

Sample 4

Problem 4 (16 points)

A medical doctor believes that a new drug for treating cancer will decrease the number of symptoms experienced by patients. The hospital randomly selects 10 cancer patients to receive the drug. The number of symptoms experienced is recorded for 1 week before receiving the drug. Then, the number of symptoms experienced was recorded for the week that the patients were on the drug.

Drug	17	16	16	18	14	12	16	19	13	10
No drug	20	19	17	21	17	16	18	22	15	19

Did the number of symptoms decrease?

Use SPSS to answer the question.

a. Follow the four steps for hypothesis testing. Use $\alpha = .01$. (10 points)

Null hypothesis (H_0): Taking the new cancer treatment does not alter the number of disease symptoms.

Alternative hypothesis (H_1): The new cancer treatment alters the number of disease symptoms.

Paired samples t-test generated the following output:

Output

Paired samples t-test results

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Drug	15.1000	10	2.80674	.88757
	No drug	18.4000	10	2.22111	.70238

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Drug & No drug	10	.652	.041

Paired Samples Test

	Paired Differences			99% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Lower	Upper			
Pair 1 Drug - No drug		-3.30	2.16282	-5.52270	-1.07730	-4.825	9	.001

The test comparing the number of symptoms before and after the treatment indicated a significant decline in the number of symptoms after taking the drug, $t(9) = -4.825$, $p < 0.01$. The significant finding shows that there is sufficient evidence proving that taking the new drug lowers the number of symptoms.

b. Compute the effect size using r^2 . (2 points)

$$r^2 = \frac{t^2}{t^2 + df} = \frac{-4.825^2}{-4.825^2 + 9} = 0.72$$

The effect size (r^2) of 0.72 reveals that the drug had a significant impact. 72% of the variation in the number of symptoms can be attributed to the drug.

c. Calculate the point estimate for μ_D . (2 points)

The point estimate for μ_D is $15.1 - 18.4 = -3.3$

d. Calculate the 99% confidence interval for μ_D . (2 points)

As per the paired samples t-test output, the 99% confidence interval is between -5.52 and -1.08.