Self-Assessment
Week 1: Review of Basics

Answers

1. Write a directional, non-directional, and null hypothesis for the following variables:

IV = grade retention (retained vs. not retained)
DV = degree of alienation from school a student feels (ranges from 1 = no feelings of alienation to 50 = very extreme feelings of alienation).

Degree of alienation ranges from a low of 1 to a high of 50 with 50 indicating the highest level of alienation obtainable with the measuring device. You must label which hypotheses are directional, non-directional, and null to receive credit.

Since the IV is categorical (nominal), hypotheses should focus on group differences, not relationships.

Directional: **Those retained will have greater alienation than those not retained a grade.**
Non-directional: **There will be a difference in alienation between those retained and those not retained a grade.**
Null: **There will be no difference in alienation between those retained and those not retained a grade.**

2. Write a directional, non-directional, and null hypothesis for the following variables:

IV = attitude toward school (ranges from 1 = very negative attitude and 15 = very positive attitude)
DV = amount of financial contribution (i.e., US dollars) to school.

You must label which hypotheses are directional, non-directional, and null to receive credit.

Since the IV is quantitative (ordinal [with many categories], interval, or ratio), hypotheses should focus on relationships, not comparisons or group differences.

Directional: **The more positive one's attitude toward school, the greater will be the financial contribution**
Non-directional: **There is a relationship between one's attitude toward school and financial contribution.**
Null: **There is no relationship between one's attitude toward school and financial contribution.**

3. Below is a frequency distribution. Find the mean, median, mode, SD, Range, and sample size for these scores.

Score	Frequency
15	1
14	3
13	1
12	2
11	0
10	2

The frequency distribution above shows the frequency of each score. The scores occur as follows:
15 14 14 14 13 12 12 10 10

These scores were entered into SPSS, the Frequency command was used to obtain descriptive statistics, and the following results were obtained.

Statistics

Scores

N	**Valid**	**9**
	Missing	**0**
Mean		**12.6667**
Std. Error of Mean		**.60093**
Median		**13.0000**
Mode		**14.00**
Std. Deviation		**1.80278**
Variance		**3.250**
Range		**5.00**
Minimum		**10.00**
Maximum		**15.00**

4. I take blood pressure medication. I was curious whether blood pressure medication could possibly influence my heart rate. Below are measures of my heart rate per minute each morning after exiting my bed. One set of measures occurred while taking Ziac, and the second set of measures occurred while taking Lisinoprol. Is there any difference in heart rate between these two blood pressure medications? Present results in APA style. Also, use t-test results that assume equal variances between groups.

Ziac (10 mg)	54	51	53	50	48	47	48	49	48	50	49	48
Lisinoprol (12.5 mg)	60	57	64	64	62	61	56	65	63	59	58	

SPSS Results

Group Statistics

	Drug	N	Mean	Std. Deviation	Std. Error Mean
Heart_Rate	1.00	12	49.5833	2.15146	.62107
	2.00	11	60.8182	3.06001	.92263

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Heart_Rate	Equal variances assumed	2.435	.134	-10.259	21	.000	-11.23485	1.09517	-13.51238	-8.95732
	Equal variances not assumed			-10.102	17.79	.000	-11.23485	1.11219	-13.57341	-8.89628

APA Styled Results

Table 4

Results of t-test and Descriptive Statistics for Heart Rate by Drug

	Sex								
	Ziac			Lisinoprol			95% CI for Mean Difference		
	M	SD	n	M	SD	n		t	df
Heart Rate.	49.58	2.15	12	60.82	3.06	11	-13.51, -8.96	-10.26	21

*** p < .05.**

There is a statistically significant mean difference in heart rate between Ziac and Lisinoprol. With Ziac, the heart rate is about 11 beats slower per minute than with Lisinoprol.

5. In addition to heart rate measures noted above, I also record my weight and blood pressure. These measures were recorded while taking Ziac. What is the relationship between weight, heart rate, and the two measures of blood pressure? Present results in APA style.

The data appear in the table below. To alleviate the data entry task, these data can be downloaded as an SPSS data or Excel data file from the link that appears below.

SPSS: http://www.bwgriffin.com/gsu/courses/edur8132/selfassessments/Week01/Week01Q5Data.sav

Excel: http://www.bwgriffin.com/gsu/courses/edur8132/selfassessments/Week01/Week01Q5Data.xlsx

Weight (lbs)	Heart Rate	systolic	diastolic
218	44	144	93.5
219	45	135.5	94
217	52	134	87.5
223	47	155.5	95
223	53	161.5	102.5
224	48	154.5	102
224	49	144	95
228	49	151.5	101.5
227	51	155.5	106
226	51	158.5	98
227	56	155	103.5
223	48	158	101
225	52	148	102.5
221	47	174	105.5
221	45	180.5	108
223	46	163	104
222	52	160	106
222	57	162.5	107
205	49	140.5	92
205	48	125	85
208	52	160	102
205	53	153.5	98
208	47	154	98
210	48	142	92
209	49	137.5	96

207	48	138	91.5
212	50	158.5	95
208	53	129.5	93

SPSS Results

Descriptive Statistics

	Mean	Std. Deviation	N
Weight (lbs)	217.50	7.937	28
Heart Rate	49.61	3.213	28
systolic	151.21	12.923	28
diastolic	98.393	6.1061	28

Correlations

		Weight (lbs)	Heart Rate	systolic	diastolic
Weight (lbs)	Pearson Correlation	1	.078	.485**	.605**
	Sig. (2-tailed)		.694	.009	.001
	N	28	28	28	28
Heart Rate	Pearson Correlation	.078	1	.024	.232
	Sig. (2-tailed)	.694		.902	.235
	N	28	28	28	28
systolic	Pearson Correlation	.485**	.024	1	.849**
	Sig. (2-tailed)	.009	.902		.000
	N	28	28	28	28
diastolic	Pearson Correlation	.605**	.232	.849**	1
	Sig. (2-tailed)	.001	.235	.000	
	N	28	28	28	28

**. Correlation is significant at the 0.01 level (2-tailed).

APA Styled Results

Table 5

Correlations and Descriptive Statistics for Weight, Heart Rate, and Blood Pressure

	1	2	3	4
1. Weight	---			
2. Heart Rate	.078	---		
3. Systolic	.485*	.024	---	
4. Diastolic	.605*	.232	.849*	---
M	217.50	49.61	151.21	98.39
SD	7.94	3.21	12.92	6.11

Note. n = 28.

* p < .05.

Results show statistically significant correlations between weight and both measures of blood pressure, and between the two measures of blood pressure. Heart rate is not statistically correlated with any of the other variables. As weight increases, so too do both measures of blood pressure (systolic and diastolic). Similarly, as one blood pressure measure increases, the other also increasesr. Heart rate does not seem to change in a systematic way with weight or blood pressure.

6. What is a Type 1 error in hypothesis testing?

Incorrectly rejecting a true null. When one claims, based upon sample data, there is an effect (a relationship or group difference) when in fact there is not an effect in the population. For example, claiming there is a benefit to peer tutoring when in fact there is no benefit.

7. What is a Type 2 error in hypothesis testing?

Failing to reject a false null. When one claims, based upon sample data, there is no effect (no relationship or no group difference) when in fact there is an effect in the population. For example, claiming there is no benefit to peer tutoring when in fact there is a benefit.

8. What is alpha (α)?

Probability of committing a Type 1 error.

9. What is beta (β)?

Probability of committing a Type 2 error.

10. What is power ($1-\beta$)?

Probability of not committing a Type 2 error; probability of detecting an effect (a relationship or group difference) if there is an effect in the population.

11. Assume the p-value for a Pearson correlation is 0.16. What does this p-value tell us?

A p-value of 0.16 for a Pearson correlation tells us that the probability of obtaining a Person correlation this extreme or more extreme (in either in a positive or negative direction), assuming the null hypothesis of no relationship is true, in a random sample of size n, is 0.16 or 16%. Thus, the p-value is the likelihood of obtaining a similar or more extreme result (Pearson r) if Ho is true for a random sample of size n.

12. For each of the following indicate whether the decision regarding the null hypothesis is reject or fail to reject. When needed, assume $\alpha = .05$.

	Obtained Statistic	Test Information	Decision
(a)	t = -3.26	Critical t = ± 2.85	**Reject**
(b)	$b_1 = 0.01$	p-value = .16	**Fail to Reject**
(c)	F = 0.008	Critical F = 3.86	**Fail to Reject**
(d)	t = -3.75	p-value = .01	**Reject**
(e)	Z = 1.97	p-value = .049	**Reject**

13. For each scenario indicate whether a Type 1, a Type 2, or no error occurred.

(a) Assume there is a strong, positive relationship between variable X (number of 6th grade students in a teacher's classroom) and variable Y (amount of stress that 6th grade teachers experience during the school day) in the population of 6th grade teachers in the United States. That is, the more 6th grade students in the classroom, the more stress the teacher experiences. As with any educational study, researchers investigating the relationship between X and Y are not aware of the true relationship in the population, so researchers must conduct studies with samples and then use inferential statistics to make decisions whether to reject the null hypothesis (Ho: There is no relationship between X and Y) or fail to reject the null hypothesis. A local researcher wishes to study the relationship between X and Y and he samples 6th grade teachers from local counties. After collecting relevant data, the researcher finds a strong, positive relationship between X and Y and therefore rejects the null hypothesis. The local researcher infers there is a positive relationship between X and Y in the population of 6th grade teachers in the United States.

No error.

(b) Assume there is a strong, positive relationship between variable X (number of hours per week a child reads for pleasure) and variable Y (language arts scores in the classroom) in the population of 3rd grade students in the United States. As with any educational study, researchers investigating the relationship between X and Y are not aware of the true relationship in the population, so researchers must conduct studies with samples and then use inferential statistics to make decisions whether to reject the null hypothesis (Ho: There is no relationship between X and Y) or fail to reject the null hypothesis. A local researcher wishes to study the relationship between X and Y and he samples 3rd grade students from Bulloch County. After collecting relevant data, the researcher finds no relationship between X and Y and therefore fails to rejects the null hypothesis. The local researcher infers there is no relationship between X and Y in the population of 3rd grade students in the United States.

Type 2 error.

(c) Assume there is no relationship between variable X (number of 6th grade students in a teacher's classroom) and variable Y (amount of stress that 6th grade teachers experience during the school day) in the population of 6th grade teachers in the United States. That is, the number of 6th grade students in the classroom does not influence the level of stress a teacher experiences. As with any educational study, researchers investigating the relationship between X and Y are not aware of the true relationship in the population, so researchers must conduct studies with samples and then use inferential statistics to make decisions whether to reject the null hypothesis (Ho: There is no relationship between X and Y) or fail to reject the null hypothesis. A local researcher wishes to study the relationship between X and Y and he samples 6th grade teachers from local counties. After collecting relevant data, the researcher finds no relationship between X and Y and therefore fails to reject the null hypothesis (i.e., the researcher states that he believes the null

hypothesis is correct). The local researcher infers that X and Y are unrelated in the population of 6th grade teachers in the United States.

No error.

(d) A researcher found a statistically significant difference between group means. If the researcher committed an error in hypothesis testing, which error is possible?

Type 1 error. The phrasing that one found a statistically significant difference (or relationship) means Ho was rejected. If Ho is rejected, then only a Type 1 error is possible.