



## PROJECT

## Test a Perceptual Phenomenon

A part of the Data Analyst Nanodegree Program

## PROJECT REVIEW

## NOTES

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Null hypothesis: there is no difference between the sample means

$$H_0 : \mu_{diff} = 0$$

Alternative hypothesis: there is a difference between sample means

$$H_1 : \mu_{diff} \neq 0$$

- ✗ Null and Alternative Hypotheses stated correctly without ambiguity to the variables they represent
- ✓ Mathematical symbols are used to represent the set of hypotheses and are correct.

- The current wording and/or math symbols of the set of hypotheses implies they are concerned with determining the differences between the paired **observations** - or in other words, the samples we have - this is incorrect. We do not need to test to determine the differences between the means of the observations since we already know they are different -  $14.05 \neq 22.02$ . We are trying to determine if the differences we are observing with the sample means are representative of the **population** in general. This distinction is a critical concept in Inferential Statistics. I have provided a guide below to help you better articulate this distinction.

- The idea of hypothesis testing is that we have limited data, **samples**, and from that limited data, we are trying to test our **hypotheses about the population**. Please take a look at the following material to help create a complete answer.
- It is important that students be able to articulate the hypotheses statements accurately. Symbolic representations are required by the rubric and the hypotheses statements should be referencing means. Symbolic representations **alone** without statements and/or statements referring to something other than means are not enough to convey to reviewers that the underlying concepts are understood. The means they are referring to must be specific, as well. Are we talking about the population means or the sample means? Please state this explicitly like in the hypotheses statements below.

#### How to Explicitly State Sets of Hypotheses

**TABLE 16.2** Examples of Null and Alternative Hypotheses in Inferential Statistics

Research Question	Verbal Null ( $H_0$ ) Hypothesis	Symbolic $H_0$ Hypothesis	Verbal Alternative ( $H_1$ ) Hypothesis	Symbolic $H_1$ Hypothesis
Do teachers score higher on the GRE verbal than the national average?	The teacher <u>population</u> GRE verbal <u>mean</u> is equal to the national average of 476.	$H_0: \mu_{\text{GRE V}} = 476$	The teacher <u>population</u> GRE verbal <u>mean</u> is different from the national average of 476.	$H_1: \mu_{\text{GRE V}} \neq 476$
Do males or females tend to score better on the GRE verbal?	The male and female <u>population means</u> are not different.	$H_0: \mu_M = \mu_F$	The male and female <u>population means</u> are different.	$H_1: \mu_M \neq \mu_F$
Do education, arts and sciences, and business students have different starting incomes?	The education, arts and sciences, and business student <u>populations</u> have the same <u>mean</u> starting incomes.	$H_0: \mu_E = \mu_{A\&S} = \mu_B$	At least two of the three <u>population means</u> are different.	$H_1: \text{Not all equal}$

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