Two Independent Samples t-test

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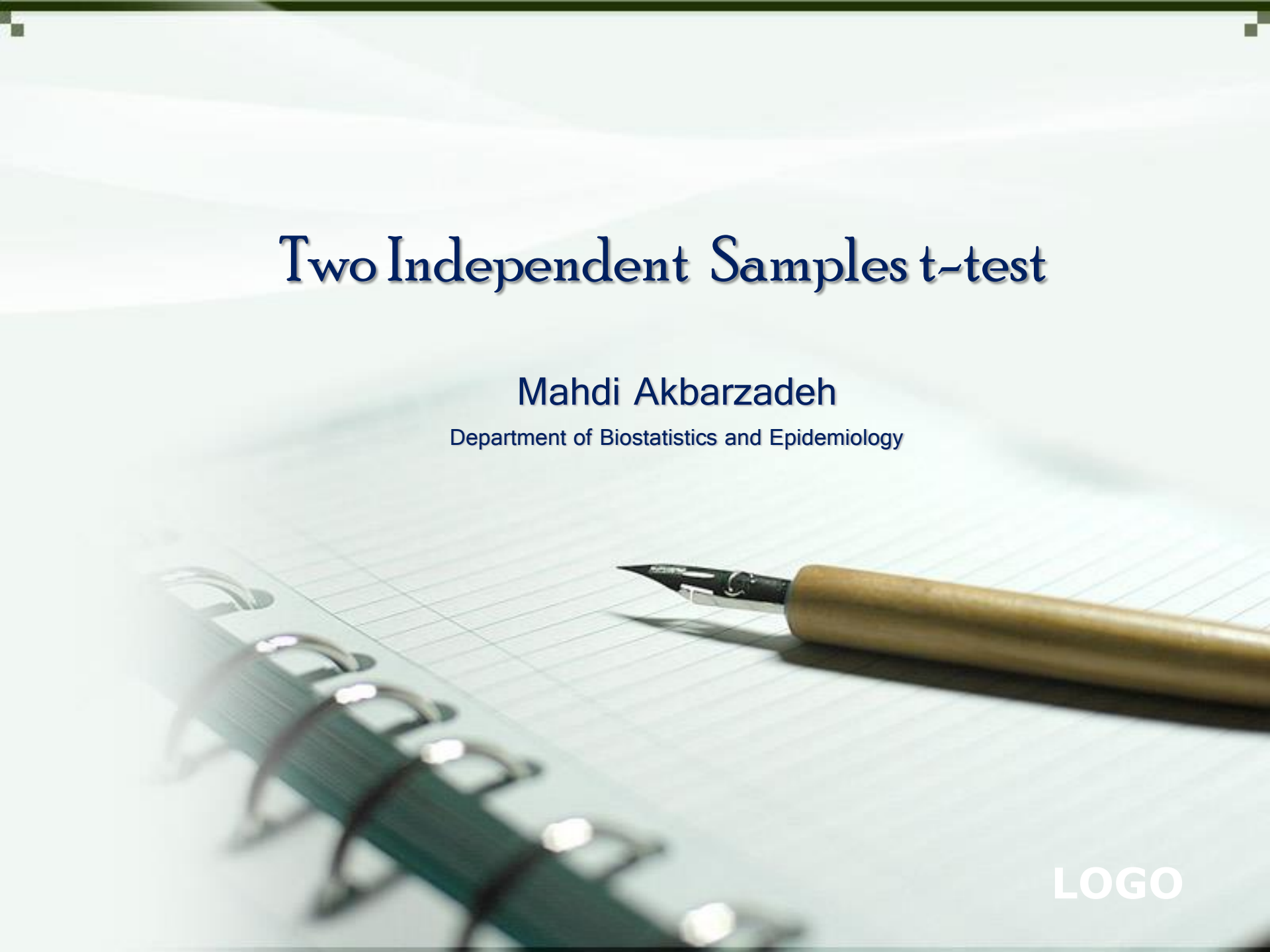

LOGO

Two Independent Samples t-test

Introduction

The independent-samples t-test (or independent t-test, for short) compares the means between two unrelated groups on the same continuous, dependent variable. For example, you could use an independent t-test to understand whether first year graduate salaries differed based on gender (i.e., your dependent variable would be "first year graduate salaries" and your independent variable would be "gender", which has two groups: "male" and "female").

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Two Independent Samples t-test

- **Hypothesis**

$$\begin{cases} H_0 : \mu_2 = \mu_1 \\ H_1 : \mu_2 \neq \mu_1 0 \end{cases}$$

$$\begin{cases} H_0 : \mu_2 - \mu_1 = 0 \\ H_1 : \mu_2 - \mu_1 \neq 0 \end{cases}$$

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Two Independent Samples t-test

Statistics

$$S_P^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

$$t^* = \frac{(\overline{X_1} - \overline{X_2}) - d_0}{\sqrt{\frac{S_p^2}{n_1} + \frac{S_p^2}{n_2}}}$$

$$df = n_1 + n_2 - 2$$

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Statistics

$$t^* = \frac{\left(\overline{X}_1 - \overline{X}_2\right) - d_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$df = \frac{\left(\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}\right)^2}{\frac{\left(\frac{S_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{S_2^2}{n_2}\right)^2}{n_2 - 1}}$$

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Two Independent Samples t-test

Assumptions

- **Assumption #1:** Your dependent variable should be measured on a continuous scale (i.e., it is measured at the interval or ratio level).
- **Assumption #2:** Your independent variable should consist of two categorical, independent groups
- **Assumption #3:** You should have independence of observations,
- **Assumption #4:** There should be no significant outliers.
- **Assumption #5:** Your dependent variable should be approximately normally distributed for each group of the independent variable.
- **Assumption #6:** There needs to be homogeneity of variances.

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Assumption #6

Assumptions

- **Assumption #6:** There needs to be homogeneity(or equality) of variances.
- **Levene's test for equality of variamces with F statistics:**

$$\begin{cases} H_0 : \sigma_1^2 = \sigma_2^2 \\ H_0 : \sigma_1^2 \neq \sigma_2^2 \end{cases}$$

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Reporting the Results

Writing up your results

An independent-samples t-test was run to determine if there were differences in engagement to an advertisement between males and females. There were no outliers in the data, as assessed by inspection of a boxplot. Engagement scores for each level of gender were normally distributed, as assessed by Shapiro-Wilks test ($p >$ .05). Homogeneity of variances was violated, as assessed by Levene's Test for Equality of Variances (p = .013), so separate variances and the Welch-Satterthwaite correction were used. The advertisement was more engaging to male viewers (M = 5.56, SD = 0.35) than female viewers (M = 5.30, SD = 0.35), a statistically significant difference, M = 0.26, 95% CI [0.03, 0.48], t(37.998) = 2.325, p = .026.

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In SPSS

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Thank You

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