EDUR 7130 Presentation 5d Pearson Correlation

1. Pearson Correlation

1a. Characteristics

Pearson r

- r = Pearson's correlation coefficient
- used to assess a linear relation between two quantitative variables
- ranges from -1.00 to 1.00
- r = 0.00 means no linear relation, but there may be a non-linear relation
- the closer r to 1.00 in absolute value, the stronger the relationship, the closer to 0.00, the weaker the relationship

1b. General Interpretation

a. Found r = -.77 between car <u>horsepower</u> and <u>MPG</u>. What does this tell us; what is the interpretation of this correlation in terms of the variables examined?

Negative relationship ---- The greater the car horsepower, the lower will be expected MPG.

b. Found r = .40 between <u>reading self-efficacy</u> and <u>reading test scores</u>. What does this tell us; what is the interpretation of this correlation in terms of the variables examined?

Positive relationship --- The higher reading self-efficacy, the higher will be reading test scores, on average.

c. Found r = .00 between student weight and interest in mathematics. What does this tell us?

No linear relationship --- student weight and interest in mathematics does not appear to be linearly related; one cannot predict interest in mathematics based upon one's weight.

2. Reading Published Correlation Tables

Example 1

Menon, ST (2001). Employee empowerment: An integrative psychological approach. Applied psychology: An international review, 50, 153-180.

Source:

http://www.bwgriffin.com/gsu/courses/edur9131/activities/Menon_ST_2001_employee_empowerment_Applied_Psyc hology.pdf

TABLE 1 Means, Standard Deviations, and Intercorrelations

Item*	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Perceived Control																
1. PC1	4.58	1.18														
2. PC2	4.50	1.26	.57													
3. PC3	4.72	1.11	.44	.61												
4. PC4	4.47	1.29	.75	.57	.45											
5. PC5	4.87	1.01	.43	.48	.36	.46										
Perceived Competence	e															
6. COMP1	5.54	0.62	.15	.14	.25	.15	.06									
7. COMP2	5.53	0.69	.09	.10	.16	.11	.13	.45								
8. COMP3	5.56	0.57	.16	.13	.28	.18	.12	.66	.63							
9. COMP4	5.39	0.79	.24	.27	.32	.30	.15	.33	.37	.43						
10. COMP5	5.26	0.77	.19	.18	.37	.26	.15	.37	.38	.45	.47					
Goal Internalisation																
11. GI1	4.45	1.18	.29	.38	.40	.34	.42	.05	.20	.18	.23	.19				
12. GI2	4.67	1.11	.29	.39	.43	.38	.38	.17	.11	.17	.24	.20	.68			
13. GI3	4.79	0.92	.34	.39	.44	.30	.35	.16	.21	.20	.32	.27	.46	.55		
14. GI4	4.38	1.19	.29	.36	.43	.39	.40	.10	.22	.22	.28	.25	.73	.69	.52	
15. GI5	5.25	0.95	.29	.34	.38	.36	.41	.08	.16	.25	.32	.29	.45	.52	.43	.52

* Item wordings are available in Table 2.

Correlations <.12 nonsignificant. Correlations .12 to .15, p <.05. Correlations .16 to .19, p <.01. All other correlations, p <.001

Example 2

Source: Pintrich & De Groot (1990) Motivational and Self-Regulated Learning Components of Classroom Academic Performance. Journal of Ed. Psychology, 82, 33-40.

Table 2

Zero-Order Correlations Between Motivation and Self-Regulated Learning Variables and Performance

Variable	Grade 1	Seat- work	Exams/ Quizzes	Essays/ Reports	Grade 2
Motivation components					
Intrinsic value	.25**	.21**	.20**	.27**	.30***
Self-efficacy	.34***	.19*	.24**	.25**	.36***
Test anxiety	24**	14	21**	14	23**
Self-regulated learning components					
Strategy use	.18*	.07	.20**	.19*	.20**
Self-regulation	.32***	.22**	.28**	.36***	.36***

Note. N = 173.

* p < .05. ** p < .01. *** p < .001.

Example 3

Source: Martinez, Gudino, & Lau (2013) Problem-Specific Racial/Ethnic Disparities in Pathways from Maltreatment Exposure to Specialty Mental Health Service Use for Youth in Child Welfare. Child Maltreatment, 18, 98-107.



3. Worked Example 1: Car MPG and Car Weight

Below is a random sample of 9 cars with their MPG and weight (pounds). Is there a relation between car MPG and weight?

Car MPG	Car Weight
21	4290
21	2750
19	3200
35	2050
18	3670
26	1830
41	2040
22	3220
24	2750

Null Hypothesis

What is the written null hypothesis for MPG and weight?

What would be the NULL hypotheses for the above predictions?

Written:

No correlation between car MPG and weight.

Symbolic:

Ho: $\rho_{(MPG,Weight)} = 0.00$

 ρ = Greek rho, population correlation coefficient

r = English r, sample correlation coefficient

Excel Pearson r Correlation Spreadsheet

	А	В	с	D	E	F	
1	Enter Data Bel	ow (up to 300)	Both Y and X	Note: This sheet	Note: This sheet is protected so for		
2	Variable 1	Variable 1 Variable 2		sheet to access cells other t			
3	21	4290	1				
4	21	2750	1	Pearson r =	-0.711553		
5	19	3200	1	n (sample size) =	9		
6	35	2050	1	t test for r =	-2.68		
7	18	3670	1	p-value for r =	0.031569		
8	26	1830	1	p-value for r =	0.031569		
9	41	2040	1				
10	22	3220	1		Sc	att∉	
11	24	2750	1	4500			
12			0	1000	•		
12			0	4000			

Screenshots here of data entry and results

Reject or Fail to Reject Ho?

Use p-value to decide whether to reject or fail to reject Ho (no correlation between MPG and weight). Use alpha of .05 (remember, alpha is the probability of making a Type 1 error – claiming a relationship exists when it does not).

Decision rule for p-values:

If $p \le \alpha$ reject Ho; if $p > \alpha$ fail to reject Ho

Both Pearson r and p-value are noted above by the red arrows.

The Pearson correlation is r = -.711p-value for this this correlation is p = .0315

Insert p-value and alpha level

Since p = .031 is less than alpha = .05, reject the null.

Interpretation of Results

Data show there is a negative correlation between MPG and car weight (r = -.71), and is significant at the .05 level.

4. Worked Example 2: Life Expectancy and Access to Safe Water

Below is a random sample of 10 countries with their average life expectancy at birth and percentage of the country's population with access to safe drinking water. Is there a relation between life expectancy and the percentage with access to safe drinking water?

Country	Life	Percent of Population with		
	Expectancy	Access to Safe Water		
Chile	75	85		
Croatia	73	63		
Netherlands	78	100		
Cuba	76	93		
France	78	100		
Ukraine	67	55		
Dominican Republic	71	71		
Uzbekistan	69	57		
Tajikistan	69	69		

Null Hypothesis

What is the written null hypothesis for life expectancy and percent with access to safe water?

Written:

No correlation between life expectancy and percent of population with access to safe water.

Symbolic:

Ho: $\rho_{(life,water)} = 0.00$

ρ = Greek rho, population correlation coefficientr = English r, sample correlation coefficient

Excel Pearson r Correlation Spreadsheet

Screenshots here of data entry and results

	А	В	С	D	E	F		
1	Enter Data Be	low (up to 300)	Both Y and X	Note: This sheet is protected so for				
2	Variable 1	Variable 2	present?	sheet to access cells other t				
3	75.000	85.000	1					
4	73.000	63.000	1	Pearson r =	0.936320			
5	78.000	100.000	1	n (sample size) =	9			
6	76.000	93.000	1	t test for r =	7.05			
7	78.000	100.000	1	p-value for r =	0.000202			
8	67.000	55.000	1	p-value for r =	0.000202			
9	71.000	71.000	1					
10	69.000	57.000	1		Sc	atte		
11	69.000	69.000	1	120.000				
12			0	120.000				

Reject or Fail to Reject Ho?

Use alpha of .05 (remember, alpha is the probability of making a Type 1 error – claiming a relationship exists when it does not). Use p-value to decide whether to reject or fail to reject Ho (no correlation between MPG and weight).

Decision rule for p-values:

If $p \le \alpha$ reject Ho; if $p > \alpha$ fail to reject Ho

Both Pearson r and p-value noted above with red arrows.

Pearson r = .936 p-value = 0.0002

Insert p-value and alpha level

If .0002 ≤ .05 reject Ho; if .0002 > .05 fail to reject Ho

Reject null since p is less than alpha.

Interpretation of Results

There is positive and statistically significant relation between life expectancy and percent of population with access to safe water. Results show that the more people with access to safe water, the higher the life expectancy in that country.