Homework #8

1. Exploring the Data



Descriptive Statistics of the Different Data Groups

VCdata$dose: Placebo

median mean SE.mean CI.mean.0.95 var std.dev

3.0000000 3.5000000 1.3102163 2.9639151 17.1666667 4.1432676

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

1.1837908 0.7760865 0.5648020 -0.5416486 -0.2029789 0.8949130

normtest.p

0.1924799

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VCdata$dose: Low Dose of Vitamin C

median mean SE.mean CI.mean.0.95 var std.dev

-2.5000000 -2.1000000 1.2862521 2.9097044 16.5444444 4.0674863

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

-1.9368982 0.1540695 0.1121251 -0.8994719 -0.3370705 0.9691904

normtest.p

0.8832389

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VCdata$dose: High Dose of Vitamin C

median mean SE.mean CI.mean.0.95 var std.dev

-5.000000000 -2.000000000 1.732050808 3.918171141 30.000000000 5.477225575

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

-2.738612788 0.595191846 0.433154778 -1.638000000 -0.613828559 0.761094087

normtest.p

0.004871267

Levene's Test for Homogeneity of Variance (center = median)

Df F value Pr(>F)

group 2 0.5361 0.5911

27

ANOVA assumptions:

* Dose and Low Dose of Vitamin C data groups is most likely normally distributed, however, data within the High Dose of Vitamin C group is most likely not normally distributed. This suggests a failure to satisfy all the groups being normally distributed, however, for homework purposes, I must move on.
* The difference in the amount of cold (sick) days was measured at least at the interval level.
* Homogeneity of variance is satisfied by Levene’s Test (.
* Observations are taken from different people, so they are independent.

Df Sum Sq Mean Sq F value Pr(>F)

dose 2 205.4 102.70 4.836 0.016 \*

Residuals 27 573.4 21.24

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Effect Size:

Using this formula:

SS(m) = ((205.4- (2)21.24)/ (778.8+21.24)) ^.5

Effect Size: ω = .4513

Conclusion:

There was a significant effect of Vitamin C dosage on the difference in the amount cold (sick) days from year one to two, F(2,27)=4.836, p = .016, ω = 0.4513

Planned Comparisons:

contrast1 contrast2

Placebo -2 0

Low Dose of Vitamin C 1 -1

High Dose of Vitamin C 1 1

Levels: Placebo Low Dose of Vitamin C High Dose of Vitamin C

Call:

aov(formula = diff ~ dose, data = VCdata)

Residuals:

Min 1Q Median 3Q Max

-6.9 -3.8 -0.7 1.7 8.5

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.2000 0.8414 -0.238 0.81390

dosecontrast1 -1.8500 0.5949 -3.110 0.00438 \*\*

dosecontrast2 0.0500 1.0305 0.049 0.96166

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.608 on 27 degrees of freedom

Multiple R-squared: 0.2637, Adjusted R-squared: 0.2092

F-statistic: 4.836 on 2 and 27 DF, p-value: 0.01603

Contrast Effect Sizes:

r(contrast1) = ((-3.11^2)/(-3.11^2+27))^.5 = .5136

r(contrast2) = ((.049^2)/(.049^2+27))^.5 = .0094

Conclusion Based on Contrasts:

Planned contrasts show that taking any dose of Vitamin C results in less cold (sick) days than when taking a placebo,

Planned contrasts also show that there is not a significant difference in less cold (sick) days between taking a low dose of Vitamin C and a high dose of Vitamin C, .

To conclude, Vitamin C does appear to be effective in the treatment of colds, however, higher doses of Vitamin C do not appear to be more effective in the treatment of colds than low doses of Vitamin C.

Trend Analysis

Call:

aov(formula = diff ~ dose, data = VCdata)

Residuals:

Min 1Q Median 3Q Max

-6.9 -3.8 -0.7 1.7 8.5

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.2000 0.8414 -0.238 0.8139

dose.L -3.8891 1.4573 -2.669 0.0127 \*

dose.Q 2.3270 1.4573 1.597 0.1219

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.608 on 27 degrees of freedom

Multiple R-squared: 0.2637, Adjusted R-squared: 0.2092

F-statistic: 4.836 on 2 and 27 DF, p-value: 0.01603

There was a significant linear trend, .

2. Exploring the Data with a Boxplot



Descriptive Stats on the Different Groups of the Data

: Control

: Men

median mean SE.mean CI.mean.0.95 var std.dev

0.17500000 0.16500000 0.04716991 0.10670574 0.02225000 0.14916434

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.90402630 -0.17083940 -0.12432950 -1.09607752 -0.41074706 0.97870046

normtest.p

0.95783515

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: Method 1

: Men

median mean SE.mean CI.mean.0.95 var std.dev

0.30000000 0.33500000 0.07228416 0.16351813 0.05225000 0.22858259

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.68233609 0.46946272 0.34165458 -0.64528811 -0.24181702 0.96397684

normtest.p

0.83008752

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: Method 2

: Men

median mean SE.mean CI.mean.0.95 var std.dev

0.60000000 0.64000000 0.05617433 0.12707517 0.03155556 0.17763883

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.27756068 0.62938274 0.45803743 -0.77021028 -0.28863069 0.90590400

normtest.p

0.25402362

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: Control

: Women

median mean SE.mean CI.mean.0.95 var std.dev

0.10000000 0.10500000 0.04621808 0.10455257 0.02136111 0.14615441

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

1.39194675 0.56021412 0.40769951 -0.75856411 -0.28426637 0.93621319

normtest.p

0.51169547

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: Method 1

: Women

median mean SE.mean CI.mean.0.95 var std.dev

0.15000000 0.17000000 0.05783117 0.13082320 0.03344444 0.18287822

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

1.07575425 0.49638173 0.36124507 -1.36305813 -0.51079610 0.86858854

normtest.p

0.09624590

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: Method 2

: Women

median mean SE.mean CI.mean.0.95 var std.dev

0.27500000 0.30500000 0.06075909 0.13744660 0.03691667 0.19213710

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.62995772 0.02664576 0.01939163 -1.44305994 -0.54077619 0.96653387

normtest.p

0.85698091

Levene's Test for Homogeneity of Variance (center = median)

Df F value Pr(>F)

group 5 0.4716 0.7958

54

ANOVA assumptions:

* By looking at the descriptive statistics, I can see that the data groups are most likely normally distributed.
* The GPA improvement is measured at least at the interval level.
* Homogeneity of variance is satisfied by Levene’s Test (.
* Observations are taken from different people, so they are independent.

Df Sum Sq Mean Sq F value Pr(>F)

method 2 1.1741 0.5870 17.809 1.15e-06 \*\*\*

gender 1 0.5227 0.5227 15.856 0.000206 \*\*\*

method:gender 2 0.1926 0.0963 2.921 0.062429 .

Residuals 54 1.7800 0.0330

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

There was a significant main effect by the method of note taking used among students, on the amount of GPA improvement, *F*(2, 54) = 17.809, 1.15e-06.



There was a significant main effect by the gender of the student, on the amount of GPA improvement, *F*(1, 54) = 15.856, 0.000206.



There was not a significant interaction between the method of note taking and the gender of the student, on the amount of GPA improvement, *F*(2, 54) = 2.921, p = 0.062429.



There was not a significant interaction effect between the method of note taking and the gender of the students, on the amount of GPA improvement, *F*(2, 54) = 2.921, p = 0.062429. This indicates males and females were not affected differently by the method of note taking. Specifically, the amount of GPA improvement was relatively similar with males having a slight edge (M=.165, SD=.149) over females (M=.105, SD=.146) after not using any specific note taking strategy, males saw slightly more GPA improvement (M=.335, SD=.229) than females (M=.17, SD=.183) after using method 1 of note taking, and males saw even slightly more GPA improvement (M=.64, SD=.178) than females (M=.305, SD=.192) after using method 2 of note taking. However, the improvement in GPA is too small a difference between males and females to deem a significant interaction effect among the gender of students. Both genders see an improvement from no note taking instruction to method 1 to method 2.

Planned Comparisons:

[,1] [,2]

Control -2 0

Method 1 1 -1

Method 2 1 1

Levels: Control Method 1 Method 2

[,1]

Men -1

Women 1

Levels: Men Women

Contrasts:

Call:

aov(formula = gpaimpr ~ method \* gender, data = noteData)

Residuals:

Min 1Q Median 3Q Max

-0.3350 -0.1125 -0.0350 0.1350 0.4650

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.28667 0.02344 12.230 < 2e-16 \*\*\*

method1 0.07583 0.01657 4.575 2.82e-05 \*\*\*

method2 0.11000 0.02871 3.832 0.000334 \*\*\*

gender1 -0.09333 0.02344 -3.982 0.000206 \*\*\*

method1:gender1 -0.03167 0.01657 -1.911 0.061366 .

method2:gender1 -0.04250 0.02871 -1.480 0.144554

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.1816 on 54 degrees of freedom

Multiple R-squared: 0.5149, Adjusted R-squared: 0.47

F-statistic: 11.46 on 5 and 54 DF, p-value: 1.444e-07

Method1: There was a significant effect of method of note taking on the GPA improvement of the student.

Method2: There was a significant effect based off whether the student used method 1 or method 2 on the GPA improvement of the student.

Gender1: There was a significant effect based off whether the student was male or female on the GPA improvement of the student.

Method1:Gender1: The effect on whether or not a note taking method was used had on the amount of GPA improvement is most likely the same for men and women.

Method2:Gender1: The effect on whether the student used note taking method 1 or method 2 had on the amount of GPA improvement is most likely the same for men and women.

To conclude, both men and women significantly benefit from using a note taking strategy, specifically they seem to gain the most GPA improvement through note taking method 2. There does not seem to be any significant effect between the method of note taking and gender of the student, on the amount of GPA improvement.