FA7_Dizon_STATS

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Introduction

This analysis aims to compare the means of two groups (those using the invisibility cloak and those not using it) in terms of their “Mischief” scores.

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)

# Create the dataset
data <- data.frame(
  Participant = 1:24,
  Cloak = c(rep(0, 12), rep(1, 12)),  # 0 = no cloak, 1 = cloak
  Mischief = c(3, 1, 5, 4, 6, 4, 6, 2, 0, 5, 4, 5,
               4, 3, 6, 6, 8, 5, 5, 4, 2, 5, 7, 5)
)

# Display the data
head(data)
```

```
##   Participant Cloak Mischief
## 1           1     0        3
## 2           2     0        1
## 3           3     0        5
## 4           4     0        4
## 5           5     0        6
## 6           6     0        4
```

Assumptions of the Independent Samples t-test

Assumption 1: Independence of Observations

The participants in each group are independent. There should be no relationship between the individuals in the different groups.

Assumption 2: Normality

The distribution of scores in each group should be approximately normally distributed. This can be checked using Shapiro-Wilk test.

```
shapiro_test_no_cloak <- shapiro.test(data$Mischief[data$Cloak == 0])
shapiro_test_with_cloak <- shapiro.test(data$Mischief[data$Cloak == 1])

shapiro_test_no_cloak
```

```
##
##  Shapiro-Wilk normality test
##
## data:  data$Mischief[data$Cloak == 0]
## W = 0.91276, p-value = 0.2314
```

```
shapiro_test_with_cloak
```

```
##
##  Shapiro-Wilk normality test
##
## data:  data$Mischief[data$Cloak == 1]
## W = 0.97262, p-value = 0.9362
```

Assumption 3: Homogeneity of Variance

The variances in each group should be approximately equal. This can be checked using Levene's Test.

```
# Install and load car package for Levene's Test
if (!requireNamespace("car", quietly = TRUE)) {
    install.packages("car")
}
library(car)
```

```
## Loading required package: carData
```

```
##
## Attaching package: 'car'
```

```
## The following object is masked from 'package:dplyr':
##
##     recode
```

```
# Levene's Test
levene_test <- leveneTest(Mischief ~ as.factor(Cloak), data = data)
levene_test
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  0.2698 0.6087
##       22
```

Assumption 4: Scale of Measurement

The dependent variable (Mischief scores) is measured on a continuous scale.

Assumption 5: Random Sampling

The sample should be randomly selected from the population.

```
# Independent samples t-test
t_test_result <- t.test(Mischief ~ Cloak, data = data, var.equal = TRUE)  # Change to var.equal = FALSE if varian
ces are unequal
t_test_result
```

```
##
##  Two Sample t-test
##
## data:  Mischief by Cloak
## t = -1.7135, df = 22, p-value = 0.1007
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0
## 95 percent confidence interval:
##  -2.7629284  0.2629284
## sample estimates:
## mean in group 0 mean in group 1
##            3.75            5.00
```

```
# Extract results
t_value <- t_test_result$statistic
p_value <- t_test_result$p.value
mean_no_cloak <- mean(data$Mischief[data$Cloak == 0])
mean_with_cloak <- mean(data$Mischief[data$Cloak == 1])
confidence_interval <- t_test_result$conf.int

# Summarize results
cat("T-Value:", t_value, "\n")
```

```
## T-Value: -1.713459
```

```
cat("P-Value:", p_value, "\n")
```

```
## P-Value: 0.1006863
```

```
cat("Mean Mischief (No Cloak):", mean_no_cloak, "\n")
```

```
## Mean Mischief (No Cloak): 3.75
```

```
cat("Mean Mischief (With Cloak):", mean_with_cloak, "\n")
```

```
## Mean Mischief (With Cloak): 5
```

```
cat("95% Confidence Interval:", confidence_interval, "\n")
```

```
## 95% Confidence Interval: -2.762928 0.2629284
```

Conclusion

Based on the independent samples t-test, we observed a t-value of r round(t_value, -1.71) with a p-value of r round(p_value, 0.10). The mean mischief score for participants without the cloak was r round(mean_no_cloak, 3.75), while for those with the cloak, it was r round(mean_with_cloak, 5). The 95% confidence interval for the difference in means is r round(confidence_interval[1], -2.76) to r round(confidence_interval[2], 0.26).

If the p-value is less than the significance level (typically 0.05), we reject the null hypothesis, concluding that there is a statistically significant difference in the mischief scores between the two groups.