Introduction to Lab 11- Two Group Designs

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8 February 2019

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The objective of the two-group design used in Lab 11 was to determine if various types of encoding conditions would change retention and to measure accuracy and response time during the study and test phase to determine what factors influence memory The present study examined levels of processing by manipulating the encoding of words at study in a physical and semantic condition. The study focused on shallow or structural processing (appearance) which is when we encode only the physical qualities of something such as the typeface of a word or how the letters look (shallow versus deep or semantic processing, which happens when we encode the meaning of a word and relate it to similar words with similar meaning. In the test phase, a memory test was conducted to see how well test subjects remembered the words that appeared in the study phase.

During the study phase, subjects were asked questions to induce word processing at a certain level. Accuracy of correctly answering the question, as well as the latency of response was measured. In the test phase, a memory test was conducted to see how well they remembered the words that appeared in the study phase. different conditions were used (i.e. rhyming, capitalization, semantics) and results showed that deeper processing leads to better retention. The conditions that led to further processing were conditions that required fitting into a category or sentence (semantic processing).

It was hypothesized that the questions in the semantic condition would have less accurate results in the study phase than the physical condition, which would show to be most accurate. It was also predicted that the words that were in the semantics condition would be best remembered in the test phase.

	Double-Letter	Difference	Concrete
	12.00	12.00	0
	9.00	8.00	1
	11.00	14.00	-3
	7.00	11.00	-4
	9.00	10.00	-1
	14.00	14.00	0
	5.00	7.00	-2
	8.00	10.00	-2
	5.00	7.00	-2
	10.00	11.00	-1
	11.00	12.00	-1
	13.00	14.00	-1
	12.00	8.00	4
	13.00	10.00	3
	6.00	12.00	-6
	10.00	10.00	0
	7.00	9.00	-2
	13.00	14.00	-1
	10.00	14.00	-4
	9.00	11.00	-2
Average	9.7	10.9	-1.2

St. Dev.	2.736	2.36	2.285
n	20	20	20

From the sample data, it is found that the corresponding sample means are:

$$\bar X_1 = 9.7 \bar{X}_1 = 9.7 \bar X_2 = 10.9 \bar{X}_2 = 10.9$$

Also, the provided sample standard deviations are:

$$s_1 = 2.736 s_1 = 2.736 s_2 = 2.36 s_2 = 2.36$$

and the sample size is n = 20. For the score differences we have

$$\bar D = -1.2 \bar{D} = -1.2 s_D = 2.285 s_D = 2.285$$

(1) *Null and Alternative Hypotheses*

The following null and alternative hypotheses need to be tested:

Ho: $\mu_D \mu_D \geq 0$
Ha: $\mu_D \mu_D < 0$

This corresponds to a left-tailed test, for which a t-test for two paired samples be used.

(2) *Rejection Region*

Based on the information provided, the significance level is $\alpha = 0.2 \alpha = 0.2$, and the degrees of freedom are $df = 19 df = 19$.
Hence, it is found that the critical value for this left-tailed test is $t_c = -0.861 t_c = -0.861$, for $\alpha = 0.2 \alpha = 0.2$ and $df = 19 df = 19$.
The rejection region for this left-tailed test is $R = \{t: t < -0.861\} R = \{t: t < -0.861\}$.

(3) *Test Statistics*

The t-statistic is computed as shown in the following formula:

$$t = \frac{\bar D}{s_D/\sqrt n} = \frac{-1.2}{2.285/\sqrt 20} = -2.349 t = s_D / n \bar{D} = 2.285/20 - 1.2 = -2.349$$

(4) *Decision about the null hypothesis*

Since it is observed that t = -2.349 < t_c = -0.861$t=-2.349<t_c=-0.861$, it is then concluded that *the null hypothesis is rejected.*
Using the P-value approach: The p-value is p = 0.0149$p=0.0149$, and since p = 0.0149 < 0.2$p=0.0149<0.2$, it is concluded that the null hypothesis is rejected.

(5) *Conclusion*

It is concluded that the null hypothesis Ho is *rejected.* Therefore, there is enough evidence to claim that population mean \mu_1μ_1 is less than \mu_2μ_2, at the 0.2 significance level.

Confidence Interval

The 80% confidence interval is -1.878 < \mu_D < -0.522$-1.878<\mu_D<-0.522$.

Graphically