Assignment 5: Related-Samples t Test

Use the following data to determine if poker competition causes a change in testosterone.

Participant	Pre-competition T (pg/mL)	Post-competition T (pg/mL)
1	201	240
2	174	255
3	184	150
4	122	121
5	150	184
6	80	155
7	96	75
8	200	239
9	173	199
10	183	149
11	121	120
12	149	179
13	79	165
14	95	74
15	222	283

SPSS Instructions

- On the bottom left, click Variable View.
- Enter 'PreT' in the first cell.
- Enter 'PostT' in the cell below it.
- On the bottom left, click Data View.
- Enter the data scores.
- Click Analyze, Compare Means, Paired-Samples T Test
- Move PostT under Variable1 and PreT under Variable2.
- Click OK.
- Save the Data file and Output file separately. Use informative file names.

SPSS Data

	PreT	PostT
1	201.00	240.00
2	174.00	255.00
3	184.00	150.00
4	122.00	121.00
5	150.00	184.00
6	80.00	155.00
7	96.00	75.00
8	200.00	239.00
9	173.00	199.00
10	183.00	149.00
11	121.00	120.00
12	149.00	179.00
13	79.00	165.00
14	95.00	74.00
15	222.00	283.00

SPSS Output

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PostT	172.5333	15	62.62686	16.17019
	PreT	148.6000	15	47.14234	12.17210

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PostT & PreT	15	.754	.001

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PostT - PreT	23.93333	41.12779	10.61915	1.15752	46.70915	2.254	14	.041

Written Answers

Show all work.

(1) Provide the notation for the null and research hypotheses, and a written statement for the former.
(2) Calculate t by hand, provide the result in APA format, and write a conclusion. Use α .05. You may take the mean and standard deviation of the difference scores from the SPSS Output.
(3) Provide the effect size using Cohen's d and write a conclusion.
(4) Calculate the Confidence Interval for the population mean change using α .05 and write a conclusion.

1.)

H_0: $\mu_1 = \mu_2$
H_1: $\mu_1 \neq \mu_2$

Null hypothesis: There is no statistically significant difference between the population means of testosterone level from before and after poker competition.

2. $t = \frac{\bar{D}}{S_D/\sqrt{N}}$ $\quad t = \frac{23.933}{41.128/\sqrt{15}} = \boxed{2.25}$

$df = N-1 = 14$

The critical values for 14 using $\alpha .05 = \pm 2.15$. The test statistic of $2.25 > 2.15$, so we reject H_0.

Result in APA format: $t(14) = 2.25$, $p = .04 < .05$

Conclusion: There is a statistically significant increase in the population mean of testosterone from before to after poker competition.

3. $\hat{d} = \frac{\bar{X}_1 - \bar{X}_2}{s_1}$ $\quad \hat{d} = \frac{148.6 - 172.533}{47.142} = -.51$. The absolute value is .51 $\boxed{\hat{d} = .51}$

Conclusion: Testosterone increased an average of .51 standard deviations of the pre-competition level, indicating a medium effect.

4. $CI_{.95} = \bar{d} \pm t_{df} \times s_d/\sqrt{N} = 23.933 \pm 2.145 \times 41.128/\sqrt{15}$

$= 23.933 \pm 22.778 = 1.16, 46.71$

$= 1.16 \leq \mu \leq 46.71$ $\quad \boxed{95\%\ CI\ [1.16, 46.71]}$

Conclusion: There is a 95% probability that the interval 1.16 to 46.71 includes the population mean increase in testosterone during poker competition.