

# A boring (academic) title or a clever title?

## A secondary title

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In this article we compare the *empirical characteristic function* (Tukey 1977; Becker et al. 1988) to a *moment-generating-functional form* to compute the proportion of hypotheses  $m$  that are rejected under the null hypothesis.

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Generally, we write this abstract last. Often it is called the executive summary. It should succinctly summarize the entire document. You can include references such as this one to the Appendices section 6 if necessary.

**Keywords:** multiple comparisons to control; multivariate chi-square distribution; nonlinear growth curves; Richard's curve; simulated critical points

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November 10, 2020

## 1 Introduction

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[ONE GRAPHIC]

[TWO GRAPHICS AS ONE]

Write something here.

## 2 Research Question: What is my primary question

### 2.1 What is my secondary question

### 2.2 What is my other secondary question

## 3 Data Description

Very brief introduction to the data, how it was collected, and so on. Remember that everything is covered (who, what, when, where, why, how, so what, and so on). Reference the section in the Appendix with greater detail about the data provenance. This section should be about two paragraphs, and the Appendix should have more information.

### 3.1 Summary of Sample

### 3.2 Summary Statistics of Data

## 4 Key Findings

## 5 Conclusion

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Here is some more text.  
Below are some example code that may benefit you in preparing your document.

Please state your name: \_\_\_\_\_  
I was born on \_\_\_\_\_ in \_\_\_\_\_

$$Y_{jt} = \alpha + \beta X_{jt} + v_j + \varepsilon_{jt}, \tag{1}$$

where  $\alpha$  is the grand mean,  $v_j$  is the fixed-time country mean,  $X_{jt}$  (country  $j$  at time  $t$ ) is the matrix of country-level observations for the vector of aforementioned parameters  $\beta$ , and  $\varepsilon_{jt}$  represents the residual idiosyncratic disturbance. Our panel data set consists of repeated observations of countries over time. Therefore, we employ cross-section time-series models. This approach redefines Equation~1 by subtracting time-demeaned values. This *within* transformation subtracts constant country effects for the dependent variable  $\bar{Y}_j$ , the predictor variables  $\bar{X}_j$ , and the intercept  $\bar{v}_j$ :

$$(Y_{jt} - \theta \bar{Y}_j) = (1 - \theta)\alpha + \beta(X_{jt} - \bar{X}_j) + (v_{jt} - \theta \bar{v}_j), \tag{2}$$

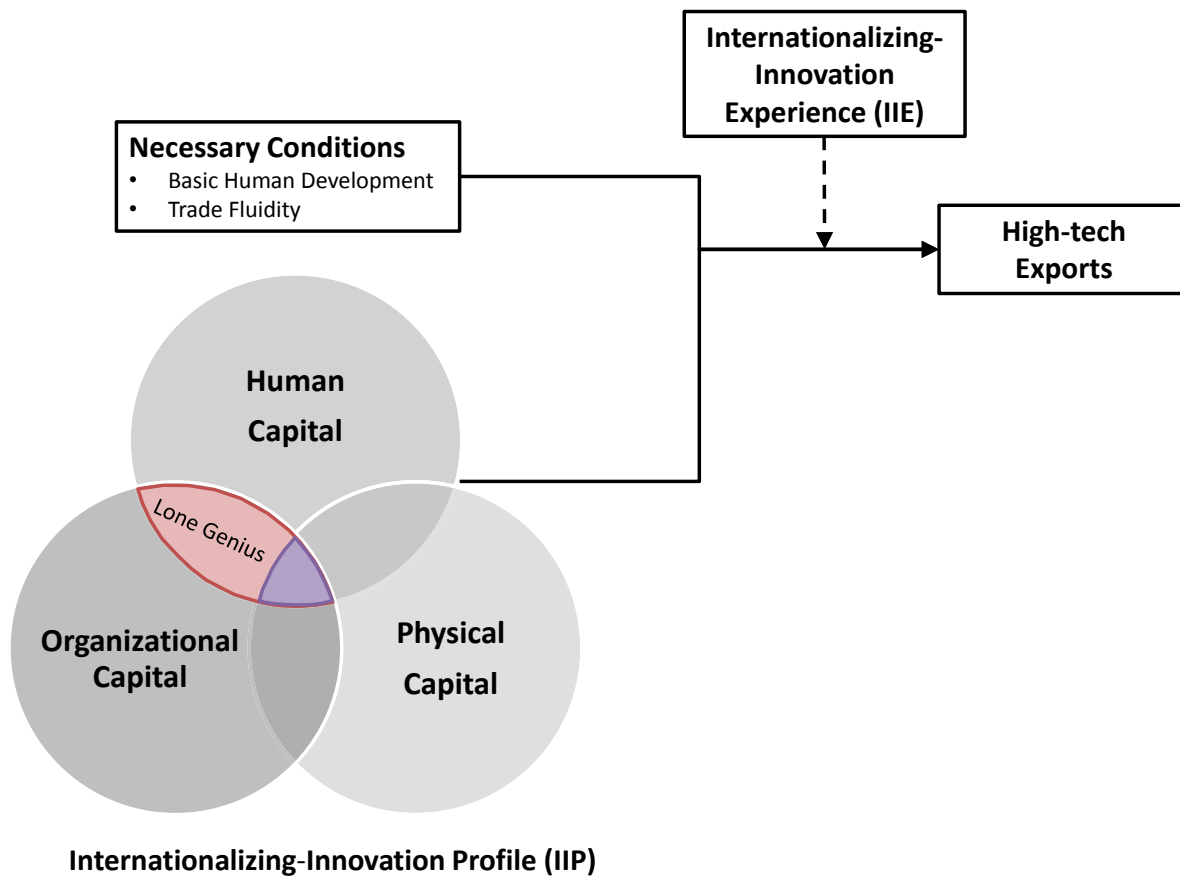
If  $\theta = 0$ , the model reduces to a basic pooled ordinary-least-squares (OLS) model; if  $\theta = 1$ , the model reduces to a fixed-effects model; otherwise the model represents a random-effects model. The pooled OLS estimation is biased if country effects exist (Hsiao 2003). The random-effects model may be susceptible to omitted-variable bias (Wooldridge 2006): bias because a predictor was excluded from the model specification. Conversely, the fixed-effects model is not susceptible to this bias as it captures unobserved intracountry variation around its average country-level “fixed effect.” Panel-data analysis commonly has issues with heteroskedasticity, serial autocorrelation, and cross-sectional autocorrelation.

$i = 1$  and  $i = 1$

1	2	3	4	5
6	7	8	9	10

See Figure 1.

Figure 1: Conceptual Model



This is a footnote<sup>[1]</sup> that can be placed within a document.

Refer to the Appendices in section~6 where I am going to cite John (Tukey 1962, pp. 2-3).  
Here is a quote by Tukey (1962, pp. 2-3):

For a long time I have thought I was a statistician, interested in inferences from the particular to the general. But as I have watched mathematical statistics evolve, I have had to cause to wonder and to doubt. [...] All in all, I have come to feel that my central interest is in *data analysis*, which I take to include among other things: procedures for analyzing data, techniques for interpreting the results of such procedures, ways of planning the gathering of data to make its analysis easier, more precise or more accurate, and all the machinery and results of (mathematical) statistics which apply to analyzing the data.

Large parts of data analysis are inferential in the sample-to-population sense, but these are only parts, not the whole. Large parts of data analysis are incisive, laying bare indications which we could not perceive by simple and direct examination of the raw data, but these too are only parts, not the whole. Some parts of data analysis, as the term is here stretched beyond its philology, are allocation, in the sense that they guide us in the distribution of effort and other valuable considerations in observation, experimentation, or analysis. Data analysis is a larger and more varied field than inference, or incisive procedures, or allocation.

Statistics has contributed much to data analysis. In the future it can, and in my view should, contribute more. For such contributions to exist, and be valuable, it is not necessary that they be direct. They need not provide new techniques, or better tables for old techniques, in order to influence the practice of data analysis.

Table 1: Descriptive Statistics and Correlation Analysis

	M	SD	1	2	3	4	5	6	7	8	9
1 Height (cm)	167.3	15.24	1								
2 Arm Span (cm)	167.4	21.54	.72***	1							
3 Hand Length (cm)	19.6	16.82	.15*	.11†	1						
4 Hand to Elbow (cm)	42.5	4.60	.70***	.60***	.10	1					
5 Elbow to Armpit (cm)	26.7	6.47	.39***	.27***	.05	.42***	1				
6 Arm Reach (cm)	191.6	49.68	.28***	.27***	.08	.09	-.03	1			
7 Foot Length (cm)	24.8	2.69	.71***	.60***	.08	.58***	.29***	.30***	1		
8 Floor to Kneepit (cm)	45.2	5.24	.70***	.43***	.10	.53***	.32***	.17*	.52***	1	
9 Floor to Hip (cm)	95.3	9.51	.71***	.50***	.10	.53***	.27***	.26***	.56***	.54***	1
10 Floor to Armpit (cm)	131.3	11.90	.88***	.57***	.14*	.68***	.37***	.31***	.66***	.63***	.77***

**Notes:** Pearson pairwise correlations are reported;  
a two-side test was performed to report correlation significance.

†  $p < .10$     \*  $p < .05$     \*\*  $p < .01$     \*\*\*  $p < .001$

## 6 APPENDICES

### 6.1 *Data Provenance*

## 6.1.1 Data Collection Handout

Figure 2: Handout Page 1



## EXPLORATORY DATA ANALYSIS

We were together learning how to use the analysis of variance, and perhaps it is worth while stating an impression that I have formed—that the analysis of variance, which may perhaps be called a statistical method, because that term is a very ambiguous one — is not a mathematical theorem, but rather a convenient method of arranging the arithmetic. Just as in arithmetical textbooks — if we can recall their contents — we were given rules for arranging how to find the greatest common measure, and how to work out a sum in practice, and were drilled in the arrangement and order in which we were to put the figures down, so with the analysis of variance; its one claim to attention lies in its convenience.

*The Future of Data Analysis*  
J. W. TUKEY

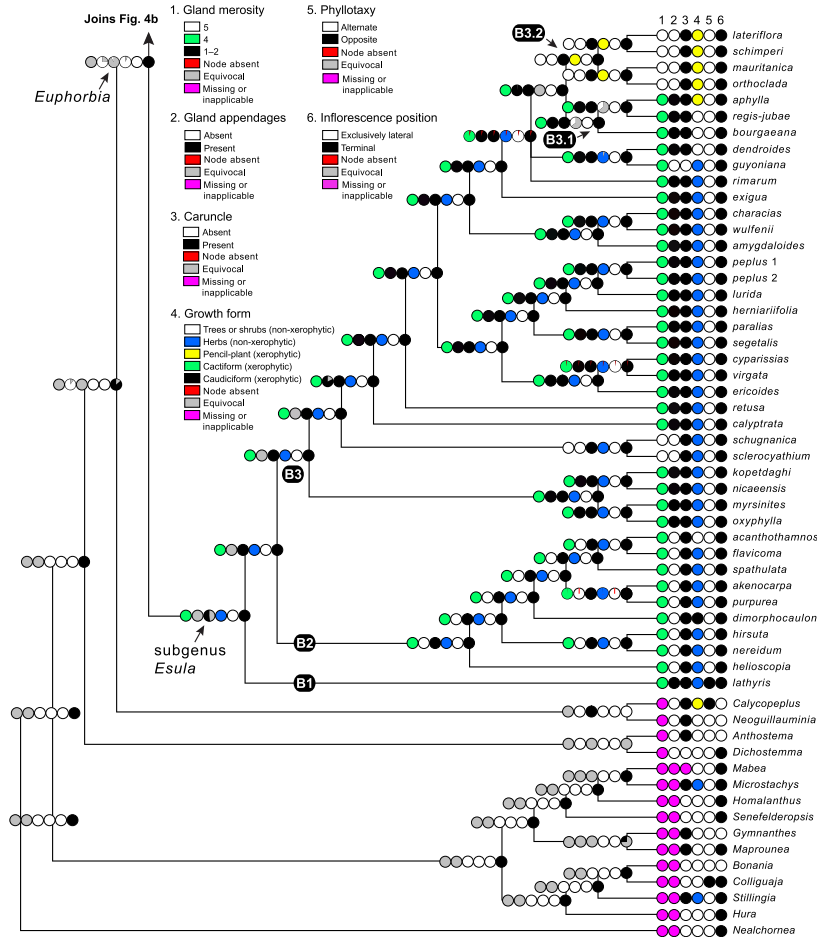
**I**N 1986, the Vietnamese government began a policy of *textitdoi moi* (renovation), and decided to move from a centrally planned command economy to a "market economy with socialist direction". As a result, Vietnam was able to evolve from near famine conditions in 1986 to a position as the world's third largest exporter of rice in the mid nineties. Between 1992 and 1997 Vietnam's GDP rose by 8.9% annually (World Bank, 1999).

The first Vietnam Living Standards Survey (VLSS) was conducted in 1992-93 by the State Planning Committee (SPC) (now Ministry of Planning and Investment) along with the General Statistical Office (GSO). The second VLSS was

Figure 3: Handout Page 2

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J.W. Horn et al. / Molecular Phylogenetics and Evolution 63 (2012) 305–326



**Fig. 4a.** Ancestral state reconstructions for (1) cyathial gland merosity, (2) gland appendages, (3) caruncle, (4) growth form, (5) phyllotaxy, and (6) inflorescence position in *Euphorbia* and Euphorbiaceae outgroups. Ancestral states for each character were estimated using likelihood optimizations across a randomly selected subset of 1000 post burn-in trees from the Bayesian inference analysis of the combined data set and plotted onto the 95% majority rule tree of the complete set of post burn-in trees. Pie charts at each node represent the proportion of trees in which the optimizations indicated were present, given a likelihood decision threshold of 2.0 (>2 log units better than the raw likelihood value(s) of the other states). Shown here are optimizations for Euphorbiaceae outgroups and *Euphorbia* subgenus *Esula*; continued in Figs. 4b and 4c.

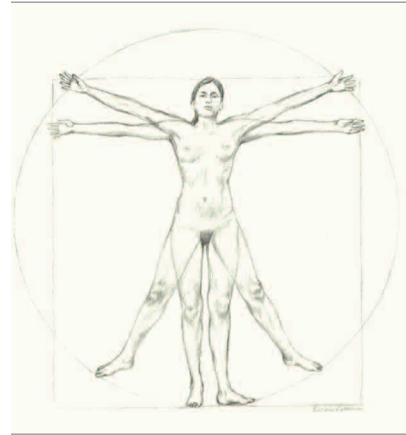
the root, the root of Clade C + D, and at the root nodes of Clades A, C, and D. The asymmetrical model of character evolution we used to optimize this trait favors a scenario of multiple, independent gains of caruncles within both Clades C and D; caruncles are absent from Clade A (Figs. 4b and 4c). In contrast, caruncles are present in all but one species we scored from Clade B, but they are reconstructed as unequivocally present at the root node of this clade in just over half of trees that we examined (Fig. 4a; present: 521, equivocal: 479).

Trees and shrubs are reconstructed as the ancestral growth form (Character 4) at all deep nodes within the phylogeny, including all backbone nodes of *Euphorbia* (root node of *Euphorbia*, woody: 937, equivocal: 63). Among the subgeneric clades, a transition to the herbaceous habit is likely to be a synapomorphy for Clade B (Fig. 4a). A non-succulent, woody growth form is the ancestral state at the root nodes of Clades A and C (Figs. 4b and 4c). The root node of Clade D is woody in just over half of the reconstructions, but equivocal in the rest (Fig. 4c; woody: 529, equivocal: 471).





(a) Thomas et al. (2020) discuss this.



(b) Schnitt realer Sensor (Thomas et al. 2020)

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**Figure 4: Der Sensor in Theorie und Verwirklichung... caption at bottom instead?** I can write a really long caption if I want.

This is using "crop" to include one image and trim it to appear as two. Likely you will have two separate images if you use this option, so you would set the trim parameters all equal to 0.

This figure has subfigures which each also have a possible caption.

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## 6.2 Preparing the Report Workspace as a subsection

### 6.2.1 Preparing the Report Workspace as a subsubsection

#### Preparing the Report Workspace as a paragraph

*Preparing the Report Workspace as a subparagraph* Below is the necessary functions and libraries required to run the code referenced in this document.

```
library(devtools); # required for source_url

path.humanVerseWSU = "https://raw.githubusercontent.com/MonteShaffer/humanVerseWSU/"
source_url( paste0(path.humanVerseWSU,"master/misc/functions-project-measure.R") );
```

Below is the code to load the data and prepare it for analysis.

```
path.to.project = "C:/Users/Connor/.ssh/stats419/project-measure/";
path.to.secret =
  "C:/Users/Connor/Documents/1) WSU 2018-/Fall 2020/Stat 419/Project 1 Measure/";
path.to.tables = paste0(path.to.project,"tables/");
createDirRecursive(path.to.tables);

measure = utils::read.csv( paste0(path.to.secret, "cm.final.measure.txt"), header=TRUE,
                           quote="", sep="|");

path.github = "https://raw.githubusercontent.com/youknowwho/stats419/";
source_url( paste0(path.github,"master/Functions/functions-project-measure.R") );

prepareMeasureData2 = function(myData){

  newData = myData;

  newData$my.eyeye[newData$eyeye == "\"left\"" & newData$my.eyeye == "r"] = "l";
  newData$minutes[newData$minutes <= 0] = NA;

  return(newData);
}

set.seed(11906189);

measure.df = prepareMeasureData2(measure);

summary(measure.df);
```

```
## data_collector      person_id      height      head.height
## Length:251          Length:251      Min.   : 85.09  Min.   :15.24
## Class :character    Class :character 1st Qu.:160.00 1st Qu.:20.50
## Mode  :character    Mode  :character Median :168.40 Median :22.00
##                                     Mean  :167.25 Mean  :22.24
##                                     3rd Qu.:177.80 3rd Qu.:23.50
##                                     Max.   :191.10 Max.   :38.10
##                                     NA's   :9      NA's   :9
## head.circumference   arm.span      floor.navel    units
## Min.   :21.50        Min.   : 61.5  Min.   : 49.0  Length:251
## 1st Qu.:55.00        1st Qu.:158.9 1st Qu.: 95.0  Class :character
```

```

## Median :56.58      Median :168.9    Median :101.0    Mode  :character
## Mean   :56.08      Mean   :167.4    Mean   :101.6
## 3rd Qu.:58.42      3rd Qu.:179.0    3rd Qu.:107.0
## Max.   :64.10      Max.   :224.0    Max.   :151.1
## NA's   :19         NA's    :8       NA's    :50
## writing          eye          eye.color        swinging
## Length:251      Length:251      Length:251      Length:251
## Class :character Class :character Class :character Class :character
## Mode  :character Mode  :character Mode  :character Mode  :character
##
##
##
##
## age            gender          quality          minutes
## Min.   : 1.00    Length:251      Min.   : 5.000    Min.   : 2.00
## 1st Qu.:22.00    Class :character 1st Qu.: 8.000    1st Qu.:10.00
## Median :27.00    Mode  :character Median : 9.000    Median :15.00
## Mean   :34.69                    Mean   : 8.616    Mean   :15.96
## 3rd Qu.:50.00                    3rd Qu.:10.000   3rd Qu.:20.00
## Max.   :94.00                    Max.   :10.000   Max.   :45.00
##                                     NA's    :21
## ethnicity        notes          hand.length      hand.width
## Length:251      Length:251      Min.   : 9.00    Min.   : 7.00
## Class :character Class :character 1st Qu.: 17.00   1st Qu.:18.48
## Mode  :character Mode  :character Median : 18.00   Median :20.00
##                                     Mean   : 19.64   Mean   :19.69
##                                     3rd Qu.: 19.50   3rd Qu.:21.59
##                                     Max.   :223.20   Max.   :26.50
##                                     NA's    :13      NA's    :23
## hand.elbow      elbow.arpit      arm.reach        foot.length      floor.kneepit
## Min.   :23.0     Min.   :10.00    Min.   : 38.0     Min.   :13.50    Min.   :23.00
## 1st Qu.:40.0     1st Qu.:23.00    1st Qu.:193.0     1st Qu.:23.00    1st Qu.:42.00
## Median :43.0     Median :26.00    Median :207.0     Median :24.77    Median :45.09
## Mean   :42.5     Mean   :26.72    Mean   :191.6     Mean   :24.77    Mean   :45.20
## 3rd Qu.:45.5     3rd Qu.:29.21    3rd Qu.:221.6     3rd Qu.:26.40    3rd Qu.:48.26
## Max.   :52.0     Max.   :71.00    Max.   :245.0     Max.   :38.10    Max.   :72.20
## NA's   :23       NA's   :24       NA's   :24       NA's   :22      NA's   :22
## floor.hip        floor.arpit      my.units          my.ethnicity
## Min.   : 35.00    Min.   : 70.0    Length:251      Length:251
## 1st Qu.: 91.40    1st Qu.:124.5    Class :character Class :character
## Median : 96.00    Median :131.5    Mode  :character Mode  :character
## Mean   : 95.29    Mean   :131.3
## 3rd Qu.:101.00    3rd Qu.:139.7
## Max.   :113.00    Max.   :156.8
## NA's   :34       NA's   :22
## my.gender        new.units          my.eye            my.writing
## Length:251      Length:251      Length:251      Length:251
## Class :character Class :character Class :character Class :character
## Mode  :character Mode  :character Mode  :character Mode  :character
##
##
##
##
## my.swinging      my.eye.color

```

```
## Length:251      Length:251
## Class :character Class :character
## Mode :character Mode :character
##
##
##
##
```

Below is the code to generate the summary statistics and save them as a table that you see in Section ??.

```
set.seed(11906189);

measure.df.numeric = measure.df[sapply(measure.df, is.numeric)]; #Help From:
#https://www.statology.org/calculate-mean-multiple-columns-in-r/#:~:text=Often%20you%20
#may%20want%20to,using%20the%20colMeans()%20function.

my.Means = colMeans(measure.df.numeric, na.rm = TRUE); #get mean of each column
my.StanDevs = sapply(measure.df.numeric, sd, na.rm = TRUE); #get stan dev of each column

file.correlation = paste0(path.to.tables,"correlation-table1.tex"); #save table name as

myData = as.matrix(measure.df.numeric[-c(2:3,5:8,10)]); #numeric values minus
#head.height (2), head.circumference (3), navel.floor (5), age (6) quality (7),
#minutes (8), and hand.width (10)

# https://www.overleaf.com/read/srzhrcryjpwn
# keepaspectratio of include graphics
# could scale \input if still too big ...
# https://tex.stackexchange.com/questions/13460/scalebox-knowing-how-much-it-scales#13487

buildLatexCorrelationTable(myData,
  rotateTable = TRUE,
  width.table = .975,
  width.names = "35mm",
  space.M.SD = ".25mm",
  space.SD.corr = ".5mm",
  space.between = ".01mm",
  myFile = file.correlation,
  myNames = c("Height (cm)", "Arm Span (cm)", "Hand Length (cm)", "Hand to Elbow (cm)",
    "Elbow to Armpit (cm)", "Arm Reach (cm)", "Foot Length (cm)",
    "Floor to Kneepit (cm)", "Floor to Hip (cm)", "Floor to Armpit (cm)"),
  myNote = "Pearson pairwise correlations are reported; \\newline a two-side test was
    performed to report correlation significance.",
  showOnes = "center");

Sys.sleep(2); # in case Knit-PDF doesn't like that I just created the file...
```

---

**ENDNOTES**

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[1] This is a footnote that can be really long.

You can have multiple paragraphs in the footnote. You can have underline or **bold** or *italics*. You can even have a math equation inline.

In this section, we review the regression results to summarize our findings. First, we examine each model for significance, and conclude the hypothesized models fit well with the data. Second, we conclude that the fixed country effects represent consistent and unbiased parameter estimates. Third, with the use of the Driscoll and Kraay (1998) robust standard errors, we adjust any variance bias to ascertain the significance of these consistent estimates. Therefore, we are able to make inferences about the hypotheses using our model estimates. For ease of interpretation across these 12 models, we introduce  $\hat{\beta}_{\text{Total}}^{\text{M1}}$  as notation to refer to parameter estimate  $\hat{\beta}_1$  (HDI) for the Total Sample and (M1) Model 1: Main Effects. We proceed by reporting findings for the total sample.

The footnotes are automatically converted to "endnotes" and will be included at the end of the document. It will finish when you have that outer brace like this.

**REFERENCES**

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