- Chi-Square Goodness of Fit Test for engine_type

Results

Chi-Square Goodness of Fit Test

Introduction

A Chi-square goodness of fit test was conducted to examine whether engine_type was equally distributed across all categories. There were 2 levels in engine_type: V-Shaped and Straight.

Results

The results of the test were significant based on an alpha value of .05, $\chi^2(1) = 10.12$, $p = .001$, indicating the null hypothesis (the levels of engine_type are equally likely) can be rejected. There were fewer observations than expected in Straight. There were more observations than expected in V-Shaped. Table 1 presents the results of the Chi-Square goodness of fit test.

Table 1

Chi-Square Goodness of Fit Test for engine_type

Level	Observed Frequency	Expected Frequency
V-Shaped	25	16.00
Straight	7	16.00

Note. $\chi^2(1) = 10.12$, $p = .001$.

References

Intellectus Statistics [Online computer software]. (2023). Intellectus Statistics.

https://statistics.intellectus360.com

Glossaries

Chi-square Goodness of Fit

A chi-square goodness of fit test is a non-parametric test that determines whether an observed distribution of data is significantly different from the expected distribution. Specifically,

Pearson's chi-square goodness of fit test is used to determine if a nominal variable has equally distributed groups (e.g., if the number of men in a sample is equal to the number of women in the sample). The test compares the observed counts of the nominal variable to the expected counts to determine if they are significantly different. This comparison produces a χ^2 statistic, which is used with the degrees of freedom (*df*) to determine the significance of the test (i.e., *p*-value). A significant result indicates the observed test statistic would be unlikely under the null hypothesis. The Pearson chi-square goodness of fit test assumes that the variable under investigation is nominal and that the groups within the category are mutually exclusive.

Chi-square Formula:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

O_i: Observed frequency
E_i: Expected frequency

Fun Fact! *The Pearson chi-square test is one of many methods used to determine how well data fit an expected distribution. Other tests include the Kolmogorov-Smirnov and Shapiro-Wilk tests, which are specifically used to determine how well data fit a normal distribution.*

Chi-Square Test Statistic (χ^2): Used with the *df* to compute the *p*-value of the overall model and each predictor in the model.

Degrees of Freedom (*df*): Refers to the number of values used to compute a statistic; used with χ^2 to compute the *p*-value.

***p*-value:** The probability of obtaining the observed results if the null hypothesis (no relationship between the independent variable(s) and dependent variable) is true; in most social science research, a result is considered statistically significant if this value is $\leq .05$.

Raw Output

Chi-Square Goodness of Fit Test for engine_type

```
Included Variables:
engine_type

Sample Size (Complete Cases):
N = 32

Frequency Table:
```

Level	Observed	Expected
V-Shaped	25	16.000
Straight	7	16.000

```
Results:
χ² = 10.125, df = 1, p = 0.00146
```