Formulating Hypotheses

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Outline

- What is a Hypotheses.
- Importance of a Hypothesis.
- Characteristics of a Good Hypothesis.
- Types of Hypotheses.
- Steps in Formulating a Hypothesis

Objectives

❖ By the end of this lecture, students should be able to:

1. Define what a hypothesis is in the context of scientific research.
2. Differentiate between research questions and hypotheses.
3. Identify characteristics of a good hypothesis.
4. Distinguish between null and alternative hypotheses.
5. Formulate clear, testable hypotheses with practical examples.

❑ What is a Hypotheses?

- A hypothesis is a **tentative explanation** or **prediction** that can be tested through research and observation.

- It bridges the gap between a **research problem/question** and the process of **data collection and analysis**.

- A **research question** asks: "What is the relationship between A and B?"
- A **hypothesis** proposes: "A increases/decreases/affects B under certain conditions."

❑ Example of research question asks:

- General form: “What is the relationship between A and B?”

- What is the relationship between physical activity (A) and blood pressure (B) in adults?

❑ Example Hypothesis in Health Sciences:

- General form: Exercise (A) affects memory performance (B) under certain conditions.

- Hypothesis: Regular aerobic exercise increases short-term memory performance in undergraduate students during examination periods.

❑ Importance of a Hypothesis

1. Guides the research design and methods.

2. Helps in focusing the study on a specific problem.

3. Provides a basis for data collection and analysis.

4. Allows prediction and testing.

❑ Characteristics of a Good Hypothesis:

1. **Testable**:– Can be evaluated through experiments, observations.
2. **Clear & Precise**:– Uses specific and unambiguous terms.
3. **Logical**:– Based on existing knowledge or theory.
4. **Falsifiable**:– It should be possible to disprove it
5. **Relevant**:– Directly related to the research problem.

❑ Types of Hypotheses:

1. Null Hypothesis (H_0):

- States that there is no relationship or no difference between variables.

✓ Example: There is no significant difference in academic performance between students who study with music and those who study in silence.

2. Alternative Hypothesis (H_1 or Ha):

- States that there is a relationship or difference.

✓Example: Students who study with music have lower academic performance compared to those who study in silence.

3. Directional Hypothesis: Predicts the specific nature of the relationship (increase/decrease).

✓Example: "Students who sleep 8 hours will score higher than those who sleep less."

4. Non-Directional Hypothesis:

- States a relationship but does not predict the direction.

✓Example: "There is a difference in exam scores between students who sleep 8 hours and those who sleep less."

❑ Steps in Formulating a Hypothesis:

1. Identify the research problem:

- Example: Does exercise improve memory performance?

2. Review existing

3. Define variables clearly

- Independent variable (cause): Exercise
- Dependent variable (effect): Memory performance

4. Formulate the hypothesis: Make a clear, testable prediction.

- Null (H_0): Exercise has no effect on memory performance.
- Alternative (H_1): Exercise improves memory performance.

5. Refine the hypothesis:

- Ensure it meets the characteristics of a good hypothesis.

❖ Examples in Different Fields:

1. Biology/Health Sciences:

- Increased exposure to antibiotics leads to higher bacterial resistance.

2. Social Sciences:

- Students who participate in group discussions perform better on exams than those who study alone.

3. Agriculture:

- Application of organic fertilizer increases maize yield compared to chemical fertilizer.

❖ Common Mistakes in Hypothesis Formulation:

- Too broad or vague.
- Not testable with available resources.
- Based on personal opinion without scientific basis.

References

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2. World Medical Association. (2013). Declaration of Helsinki.
3. Council for International Organizations of Medical Sciences (CIOMS). (2016). International Ethical Guidelines for Health-related Research Involving Humans.

Thanks