RESEARCH HYPOTHESIS

RESEARCH HYPOTHESIS

A research hypothesis is a clear, specific, and testable statement or prediction about the relationship between variables in a study.

It serves as a foundation for conducting research and guides the direction of the investigation.

Hypothesis Testing

1. Definition: A hypothesis test is a statistical method used to determine whether there is enough evidence to reject a null hypothesis in favor of an alternative hypothesis.

The Null and Alternative Hypotheses

Null Hypothesis (H_0): Represents the idea that there is no effect or no difference. It assumes that any observed changes are due to random chance.

For example, H_0 could state that antioxidant levels have no effect on stress coping ability.

Alternative Hypothesis (H_1 or H_A): Represents the idea that there is an effect or a difference. It suggests that the observations are related in some way. For instance, H_1 could state that antioxidant levels do affect stress coping ability.

Null Hypothesis vs. Alternative Hypothesis

Parameter	Null Hypothesis	Alternative Hypothesis
Definition	A null hypothesis is a statement in which there is no relation between the two variables.	An alternative hypothesis is a statement in which there is some statistical relationship between the two variables.
What is it?	Generally, researchers try to reject or disprove it.	Researchers try to accept or prove it.
Testing Process	Indirect and Implicit	Direct and Explicit
p-value	Null hypothesis is rejected if the p-value is less than the alpha-value; otherwise, it is accepted.	An alternative hypothesis is accepted if the p-value is less than the alpha-value otherwise, it is rejected.
Notation	H_0	H_1
Symbol Used	Equality Symbol (=, >=, <=)	Inequality Symbol (!=, <, >)

Assignment: Verify and Comment

A statistical *hypothesis* is an unproven statement which can be tested.

A *hypothesis test* is used to test whether this statement is true.

Steps in Hypothesis Testing

i.   *State Hypotheses*: Clearly define H_0 and H_1.

ii. *Choose Significance Level (α):* Typically set at 0.05, this is the probability of rejecting H_0 when it is actually true.

iii. *Collect Data and Compute Test Statistic*: Use the data to calculate a test statistic and its associated p-value.

iv. *Compare p-value to Significance Level*: If $p \leq \alpha$, reject H_0 in favor of H_1. If $p > \alpha$, fail to reject H_0.

v.   *Interpret Results*: Draw a conclusion based on the comparison.

P-Values

Definition: The p-value is the probability of observing a test statistic as extreme as, or more extreme than, the one observed, assuming H_0 is true.

Common Interpretation:

- $p \leq 0.05p$: Strong evidence against H_0, so reject H_0.

- $p > 0.05p$: Insufficient evidence against H_0, so fail to reject H_0.

One-Tailed vs. Two-Tailed Tests

One-Tailed Test: Used when the alternative hypothesis specifies a direction (e.g., the parameter is greater than or less than a certain value).

Two-Tailed Test: Used when the alternative hypothesis does not specify a direction (e.g., the parameter is different from a certain value).

Type I and Type II Errors

Type I Error: Rejecting H_0 when it is true (false positive). The probability of this error is equal to α.

Type II Error: Failing to reject H_0 when H_1 is true (false negative). The probability of this error is denoted by β.

Parametric vs. Non-Parametric Tests

•**Parametric Tests**: Assume the data follows a specific distribution (e.g., Normal distribution) and test hypotheses about parameters such as the mean.

•**Non-Parametric Tests**: Do not assume a specific distribution and often test hypotheses about medians or ranks.