

### Assignment 2: Correlation

Use the following data to determine if there is a relationship between math anxiety and math GPA. Higher math anxiety scores indicate higher math anxiety.

Participant	Math Anxiety	Math GPA
1	10	4.00
2	90	1.75
3	85	2.50
4	50	3.00
5	50	3.00
6	75	2.50
7	20	4.00
8	25	2.50
9	30	3.75
10	40	1.75

### SPSS Instructions

- On the bottom left, click Variable View.
- Enter 'MatAnx' in the first cell.
- Enter 'MatGPA' in the cell below the first cell.
- On the bottom left, click Data View.
- Enter the Math Anxiety scores in the first column.
- Enter the Math GPA scores in the second column.
- Click Analyze, Correlate, Bivariate.
- Move the MatAnx and MatGPA icons over to the Variables box.
- Click OK.
- Save the Data file and Output file separately. Use informative file names.

### SPSS Data

\*Untitled1 [DataSet0] - IBM SPSS Statistics Data Editor

	MatAnx	MatGPA	var	var
1	10.00	4.00		
2	90.00	1.75		
3	85.00	2.50		
4	50.00	3.00		
5	50.00	3.00		
6	75.00	2.50		
7	20.00	4.00		
8	25.00	2.50		
9	30.00	3.75		
10	40.00	1.75		
11				
12				

### SPSS Output

### Correlations

		MatAnx	MatGPA
MatAnx	Pearson Correlation	1	-.682*
	Sig. (2-tailed)		.030
	N	10	10
MatGPA	Pearson Correlation	-.682*	1
	Sig. (2-tailed)	.030	
	N	10	10

\*. Correlation is significant at the 0.05 level (2-tailed).

### Written Answers

Show all work.

- (1) Provide the notation for the null and research hypotheses, and a written statement for the former.
- (2) Calculate r.
- (3) Is r statistically significant for  $\alpha .05$ , and how do you know?

- (4) Provide the result in APA format and write a conclusion statement.
- (5) If you use  $\alpha .05$  and the null hypothesis is true, what is the probability of rejecting the null hypothesis, and what is it called?
- (6) If you use  $\alpha .05$  and the null hypothesis is true, what is the probability of not rejecting the null hypothesis?
- (7) What is the probability of rejecting a false null hypothesis, and what is it called?
- (8) What is the probability of not rejecting a false null hypothesis, and what is it called?
- (9) The SPSS Output gives you a value for "Sig. (2-tailed)" which is known as a p-value. What is the number and what does it represent?

1.)

$$H_0: \rho=0$$

$$H_1: \rho \neq 0$$

Null hypothesis: There is no statistically significant linear relationship between math anxiety and math GPA.

2.)

$$r = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{(N \sum x^2 - [\sum x]^2)(N \sum y^2 - [\sum y]^2)}}$$

$$10 \times 4 = 40$$

$$90 \times 1.75 = 157.5$$

$$85 \times 2.5 = 212.5$$

$$50 \times 3 = 150$$

$$50 \times 3 = 150$$

$$75 \times 2.5 = 187.5$$

$$20 \times 4 = 80$$

$$25 \times 2.5 = 62.5$$

$$30 \times 3.75 = 112.5$$

$$40 \times 1.75 = 70$$

$$N \sum XY = 10 \times (40 + 157.5 + 212.5 + 150 + 150 + 187.5 + 80 + 62.5 + 112.5 + 70) = 12,225$$

$$(\sum X) = 10 + 90 + 85 + 50 + 50 + 75 + 20 + 25 + 30 + 40 = 475$$

$$(\sum Y) = 4 + 1.75 + 2.5 + 3 + 3 + 2.5 + 4 + 2.5 + 3.75 + 1.75 = 28.75$$

$$(\sum X)(\sum Y) = 475 \times 28.75 = 13656.25$$

$$N \sum X^2 = 10 \times (10^2 + 90^2 + 85^2 + 50^2 + 50^2 + 75^2 + 20^2 + 25^2 + 30^2 + 40^2) = 295,750$$

$$(\sum X)^2 = 475^2 = 225,625$$

$$N \sum Y^2 = 10 \times (4^2 + 1.75^2 + 2.5^2 + 3^2 + 3^2 + 2.5^2 + 4^2 + 2.5^2 + 3.75^2 + 1.75^2) = 889.38$$

$$(\sum Y)^2 = 28.75^2 = 826.563$$

**r = -.68**

$$r = \frac{12,225 - 13,656.25}{\sqrt{(295,750 - 225,625)(889.38 - 826.563)}} \quad r = \frac{-1431.25}{\sqrt{(70,125)(62.817)}}$$

3.)

Yes. For  $N - 2$  df, which is  $10 - 2 = 8$  df, the critical values for  $\alpha = .05$  are  $\pm .632$ . The test statistic of  $.68$  is less than  $-.632$  so it's statistically significant and we reject  $H_0$ .

4.)

Result in APA format:  $r(8) = -.68, p = .03$

Conclusion: There is a statistically significant negative linear relationship between math anxiety and math GPA, such that the higher the math anxiety the lower the math GPA.

5.)

.05 or 5%. It is called a Type I error

6.)

$1 - .05 = .95$  or 95%

7.)

$1 - \beta$ . It's called power.

8.)

$\beta$ . It's called a Type II error

9.)

The number is .03.

It represents alpha.