Work Problems Chapter 12

Suppose you wanted to know whether there was a correlation between how much time healthy young adults spend exercising and how much sleep they get. You select a random sample of 25 healthy young adults and ask them how many hours they spend exercising per week and how many hours they spend sleeping per week. You find there is a correlation in this sample of .45. Please answer the following questions based on this information.

1. What is the direction of this correlation coefficient? How do you know?

   The direction of this correlation is positive. We know this because there is not a negative sign in front of the number .45.

2. What is the strength of this correlation coefficient? How do you know?

   The strength of this correlation is .45. We know this because that is what the number says. A correlation of .45 would be considered moderately strong.

3. Interpret this correlation coefficient. What does it tell you?

   Because it is positive, we know that as the number of hours spent exercising increases for this sample, so does the number of hours that they sleep, on average. We also know that because this is a moderately strong correlation, and not a very weak one or a very strong one, that this positive association is true for most of the members of the sample, but by no means all of them.

4. Calculate the coefficient of determination and interpret it. What does it tell you?

   $r^2 = (.45)^2 = .2025$. This tells us that 20.25% of the variance in hours slept is explained by hours spent exercising, and vice-versa.

5. Using Appendix B and an alpha level of .05, find the critical *t* value.

   The degrees of freedom for a correlation *t* test is the number of pairs minus 2. In this example, the sample size is 25, so our *df* = 25 – 2 = 23. The *t* tests for correlation coefficients are always 2-tailed. The critical *t* value for an alpha level of .05 and 23 *df*, 2-tailed, is 2.069 (from Appendix B).

6. Calculate the observed *t* value and decide whether this correlation coefficient is statistically significant using an alpha level of .05. Interpret your results. What do they tell you?

$t = (r)\sqrt{\frac{N-2}{1-r^2}}$ **So** $t = (.45)\sqrt{\frac{23}{.7975}}$ **→ .45(5.37) → 2.42. So our observed t value is 2.42.**

The critical t value with 23 df, alpha of .05 and 2 tailed, is 2.069. The $t_c < t_o$, so the results are statistically significant. There is a correlation between hours spent exercising and hours spent sleeping in the population of healthy young adults.

7. Calculate a 95% confidence interval for this correlation coefficient and interpret it. What does it tell you?

To calculate a confidence interval, we first need to calculate a standard error for the correlation coefficient.

$$s = \sqrt{\frac{1-r^2}{N-2}} = \sqrt{\frac{.7975}{23}} = .19.$$

CI_{95} = .45 ± (.19)(2.069) NOTE: We used the critical *t* value with *df* = 23, 2-tailed, alpha = .05

CI_{95} = .45 ± .39

CI_{95} = .06, .84

We are 95% confident that the population correlation coefficient is contained within the interval from *r* = .06 to *r* = .84.