Exam 5 -- Due Wednesday, May 6th, by noon

Round answers to 3 nonzero decimal places. Do not use scientific notation! If a p-value is very small, write it as p < .001 (as per APA style guidelines).

Warning: significance stars have been erased. The alpha level is set by default at .05.

> CHILD = read.csv("http://ww2.coastal.edu/kingw/psyc480/data/children.csv")
> summary(CHILD)

Gender       Age            Height          Weight
f:111   Min.   :139.0   Min.   :50.50   Min.   : 50.5
m:126   1st Qu.:148.0   1st Qu.:58.80   1st Qu.: 85.0
        Median :163.0   Median :61.50   Median :101.0
        Mean   :164.4   Mean   :61.36   Mean   :101.3
        3rd Qu.:178.0   3rd Qu.:64.30   3rd Qu.:112.0
        Max.   :250.0   Max.   :72.00   Max.   :171.5

> dim(CHILD)
[1] 237   4

These data are from a study of child development and were obtained at:
The original source is Lewis T. and Taylor L.R. (1967). Introduction to
Experimental Ecology, New York: Academic Press. The variables are obvious,
I think. Age is in months, Height is in inches, and Weight is in pounds.

We are interested in the relationship between Gender and Weight.

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1) What kind of variable is Gender, categorical or numeric? (2 pts)

type answer here -> categorical

2) How many subjects were used in this study? (2 pts)

type answer here -> 237

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> t.test(Weight ~ Gender, data=CHILD, var.eq=T)

Two Sample t-test
data:  Weight by Gender
t = -1.8146, df = 235, p-value = 0.07086
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -9.5317325  0.3916638
sample estimates:
mean in group f mean in group m
 98.87838       103.44841

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3) Was there a significant difference in Weight between female children and
male children? Give the p-value. (4 pts)

type yes/no answer here -> no

type the p-value here -> p = .07086 or .0709

4) What was the difference between the means? (2 pts)

type answer here -> 4.57003 or 4.570
The mean Age for female and male children in this sample is the same, but the mean Height is not. Can the difference in Height account for the difference in body Weight, or is there some other factor in addition to Height that creates a difference between boys and girls? (I was taught in my developmental psych class that there is, but let's see what the data have to say.)

> summary(lm(Weight ~ Height + Gender, data=CHILD))

Call:
  lm(formula = Weight ~ Height + Gender, data = CHILD)

Residuals:
    Min     1Q Median     3Q    Max
-24.419  -8.425  -1.639   6.654  47.239

Coefficients:
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)         -134.5375    12.6092  -10.670   <2e-16
Height               3.8564     0.2074   18.592   <2e-16
Genderm              -1.5118     1.6366   -0.924    0.357
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Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 12.32 on 234 degrees of freedom
Multiple R-squared:  0.6019,    Adjusted R-squared:  0.5985
F-statistic: 176.9 on 2 and 234 DF,  p-value: < 2.2e-16

Note: the interaction was not significant, p = .276.

****************************************QUESTIONS****************************************

5) In the regression analysis, was Height significantly related to Weight? (4 pts)

    type yes/no answer here -> yes
    type the p-value here -> p < .001

6) After Height was controlled, was there a significant relationship between Gender and Weight? (4 pts)

    type yes/no answer here -> no
    type the p-value here -> p = .357

7) After Height was controlled, what was the adjusted difference in Weight means between girls and boys? (2 pts)

    type answer here -> -1.512

8) Which group had the higher mean Weight after adjusting for Height, boys or girls? (2 pts)

    type answer here -> girls

9) Was this difference statistically significant? (4 pts)

    type yes/no answer here -> no
    type the p-value here -> p = .357

****************************************QUESTIONS****************************************

> summary(aov(Weight ~ Height + Gender, data=CHILD))

Df Sum Sq Mean Sq F value Pr(>F)
Height 1 53555 53555 352.916 <2e-16
Gender 1  129  129  0.853 0.357
Residuals 234 35510 152

****************************************QUESTIONS****************************************
10) Calculate the delta R-squared at each step. (4 pts)

   delta R-squared for Height: type answer here -> .60043 or .600
   delta R-squared for Gender: type answer here -> .00145

11) Was the delta R-squared for Gender significantly different from zero? (4 pts)

   type yes/no answer here -> no
   type the p-value here -> p = .357

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End of first problem. 34 pts so far.
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> MOM = read.table("http://ww2.coastal.edu/kingw/psyc480/data/ Leerkes.txt", header=T, row.names=1)
> summary(MOM)

Esteem         MatCare         Efficacy
Min.   :1.550   Min.   :1.750   Min.   :2.900
1st Qu.:3.167   1st Qu.:2.833   1st Qu.:3.500
Median :3.500   Median :3.418   Median :3.700
Mean   :3.464   Mean   :3.318   Mean   :3.629
3rd Qu.:4.000   3rd Qu.:3.854   3rd Qu.:3.800
Max.   :4.000   Max.   :4.000   Max.   :4.000
> dim(MOM)
1] 92  3

These are data from Esther M. Leerkes and Susan C. Crockenberg (2002). The Development of Maternal Self-Efficacy and Its Impact on Maternal Behavior. Infancy, 3(2), 227-247. These researchers were interested in maternal self-efficacy (do you think you're a good or capable mom?) in mothers who had just had their first child and had been caring for the child for 6 months. Their theory (somewhat simplified) was that how positive they feel about their own mothering skills has a lot to do with how their own mothers treated them as children. However, they believed this effect was not direct but was mediated through self-esteem. Thus, they proposed the following causal theory.

MatCare -> Esteem -> Efficacy  (their theory of maternal self-efficacy)

The variables in this data frame are:
   Esteem - score on the Adult Self-Perception Profile; Global Self-Esteem Subscale (higher=more)
   MatCare - based on a score derived from the Parental Bonding Instrument, which assesses recollections of maternal care received from one's mother (among other things) (higher=better care)
   Efficacy - score on the Maternal Self-Efficacy Scale (higher=more)

> summary(lm(Efficacy ~ MatCare + Esteem, data=MOM))

Call:
  lm(formula = Efficacy ~ MatCare + Esteem, data = MOM)

Residuals:
     Min      1Q  Median      3Q     Max
-0.67267 -0.15320  0.05492  0.17425  0.39632

Coefficients:  Estimate Std. Error t value Pr(>|t|)
   (Intercept)   2.93609    0.17318  16.954  < 2e-16
   MatCare       0.05653    0.04360   1.297  0.19809
   Esteem       0.14597    0.04830   3.022  0.00328
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.23 on 89 degrees of freedom
Multiple R-squared:  0.1578,  Adjusted R-squared:  0.1389
F-statistic: 8.341 on 2 and 89 DF,  p-value: 0.0004786
12) This multiple regression analysis shows what kind of effects, direct, indirect, or total? (2 pts)

type your answer here -> direct

13) This multiple regression analysis fails to find evidence of an effect of MatCare on Efficacy, p = .198. This suggests that the researchers' theory of maternal self-efficacy is wrong. True or False? (2 pts)

type your true/false answer here -> false

14) What is this analysis called? (2 pts)

type your answer here -> hierarchical regression

15) This type of analysis shows what kind of effects, provided the causal theory underlying it is correct? (2 pts)

type answer here -> total

16) In this analysis, was the effect of MatCare on Efficacy significant? (4 pts)

type yes/no answer here -> yes

type the p-value here -> p = .00727

17) Calculate the R-squared values at each step. (6 pts)

delta R-squared for MatCare: type answer here -> .0714
delta R-squared for Esteem: type answer here -> .0864
total multiple R-squared: type answer here -> .158

18) If the effect of Esteem were to be controlled or removed before MatCare were tested, would MatCare have a significant effect on Efficacy? (2 pts)

type yes/no answer here -> no

19) What have we forgotten to do in this analysis? (2 pts)

type answer here -> check for a significant interaction

20) Are these two analyses taken together consistent with the researchers' theory of maternal self-efficacy? Explain. (4 pts)

type your answer below this line:

Yes. There is no direct effect of MatCare on Efficacy, consistent with the theory that the effect of MatCare is mediated through Esteem. There is a total effect of MatCare of Efficacy, and there is also an effect of Esteem on Efficacy.