Assignment 2

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```
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)

Basal = c(1, 1.5, -2.5, -2.5, -1, -5.5, -2.5, -4.5, 0, -1, -2, -1.5, -3.5, 1,
-2, -0.5, -3.5, -3.5, -2.5, -3.5,-0.5, 0)
DRTA = c(2, -1, 0, 0.5, -1.5, -1, 2, 1.5, -0.5, -1.5, 0, -0.5, 2, -0.5, 1,
4.5, 2, -1.5, 2.5, 0.5, 1.5, 1)
```

1. Null Hypothesis H_0 : $\mu_{Basal} = \mu_{DRTA}$

   Alternative Hypothesis H_a : $\mu_{Basal} \neq \mu_{DRTA}$

```
data <- data.frame(
Change = c(Basal, DRTA),
Method = rep(c("Basal", "DRTA"), times = c(length(Basal), length(DRTA)))
)
```

Histogram

```
ggplot(data, aes(x = Change, fill = Method)) +
geom_histogram(position = "dodge", bins = 10, alpha = 0.7) +
labs(title = "Distribution of Comprehension Change", x = "Change", y =
"Frequency") +
theme_minimal()
```

Distribution of Comprehension Change
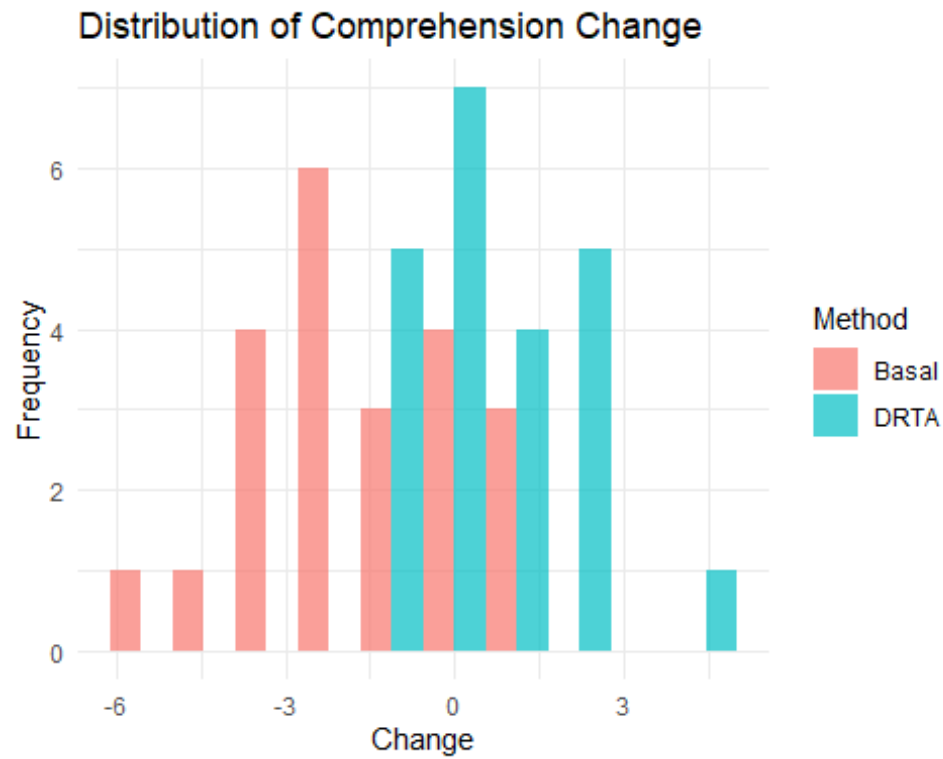
Boxplot

```
ggplot(data, aes(x = Method, y = Change, fill = Method)) +
geom_boxplot(alpha = 0.7) +
labs(title = "Boxplot of Comprehension Change by Method", x = "Method", y =
"Change") +
theme_minimal()
```

Boxplot of Comprehension Change by Method
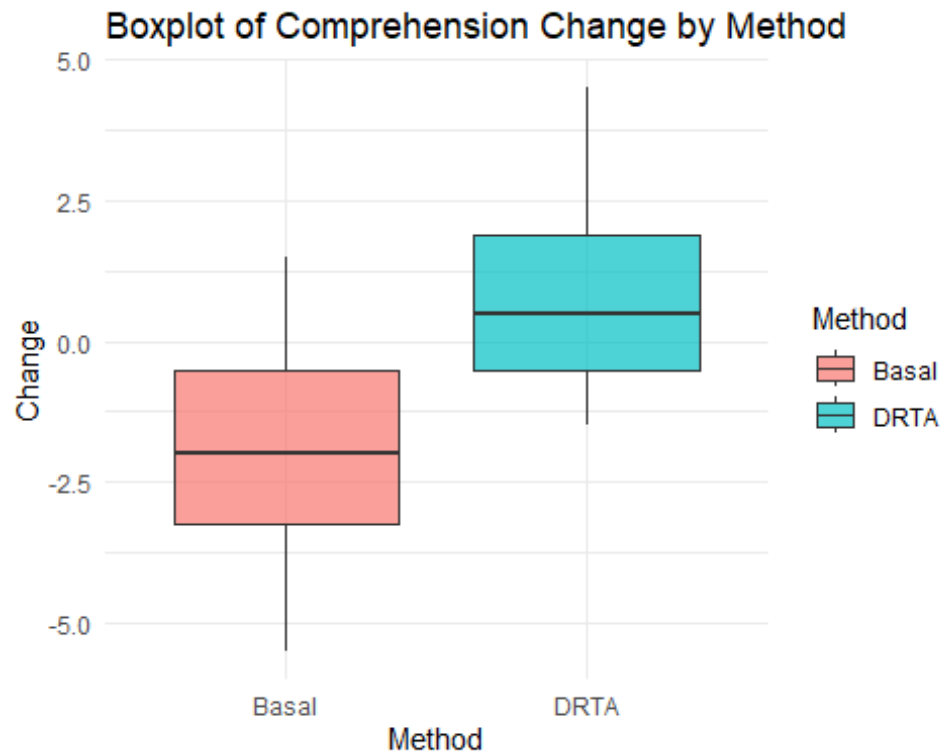
```
# two-sample t-test (with equal variance)
t_test_result <- t.test(Basal, DRTA, var.equal = TRUE)

print(t_test_result)

##
##  Two Sample t-test
##
## data:  Basal and DRTA
## t = -4.5682, df = 42, p-value = 4.268e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.407805 -1.319468
## sample estimates:
##  mean of x  mean of y
## -1.7727273  0.5909091
```

3. p-value = 4.268e-05

4. We reject the null hypothesis since the p-value is less than the alpha value of 0.05. The data provide strong evidence that the average reading comprehension change is significantly different between the two methods. The DRTA method shows a positive average improvement (0.59) compared to the Basal method, which has a negative average change (−1.77). This suggests that the DRTA method is more effective in improving reading comprehension than the Basal method.