

# **Pabna University Of Science And Technology**

**Presentation on:** Comparison of Two Sample  
Mean

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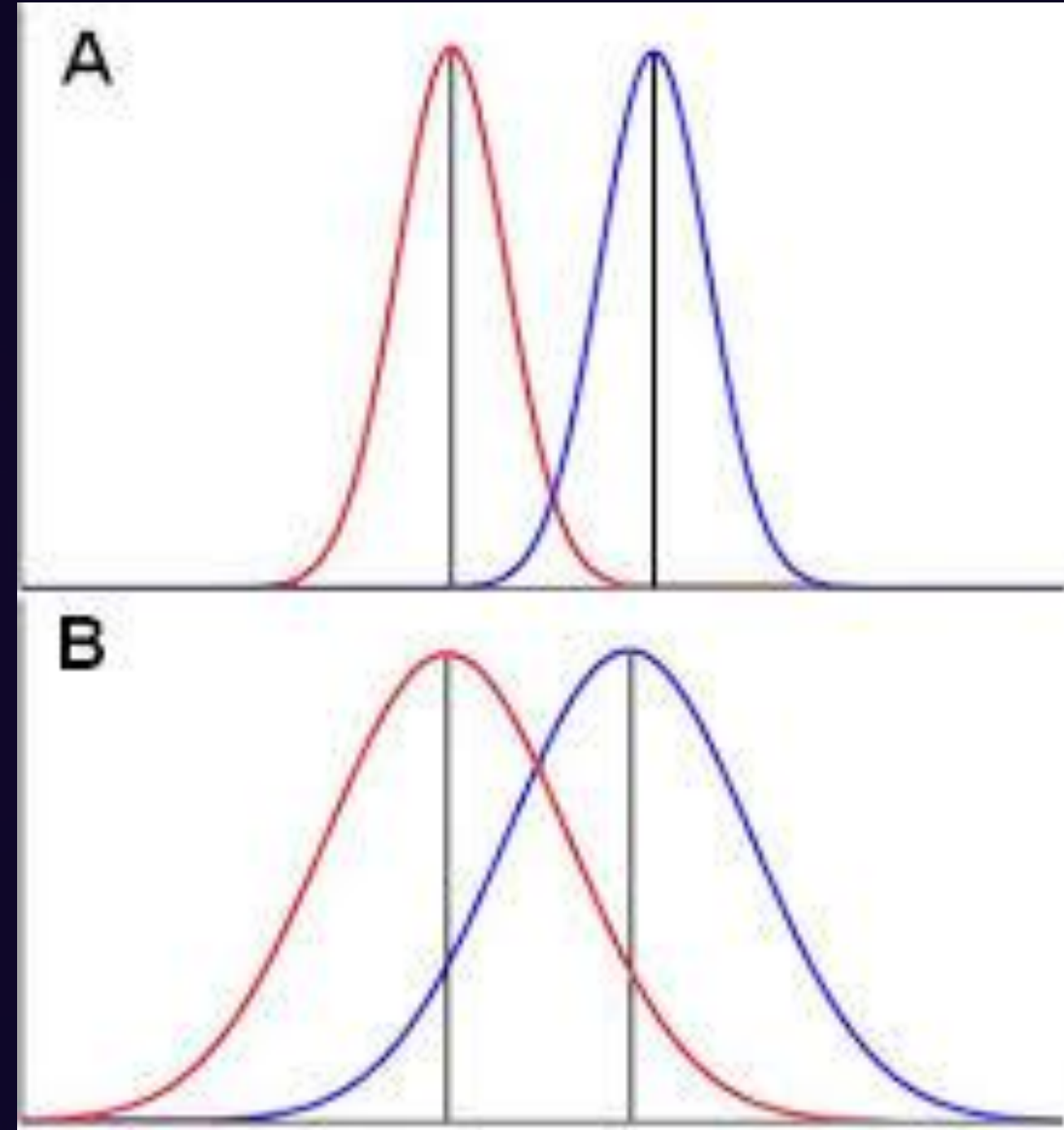
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# Comparison of Two Sample Means

Statistical Techniques for Analyzing Group Differences



# Introduction to Comparing Two Means

## Definition

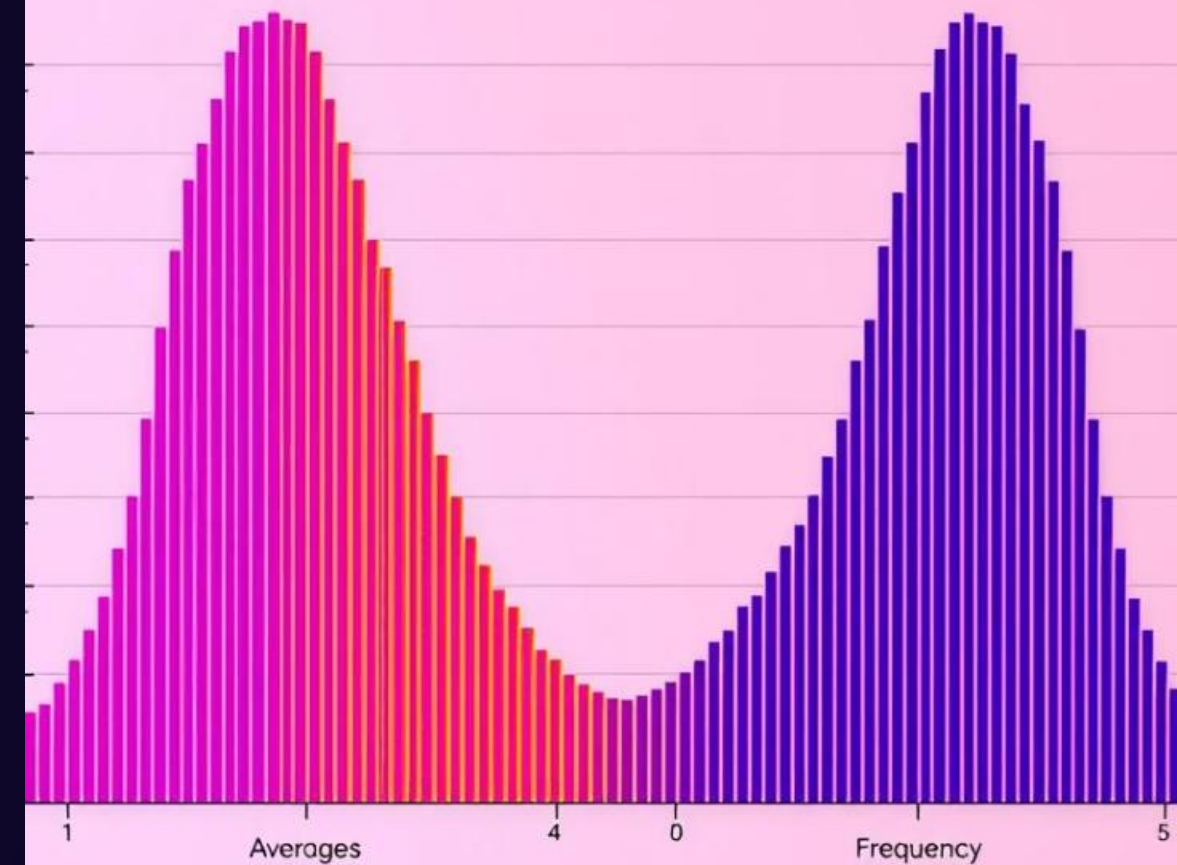
Compare averages of two groups to check difference

## Purpose

- Infer population differences from samples
- Apply in experiments and observational studies

## Examples

- Test scores by teaching method
- Weight loss on different diets



# Types of Samples

## Independent Samples

Two unrelated groups

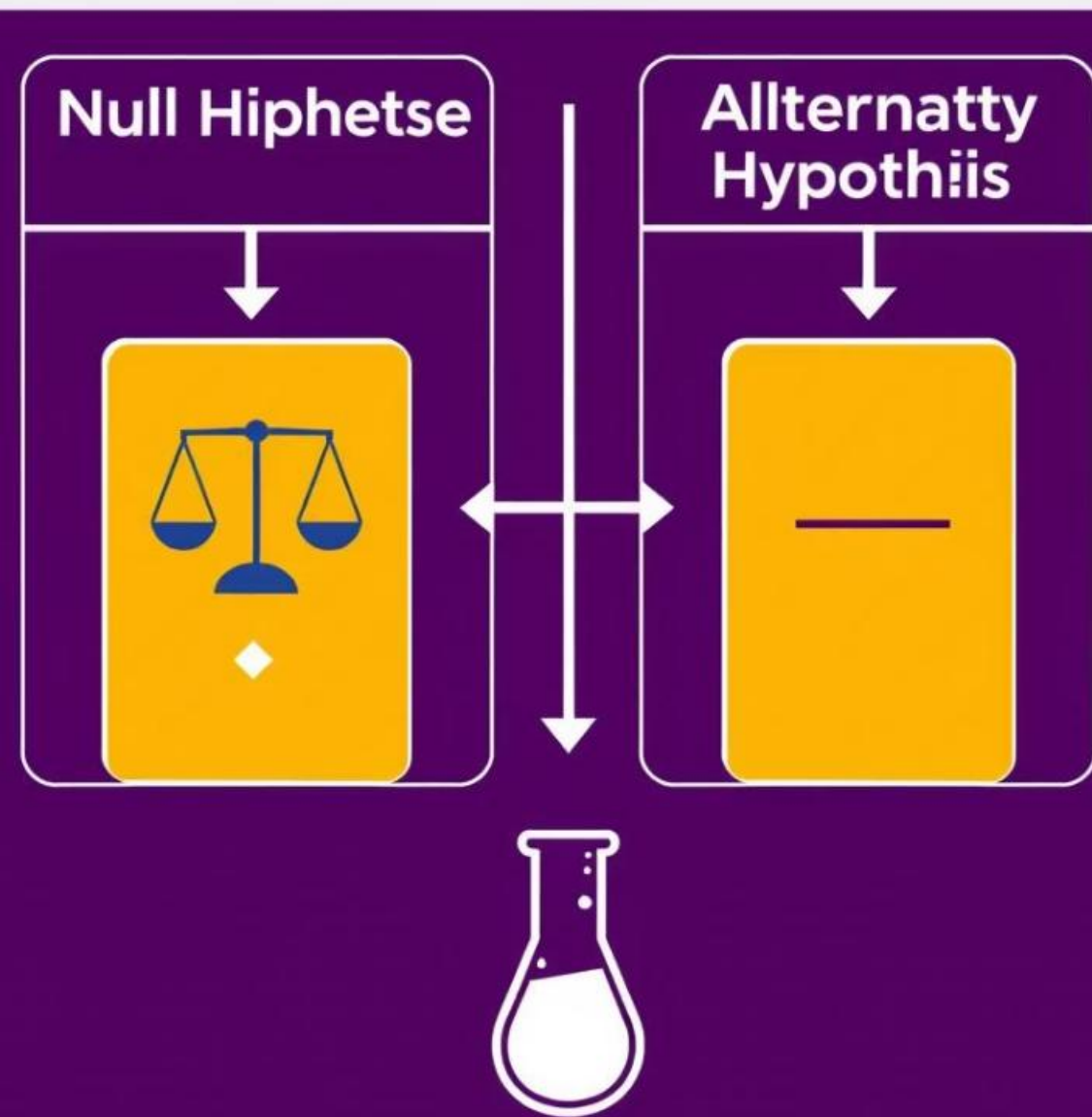
Example: Drug 1 group vs Drug 2 group

## Paired (Dependent) Samples

Same group measured twice or matched pairs

Example: Before and after treatment

# Sicentle Hypothesis Testing



## Hypothesis Testing Framework

- **Null Hypothesis ( $H_0$ )**  
Means equal:  $\mu_1 = \mu_2$ , no difference
- **Alternative Hypothesis Hypothesis ( $H_1$ )**  
Two-tailed:  $\mu_1 \neq \mu_2$   
One-tailed:  $\mu_1 > \mu_2$  or  $\mu_1 < \mu_2$
- **Key Concepts**  
Significance level  $\alpha$ , Usually 0.05  
P-value: Probability result occurs if  $H_0$  true





# Assumptions for Valid Comparison

## Normality

Data approx. normal, critical for small samples

## Independence

Observations independent within and between groups

## Variance Conditions

Independent t-test: equal or unequal variances

Paired t-test: normality of differences

# Statistical Methods for Comparing Means

## Independent Two-Sample t-Test

- For unrelated groups
- Formula: difference in means over pooled variance
- Choose pooled or Welch variant

## Paired t-Test

- Same subjects or matched pairs
- Formula: mean difference over SD of differences

## Z-Test for Large Samples

Use when  $n > 30$  and population variance known

# Step-by-Step Example (Independent Samples)

1

**State Hypotheses**

2

**Calculate Means & Variances**

3

**Find Degrees of Freedom**

4

**Use t-table or Software**

Find p-value

5

**Decision**

Reject or fail to reject  $H_0$



# Step-by-Step Example (Paired Samples)

**1** Calculate Differences

**2** Compute Mean and SD  
Of differences

**3** Calculate t-Statistic

**4** Determine p-Value

**5** Decision and Interpretation  
Pairing reduces variability, boosts power

# Conclusion & Real-World Applications

## Summary

- Choose tests based on data type
- Check assumptions before testing
- P-value determines significance

## Applications

- Medicine: Clinical trials
- Marketing: A/B testing
- Education: Teaching evaluation

## Final Note

Key for evidence-based decisions