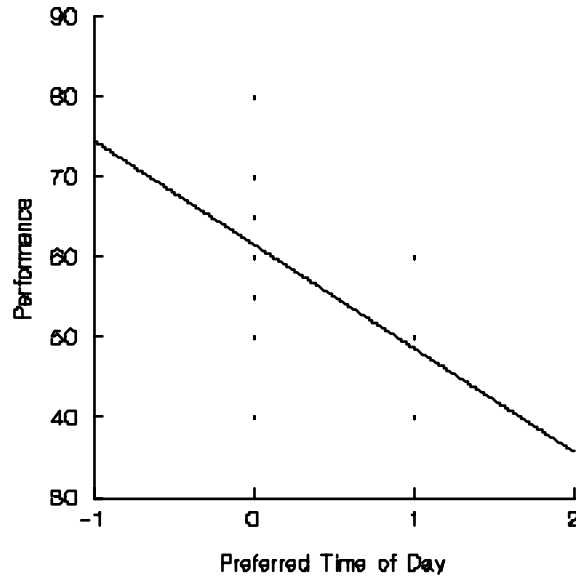


Chapter 10 - Alternative Correlational Techniques

10.1 Performance ratings in the morning related to perceived peak time to day:

a. Plot of data with regression line:



b.

$$s_X = 0.489$$

$$s_Y = 11.743$$

$$\text{cov}_{XY} = -3.105$$

$$r_{pb} = \frac{\text{cov}_{XY}}{s_X s_Y} = \frac{-3.105}{(0.489)(11.743)} = -.540$$

$$t = \frac{r\sqrt{(N-2)}}{\sqrt{1-r^2}} = \frac{(-.540)\sqrt{18}}{\sqrt{.708}} = \frac{-2.291}{.842} = -2.723 \quad [p < .01]$$

c. Performance in the morning is significantly related to people's perceptions of their peak periods.

10.3 It looks as if morning people vary their performance across time, but that evening people are uniformly poor.

10.5 Running a t test on the data in Exercise 10.1:

$$\bar{X}_1 = 61.538 \quad s_1^2 = 114.103 \quad n_1 = 13$$

$$\bar{X}_2 = 48.571 \quad s_2^2 = 80.952 \quad n_2 = 7$$

$$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} = \frac{(13 - 1)114.103 + (7 - 1)80.952}{13 + 7 - 2} = 103.053$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{s_p^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}} = \frac{61.538 - 48.571}{\sqrt{103.053 \left(\frac{1}{13} + \frac{1}{7} \right)}} = 2.725$$

$$[t_{.025(18)} = \pm 2.101] \quad \text{Reject } H_0$$

The t calculated here (2.725) is equal to the t calculated to test the significance of the r calculated in Exercise 10.1.

10.7 Regression equation for relationship between college GPA and completion of Ph.D. program:

$$b = \frac{\text{cov}_{XY}}{s_X^2} = \frac{0.051}{.503^2} = .202$$

$$a = \frac{\Sigma Y - b\Sigma X}{N} = \frac{17 - .202(72.58)}{25} = .093$$

$$\hat{Y} = bX + a = .202X + .093$$

$$\text{When } X = \bar{X} = 2.9032, \hat{Y} = .202(2.9032) + .093 = .680 = \bar{Y}.$$

10.9 Establishment of a GPA cutoff of 3.00:

a.	Ph.D. (Y):	0	0	0	0	0	0	0	0	1
		1	1	1	1	1	1	1	1	1
		1	1	1	1	1	1	1		

	GPA (X):	0	1	0	1	1	0	0	0	1
		0	1	1	1	1	0	1	1	1
		0	0	0	1	1	1	0		

b. $s_X = 0.507$

$$s_Y = 0.476$$

$$\text{cov}_{XY} = 0.062$$

$$\phi = \frac{0.062}{(0.507)(0.476)} = .256$$

$$c. \quad t = \frac{r\sqrt{(N-2)}}{\sqrt{1-r^2}} = \frac{(.256)\sqrt{23}}{\sqrt{.934}} = \frac{1.228}{.967} = 1.27 \quad [\text{not significant}]$$

10.11 Alcoholism and childhood history of ADD:

a. $s_x = 0.471$

$s_y = 0.457$

$\text{cov}_{xy} = 0.135$

$$\phi = \frac{0.135}{(0.471)(0.457)} = .628$$

b. $\chi^2 = N\phi^2 = 32(.628^2) = 12.62 \quad [p < .05]$

10.13 Development ordering of language skills using Kendall's τ

a. $\tau = 1 - \frac{2(\# \text{ inversions})}{\# \text{ pairs}} = 1 - \frac{2(6)}{15(14)/2} = 1 - \frac{23}{105} = .886$

b. $z = \frac{\tau}{\sqrt{\frac{2(2N+5)}{9N(N-1)}}} = \frac{.886}{\sqrt{\frac{2(30+5)}{9(15)(14)}}} = \frac{.886}{\sqrt{.037}} = 4.60 \quad [p < .05]$

$$r_s = \frac{8.1667}{(3.028)(3.028)} = .891$$

10.15 Ranking of videotapes of children's behaviors by clinical graduate students and experienced clinicians using Kendall's τ :

Experienced	New	Inversions
1	2	1
2	1	0
3	4	1
4	3	0
5	5	0

6	8	2
7	6	0
8	10	2
9	7	0
10	9	0

$$\tau = 1 - \frac{2(\# \text{ inversions})}{\# \text{ pairs}} = 1 - \frac{2(6)}{10(9)/2} = 1 - \frac{12}{45} = .733$$

10.17 Verification of Rosenthal and Rubin’s statement

	Improvement	No Improvement	Total
Therapy	66 (50)	34 (50)	100
No Therapy	34 (50)	66 (50)	100
Total	100	100	200

a.

$$\begin{aligned} \chi^2 &= \sum \frac{(O - E)^2}{E} = \frac{(66 - 50)^2}{50} + \frac{(34 - 50)^2}{50} + \frac{(34 - 50)^2}{50} + \frac{(66 - 50)^2}{50} \\ &= 20.48 \end{aligned}$$

b. An $r^2 = .0512$ would correspond to $\chi^2 = 10.24$. The closest you can come to this result is if the subjects were split 61/39 in the first condition and 39/61 in the second (rounding to integers.)

10.19 ClinCase against Group in Mireault’s data

	ClinCase	
	0	1
Loss	69	66
Married	108	73
Divorced	36	23

a. $\chi^2 = 2.815$ [$p = .245$]
 $\phi_c = .087$

b. The difference in Exercise 7.48 was not significant either—in fact the probability was .79.

c. This approach would be preferred over the approach used in Chapter 7 if you had reason to believe that differences in depression scores below the clinical cutoff were of no importance and should be ignored.