hotelling's Trace     0.015240523    0.9652331      3    190    0.4102760
##                 Roy's Largest Root    0.015240523    0.9652331      3    190    0.4102760
##  ---------------------------------------------------------------------------------------
##
##
##  Univariate Tests
##  ------------------------------------------------------------------------------------------
-------------
##                 Dependent Variable    Sum of Squares    df     Mean Square     F
p
##  ------------------------------------------------------------------------------------------
-------------
##    Sex          FW1                     0.487232929      1     0.487232929     0.387240534
0.5344918
##                 FW2                     2.895004544      1     2.895004544     2.867981007
0.0919799
##                 FW3                     0.006972051      1     0.006972051     0.007512172
0.9310219
##    Age          FW1                     0.791220209      1     0.791220209     0.628842013
0.4287592
##                 FW2                     1.114591017      1     1.114591017     1.104186822
0.2946699
##                 FW3                     0.510674064      1     0.510674064     0.550235722
0.4591278
##    Education    FW1                     8.662528413      1     8.662528413     6.884760713
0.0093924
##                 FW2                     6.093020122      1     6.093020122     6.036144581
0.0149039
##                 FW3                    10.187521687      1    10.187521687    10.976743767
```

```
0.0011026
##    Time         FW1                      0.014197587      1     0.014197587     0.011283886
0.9155142
##                 FW2                      0.677097778      1     0.677097778     0.670777382
0.4137961
##                 FW3                      2.094454651      1     2.094454651     2.256710978
0.1346792
##    Residuals    FW1                    241.577815787    192     1.258217791
##                 FW2                    193.809119026    192     1.009422495
##                 FW3                    178.195301405    192     0.928100528
##  ---------------------------------------------------------------------------------------------
-------------
##
##
##  ASSUMPTION CHECKS
##
##  Box's Homogeneity of Covariance Matrices Test
##  ---------------------------------------------
##    <U+03C7>²          df    p
##  ---------------------------------------------
##    9.613999     6    0.1418770
##  ---------------------------------------------
```

#Mediation Model

##Donation model

###Donate + FW1

```
modD1 <- lm(formula=Imp$Donate~Imp$FW1)
summary(modD1)
```

```
##
## Call:
## lm(formula = Imp$Donate ~ Imp$FW1)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -3.098 -1.494 -0.815  1.185  4.506
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.4186     0.6981   6.330 1.65e-09 ***
## Imp$FW1      -0.3207     0.1385  -2.317   0.0216 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.196 on 195 degrees of freedom
## Multiple R-squared:  0.02678,    Adjusted R-squared:  0.02179
## F-statistic: 5.366 on 1 and 195 DF,  p-value: 0.02157
```

```
modD1A <- lm(formula=Imp$Donate~Imp$FW1 + Imp$Education)
summary(modD1A)
```

```
##
## Call:
## lm(formula = Imp$Donate ~ Imp$FW1 + Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.3773 -1.7543 -0.7543  1.0383  5.0392
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.8245     1.0562   0.781    0.436
## Imp$FW1        -0.2074     0.1349  -1.537    0.126
## Imp$Education   0.7935     0.1807   4.391 1.85e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.1 on 194 degrees of freedom
## Multiple R-squared:  0.1148, Adjusted R-squared:  0.1056
## F-statistic: 12.58 on 2 and 194 DF,  p-value: 7.319e-06
```

###Donate + FW2

```
modD2 <- lm(formula=Imp$Donate~Imp$FW2)
summary(modD2)
```

```
##
## Call:
## lm(formula = Imp$Donate ~ Imp$FW2)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.8171 -1.8314 -0.8314  1.1686  4.4150
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.0635     0.7820   5.196 5.11e-07 ***
## Imp$FW2      -0.2464     0.1546  -1.594    0.113
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.212 on 195 degrees of freedom
## Multiple R-squared:  0.01286,    Adjusted R-squared:  0.007797
## F-statistic:  2.54 on 1 and 195 DF,  p-value: 0.1126
```

```
modD2A <- lm(formula=Imp$Donate~Imp$FW2 + Imp$Education)
summary(modD2A)
```

```
##
## Call:
## lm(formula = Imp$Donate ~ Imp$FW2 + Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.9339 -1.8419 -0.7979  1.1581  4.9780
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.3781     1.1016   0.343    0.732
## Imp$FW2        -0.1360     0.1494  -0.911    0.364
## Imp$Education   0.8200     0.1805   4.543 9.71e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.108 on 194 degrees of freedom
## Multiple R-squared:  0.1078, Adjusted R-squared:  0.0986
## F-statistic: 11.72 on 2 and 194 DF,  p-value: 1.567e-05
```

###Donate + FW3

```
modD3 <- lm(formula=Imp$Donate~Imp$FW3)
summary(modD3)
```

```
##
## Call:
## lm(formula = Imp$Donate ~ Imp$FW3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.8629 -1.8444 -0.8444  1.1556  4.4951
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.5419     0.8122   5.592 7.49e-08 ***
## Imp$FW3      -0.3395     0.1592  -2.132   0.0342 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.2 on 195 degrees of freedom
## Multiple R-squared:  0.02279,    Adjusted R-squared:  0.01777
## F-statistic: 4.547 on 1 and 195 DF,  p-value: 0.03423
```

```
modD3A <- lm(formula=Imp$Donate~Imp$FW3 + Imp$Education)
summary(modD3A)
```

```
##
## Call:
## lm(formula = Imp$Donate ~ Imp$FW3 + Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.9604 -1.7997 -0.7789  1.2003  4.9980
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.6980     1.1745   0.594    0.553
## Imp$FW3        -0.1815     0.1566  -1.159    0.248
## Imp$Education   0.7977     0.1828   4.364 2.07e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.105 on 194 degrees of freedom
## Multiple R-squared:  0.1101, Adjusted R-squared:  0.101
## F-statistic: 12.01 on 2 and 194 DF,  p-value: 1.213e-05
```

Cheat model

###Cheat + FW1

```
modC1 <- lm(formula=Imp$Cheat~Imp$FW1)
summary(modC1)
```

```
##
## Call:
## lm(formula = Imp$Cheat ~ Imp$FW1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.4215 -1.2765  0.5785  1.5785  2.3038
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.5512     0.5186   6.847 9.56e-11 ***
## Imp$FW1       0.1451     0.1029   1.410     0.16
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.631 on 195 degrees of freedom
## Multiple R-squared:  0.0101, Adjusted R-squared:  0.005019
## F-statistic: 1.989 on 1 and 195 DF,  p-value: 0.1601
```

```
modC1A <- lm(formula=Imp$Cheat~Imp$FW1 + Imp$Education)
summary(modC1A)
```

```
##
## Call:
## lm(formula = Imp$Cheat ~ Imp$FW1 + Imp$Education)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -3.456 -1.246  0.544  1.544  2.239
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)     3.0752     0.8216   3.743 0.000239 ***
## Imp$FW1         0.1601     0.1049   1.526 0.128720
## Imp$Education   0.1051     0.1406   0.748 0.455594
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.633 on 194 degrees of freedom
## Multiple R-squared:  0.01294,    Adjusted R-squared:  0.002764
## F-statistic: 1.272 on 2 and 194 DF,  p-value: 0.2827
```

###Cheat + FW2

```
modC2 <- lm(formula=Imp$Cheat~Imp$FW2)
summary(modC2)
```

```
##
## Call:
## lm(formula = Imp$Cheat ~ Imp$FW2)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.5521 -1.0010  0.4479  1.4479  2.2746
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.8988     0.5712   5.075    9e-07 ***
## Imp$FW2       0.2756     0.1129   2.440   0.0156 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.615 on 195 degrees of freedom
## Multiple R-squared:  0.02963,    Adjusted R-squared:  0.02465
## F-statistic: 5.954 on 1 and 195 DF,  p-value: 0.01557
```

```
modC2A <- lm(formula=Imp$Cheat~Imp$FW2 + Imp$Education)
summary(modC2A)
```

```
##
## Call:
## lm(formula = Imp$Cheat ~ Imp$FW2 + Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.5902 -1.0554  0.5313  1.4098  2.1641
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)     2.3529     0.8446   2.786  0.00587 **
## Imp$FW2         0.2919     0.1145   2.549  0.01158 *
## Imp$Education   0.1214     0.1384   0.878  0.38122
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.616 on 194 degrees of freedom
## Multiple R-squared:  0.03347,    Adjusted R-squared:  0.0235
## F-statistic: 3.359 on 2 and 194 DF,  p-value: 0.03681
```

###Cheat + FW3

```
modC3 <- lm(formula=Imp$Cheat~Imp$FW3)
summary(modC3)
```

```
##
## Call:
## lm(formula = Imp$Cheat ~ Imp$FW3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.4137 -1.2632  0.5863  1.5863  2.1882
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.5109     0.6027   5.825 2.32e-08 ***
## Imp$FW3       0.1505     0.1182   1.273    0.204
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.633 on 195 degrees of freedom
## Multiple R-squared:  0.008247,   Adjusted R-squared:  0.003161
## F-statistic: 1.621 on 1 and 195 DF,  p-value: 0.2044
```

```
modC3A <- lm(formula=Imp$Cheat~Imp$FW3 + Imp$Education)
summary(modC3A)
```

```
##
## Call:
## lm(formula = Imp$Cheat ~ Imp$FW3 + Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.4545 -1.2334  0.6073  1.5455  2.1731
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)     2.9781     0.9120   3.266  0.00129 **
## Imp$FW3         0.1724     0.1216   1.418  0.15787
## Imp$Education   0.1106     0.1419   0.779  0.43689
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.635 on 194 degrees of freedom
## Multiple R-squared:  0.01134,    Adjusted R-squared:  0.001147
## F-statistic: 1.113 on 2 and 194 DF,  p-value: 0.3308
```

Personal Liberties model

###Personal + FW1

```
modP1 <- lm(formula=Imp$PersonalScale~Imp$FW1)
summary(modP1)
```

```
##
## Call:
## lm(formula = Imp$PersonalScale ~ Imp$FW1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -26.586  -6.187  -1.453   7.414  13.813
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  30.7871     2.6300  11.706   <2e-16 ***
## Imp$FW1       1.1332     0.5216   2.172    0.031 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.273 on 195 degrees of freedom
## Multiple R-squared:  0.02363,    Adjusted R-squared:  0.01862
## F-statistic:  4.72 on 1 and 195 DF,  p-value: 0.03103
```

```
modP1A <- lm(formula=Imp$PersonalScale~Imp$FW1 + Imp$Education)
summary(modP1A)
```

```
##
## Call:
## lm(formula = Imp$PersonalScale ~ Imp$FW1 + Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -26.627  -6.193  -1.442   7.434  13.807
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)   31.06210    4.17212   7.445 3.09e-12 ***
## Imp$FW1        1.12454    0.53281   2.111   0.0361 *
## Imp$Education -0.06073    0.71385  -0.085   0.9323
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.294 on 194 degrees of freedom
## Multiple R-squared:  0.02367,    Adjusted R-squared:  0.0136
## F-statistic: 2.351 on 2 and 194 DF,  p-value: 0.09795
```

###Personal + FW2

```
modP2 <- lm(formula=Imp$PersonalScale~Imp$FW2)
summary(modP2)
```

```
##
## Call:
## lm(formula = Imp$PersonalScale ~ Imp$FW2)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -26.496  -6.314  -1.496   7.595  15.959
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  30.9504     2.9342  10.548   <2e-16 ***
## Imp$FW2       1.0910     0.5801   1.881   0.0615 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.298 on 195 degrees of freedom
## Multiple R-squared:  0.01781,    Adjusted R-squared:  0.01278
## F-statistic: 3.537 on 1 and 195 DF,  p-value: 0.06152
```

```
modP2A <- lm(formula=Imp$PersonalScale~Imp$FW2 + Imp$Education)
summary(modP2A)
```

```
##
## Call:
## lm(formula = Imp$PersonalScale ~ Imp$FW2 + Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -26.591  -6.308  -1.453   7.547  15.909
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    31.5717     4.3472   7.263 8.99e-12 ***
## Imp$FW2         1.0723     0.5894   1.819   0.0704 .
## Imp$Education  -0.1382     0.7122  -0.194   0.8463
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.318 on 194 degrees of freedom
## Multiple R-squared:  0.018,  Adjusted R-squared:  0.007881
## F-statistic: 1.778 on 2 and 194 DF,  p-value: 0.1716
```

###Personal + FW3

```
modP3 <- lm(formula=Imp$PersonalScale~Imp$FW3)
summary(modP3)
```

```
##
## Call:
## lm(formula = Imp$PersonalScale ~ Imp$FW3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -26.406  -5.406  -1.350   7.650  14.817
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  31.0712     3.0661  10.134   <2e-16 ***
## Imp$FW3       1.0558     0.6011   1.756   0.0806 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.307 on 195 degrees of freedom
## Multiple R-squared:  0.01557,    Adjusted R-squared:  0.01053
## F-statistic: 3.085 on 1 and 195 DF,  p-value: 0.08058
```

```
modP3A <- lm(formula=Imp$PersonalScale~Imp$FW3 + Imp$Education)
summary(modP3A)
```

```
##
## Call:
## lm(formula = Imp$PersonalScale ~ Imp$FW3 + Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -26.448  -5.474  -1.338   7.552  14.789
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)   31.39749    4.64661   6.757  1.6e-10 ***
## Imp$FW3        1.04235    0.61940   1.683    0.094 .
## Imp$Education -0.06772    0.72313  -0.094    0.925
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.328 on 194 degrees of freedom
## Multiple R-squared:  0.01562,    Adjusted R-squared:  0.005471
## F-statistic: 1.539 on 2 and 194 DF,  p-value: 0.2172
```

###Incarceration and Education

```
modI <- lm(formula=Imp$Incarceration~Imp$Education)
summary(modI)
```

```
##
## Call:
## lm(formula = Imp$Incarceration ~ Imp$Education)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.5932 -1.1404  0.3753  1.3753  2.8596
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -1.8282     0.5030  -3.635 0.000356 ***
## Imp$Education   0.4843     0.1283   3.774 0.000213 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.519 on 195 degrees of freedom
## Multiple R-squared:  0.06806,    Adjusted R-squared:  0.06328
## F-statistic: 14.24 on 1 and 195 DF,  p-value: 0.0002133
```

Hypothesis test on Sex and CBFW2

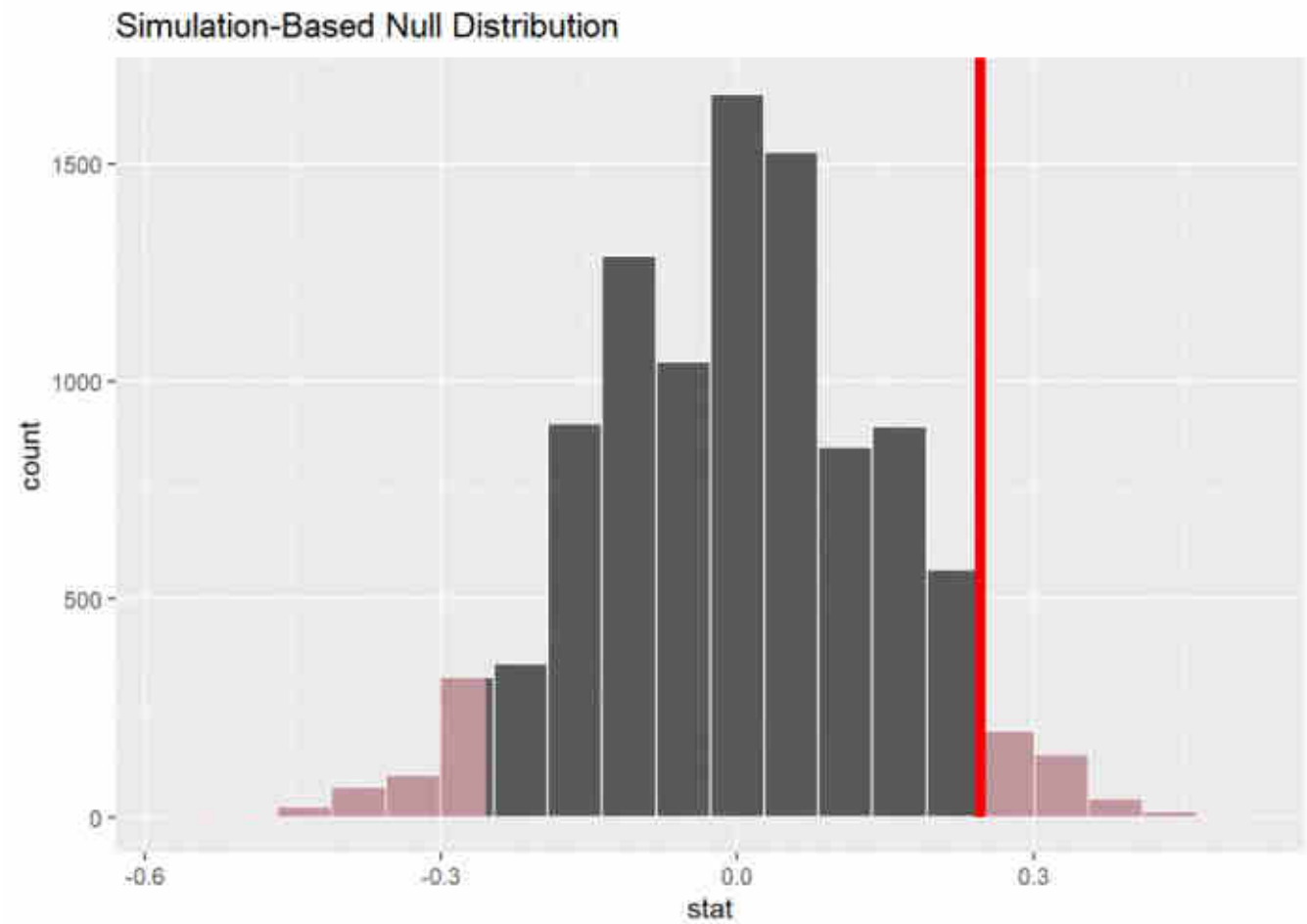
```
null_distribution_FW2sex <- Imp %>%
  specify(formula = FW2 ~ Sex) %>%
hypothesize(null = "independence") %>%
  generate(reps = 10000, type = "permute") %>%
  calculate(stat= "diff in means", order = c("Female", "Male"))
null_distribution_FW2sex
```

```
## # A tibble: 10,000 x 2
##    replicate    stat
##        <int>   <dbl>
##  1         1  0.0373
##  2         2 -0.0252
##  3         3  0.0165
##  4         4 -0.0668
##  5         5 -0.317
##  6         6 -0.0252
##  7         7 -0.296
##  8         8  0.0373
##  9         9  0.141
## 10        10  0.0165
## # ... with 9,990 more rows
```

```
obs_diff_meansFW2sex <- Imp %>%
  specify(formula = FW2 ~ Sex) %>%
  calculate(stat= "diff in means", order = c("Female", "Male"))
obs_diff_meansFW2sex
```

```
## # A tibble: 1 x 1
##    stat
##   <dbl>
## 1 0.246
```

```
visualize(null_distribution_FW2sex, bins = 20) +
  shade_p_value(obs_stat = obs_diff_meansFW2sex, direction = "both")
```




```
null_distribution_FW2sex %>%
  get_p_value(obs_stat = obs_diff_meansFW2sex, direction = "both")
```

```
## # A tibble: 1 x 1
##   p_value
##     <dbl>
## 1   0.113
```

#SEM

```
SEMmodel0 <- 'FW=~ FW1+FW2+FW3
PersonalScale~FW +Education
Cheat~ FW +Education
Donate~FW +Education
Incarceration~FW +Education
FW~Education'
fit0<-sem(SEMmodel0,data=Imp)
summary(fit0, standardized=TRUE)
```

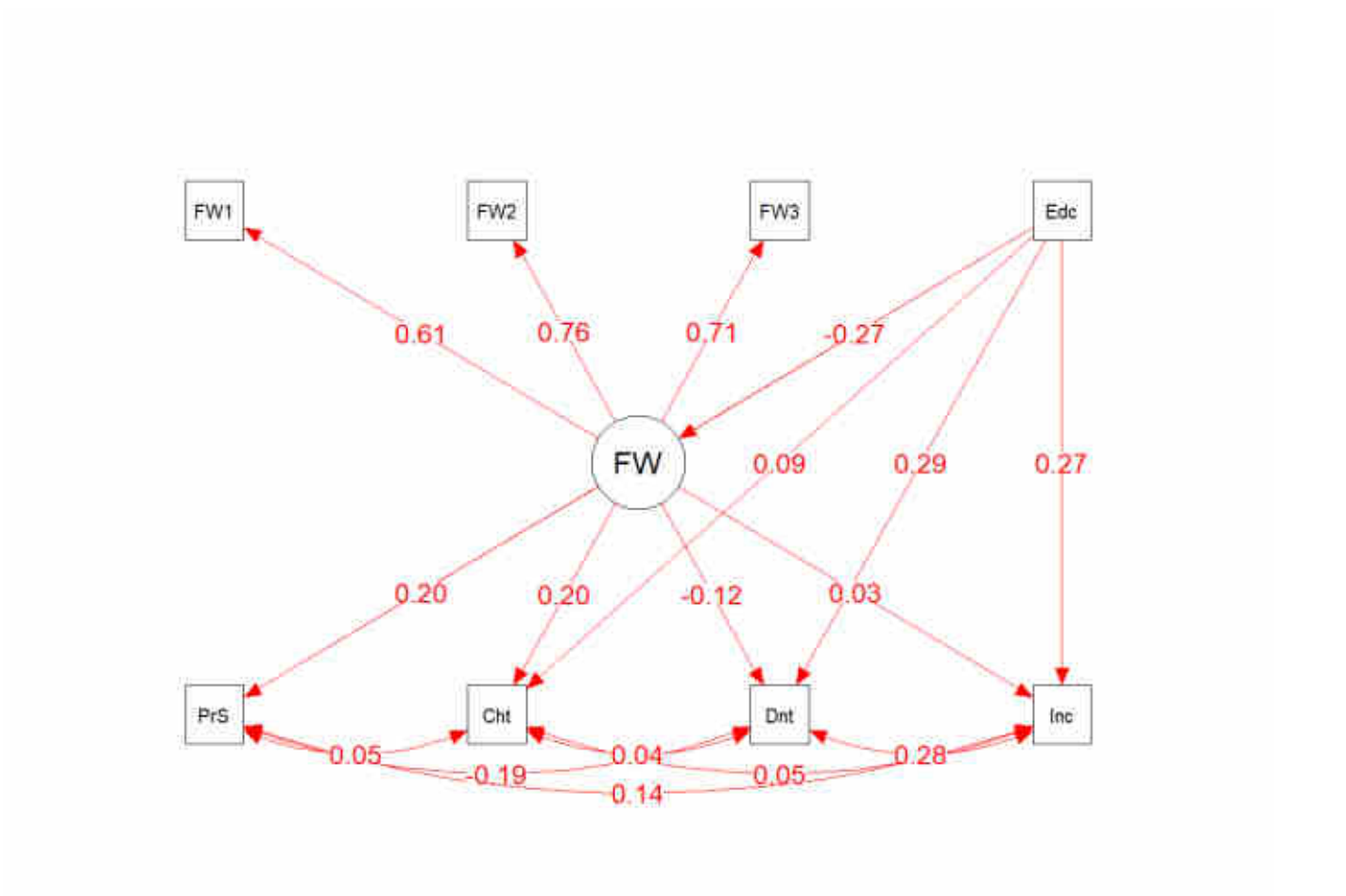
```
## lavaan 0.6-7 ended normally after 94 iterations
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of free parameters                         25
##
##   Number of observations                           197
##
## Model Test User Model:
##
##   Test statistic                                 5.506
##   Degrees of freedom                                10
##   P-value (Chi-square)                           0.855
##
## Parameter Estimates:
##
##   Standard errors                             Standard
##   Information                                 Expected
##   Information saturated (h1) model          Structured
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   FW =~
##     FW1               1.000                               0.692    0.613
##     FW2               1.119    0.166    6.729    0.000    0.775    0.760
##     FW3               1.010    0.150    6.734    0.000    0.699    0.710
##
## Regressions:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   PersonalScale ~
##     FW                2.353    1.056    2.227    0.026    1.629    0.196
##     Education         0.176    0.732    0.240    0.810    0.176    0.018
##   Cheat ~
##     FW                0.482    0.207    2.324    0.020    0.333    0.204
##     Education         0.171    0.143    1.197    0.231    0.171    0.089
##   Donate ~
##     FW               -0.369    0.263   -1.401    0.161   -0.255   -0.115
##     Education         0.764    0.186    4.117    0.000    0.764    0.291
##   Incarceration ~
##     FW                0.076    0.189    0.401    0.689    0.052    0.033
##     Education         0.501    0.134    3.729    0.000    0.501    0.270
##   FW ~
##     Education        -0.223    0.070   -3.201    0.001   -0.322   -0.272
##
## Covariances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##  .PersonalScale ~~
##    .Cheat             0.627    0.946    0.663    0.507    0.627    0.048
##    .Donate           -3.201    1.247   -2.568    0.010   -3.201   -0.188
##    .Incarceration     1.778    0.895    1.987    0.047    1.778    0.144
##  .Cheat ~~
##    .Donate            0.143    0.240    0.596    0.551    0.143    0.043
##    .Incarceration     0.133    0.174    0.765    0.444    0.133    0.055
```

```
##  .Donate ~~
##    .Incarceration     0.882    0.233    3.783    0.000    0.882    0.280
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .FW1               0.797    0.101    7.893    0.000    0.797    0.624
##    .FW2               0.438    0.085    5.172    0.000    0.438    0.422
##    .FW3               0.481    0.077    6.257    0.000    0.481    0.496
##    .PersonalScale    66.841    6.825    9.794    0.000   66.841    0.963
##    .Cheat             2.555    0.261    9.782    0.000    2.555    0.960
##    .Donate            4.334    0.439    9.875    0.000    4.334    0.884
##    .Incarceration     2.282    0.230    9.921    0.000    2.282    0.931
##    .FW                0.444    0.110    4.053    0.000    0.926    0.926
```

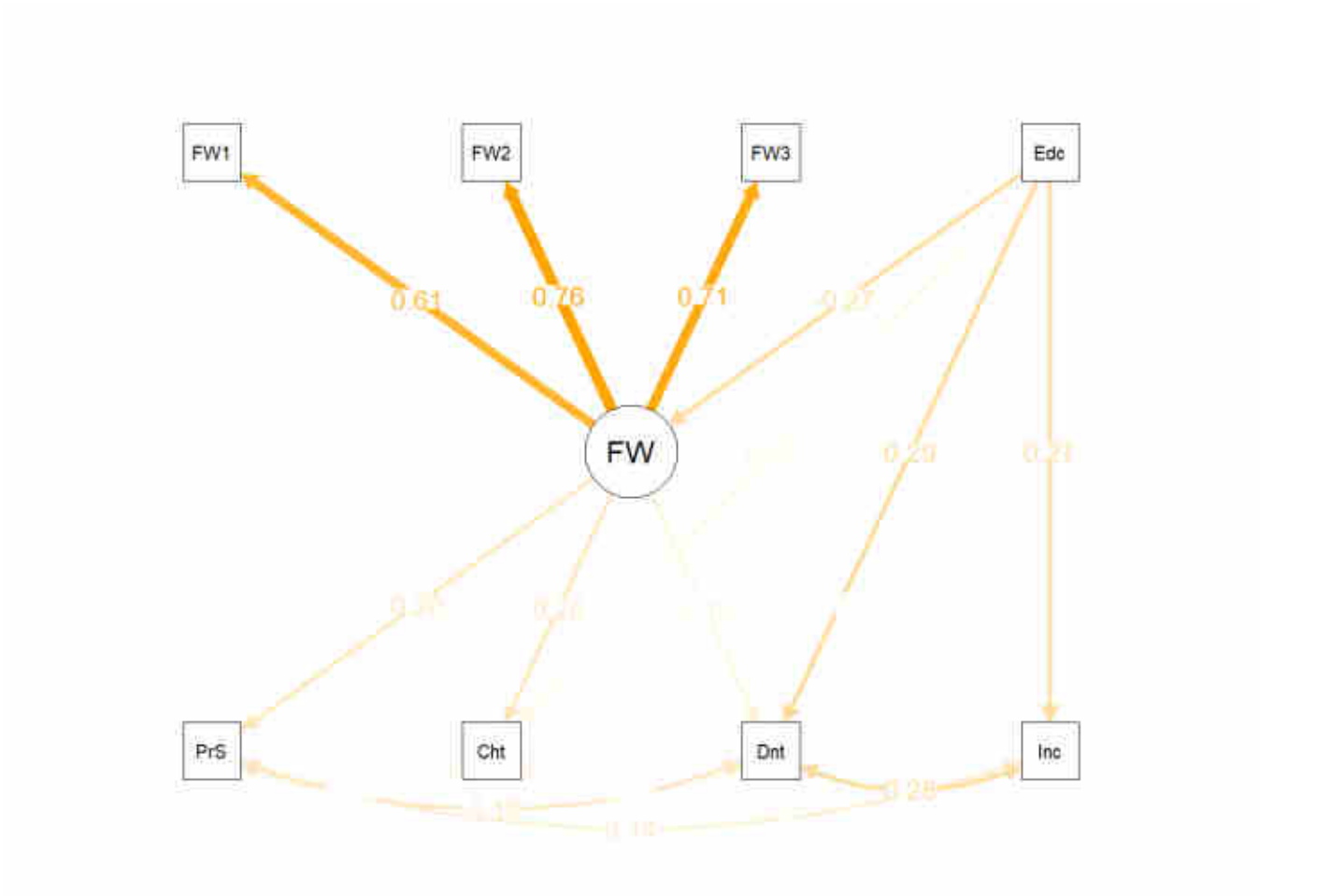
```
fitmeasures(fit0,c("gfi","agfi","nfi","cfi","rmsea","srmr","aic","bic"))
```

```
##      gfi     agfi      nfi      cfi    rmsea     srmr      aic      bic
##    0.992    0.972    0.976    1.000    0.000    0.019 5308.374 5390.454
```

```
semPaths(fit0,whatLabels="std",style="lisrel", edge.label.cex=1, edge.color="red", residuals=FAL
SE, fixedStyle=FALSE)
```




```
fitmeasures(fit0,c("gfi","agfi","nfi","cfi","rmsea","srmr","aic","bic"))
```

```
##      gfi     agfi      nfi      cfi    rmsea     srmr      aic      bic
##    0.992    0.972    0.976    1.000    0.000    0.019 5308.374 5390.454
```

```
semPaths(fit0,"std", edge.label.cex=1, edge.color="orange", residuals=FALSE, fixedStyle=FALSE)
```