FORMATIVE ASSESSMENT 7

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Introduction

This report analyzes the mischievous activities of two groups: those with and without an invisibility cloak. We'll utilize an independent samples t-test to see if the cloak has no effect on mischievous conduct.

Data

The data set includes 24 participants, 12 in each group (with and without a cloak). Each participant's number of mischief is measured.

Data Table

```
participant <- 1:24
cloak <- c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1)
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)

data <- data.frame(
  Participant = participant,
  Cloak = factor(cloak, levels = c(0, 1), labels = c("0", "1")),
  Mischief = mischief
)


kable(data, caption = "Invisibility Cloak Data", align = 'c') %>%
  kable_styling(full_width = TRUE)
```

Invisibility Cloak Data

Participant	Cloak	Mischief
1	0	3
2	0	1
3	0	5
4	0	4
5	0	6
6	0	4
7	0	6
8	0	2
9	0	0
10	0	5
11	0	4
12	0	5
13	1	4
14	1	3
15	1	6
16	1	6
17	1	8
18	1	5
19	1	5
20	1	4
21	1	2
22	1	5
23	1	7
24	1	5

Assumption 1: Dependent variable is continuous

The dependent variable, Mischief, indicates the number of mischievous activities committed by participants can be considered continuous.

Assumption 2: Independent variable consists of two groups

The independent variable, Cloak, has two levels: individuals who with cloaks and those without cloaks. There are no repeated participants in the groups.

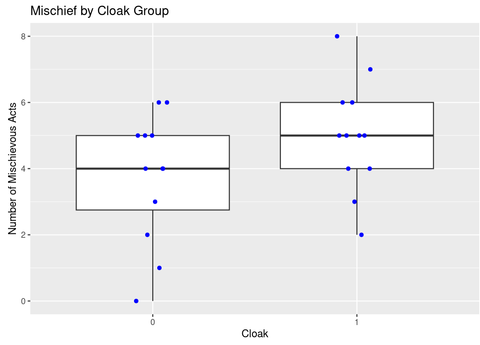
Assumption 3: Independence of observations

Each participant is present in only one group, ensuring the independence of observations.

Assumption 4: Checking for outliers

We use a boxplot to visually inspect for outliers.

```
library(ggplot2)
ggplot(data, aes(x = Cloak, y = Mischief)) +
  geom_boxplot() +
  geom_jitter(width = 0.1, height = 0, color = 'blue') +
  labs(title = "Mischief by Cloak Group", x = "Cloak", y = "Number of Mischievous Acts")
```



Assumption 5: Normality

We use the Shapiro-Wilk test to assess whether Mischief is normally distributed in each group.

```
shapiro_without_cloak <- shapiro.test(data$Mischief[data$Cloak == "0"])
shapiro_with_cloak <- shapiro.test(data$Mischief[data$Cloak == "1"])


shapiro_results <- data.frame(
  Group = c("Without Cloak", "With Cloak"),
  W = c(shapiro_without_cloak$statistic, shapiro_with_cloak$statistic),
  p_value = c(shapiro_without_cloak$p.value, shapiro_with_cloak$p.value)
)


kable(shapiro_results, caption = "Shapiro-Wilk Normality Test Results", align = 'c') %>%
  kable_styling(full_width = TRUE)
```

Shapiro-Wilk Normality Test Results

Group	W	p_value
Without Cloak	0.9127635	0.2314459
With Cloak	0.9726167	0.9361892

Computation

Independent Samples T-Test

```
t_test <- t.test(Mischief ~ Cloak, data = data, var.equal = TRUE)


results <- data.frame(
  Variable = "Mischief",
  Statistic = round(t_test$statistic, 3),
  Parameter = t_test$parameter,
  p_value = round(t_test$p.value, 3),
  Confidence_Interval = paste0("[", round(t_test$conf.int[1], 3), ", ", round(t_test$conf.int[2], 3), "]"),
  Mean_Difference = round(t_test$estimate[1] - t_test$estimate[2], 3)
)

kable(results, caption = "Results of the T-Test for Mischief")
```

Results of the T-Test for Mischief

	Variable	Statistic	Parameter	p_value	Confidence_Interval	Mean_Difference
t	Mischief	-1.713	22	0.101	[-2.763, 0.263]	-1.25

Analysis

The independent samples t-test was used to examine the number of mischievous acts performed by subjects wearing versus not wearing a cloak of invisibility. The findings revealed that there was no significant difference between the two groups (t(22) = -1.71, p = 0.101), with a mean difference of -1.25 (95% CI: -2.76, 0.26).

Thus, we fail to reject the null hypothesis and conclude that the cloak has no significant effect on the number of mischief.