Quiz2

HengMa

```r
knitr::opts_chunk$set(echo = FALSE)
install.packages("car")
```

```
Installing package into '/cloud/lib/x86_64-pc-linux-gnu-library/4.3'
(as 'lib' is unspecified)
```

```r
library(car)
```

```
Loading required package: carData
```

```r
library(ggplot2)
library(stats)
library(lawstat)
```

```
Attaching package: 'lawstat'

The following object is masked from 'package:car':

    levene.test
```

```r
set.seed(1)

TrueHeight_Edward <- rnorm(20, 170, 10)
TrueHeight_Hugo <- rnorm(20, 170, 10)
```

```r
TrueHeight_Lucy <- rnorm(20, 170, 10)


EdwardMeasurement <- TrueHeight_Edward + rnorm(20, 0, 2)
HugoMeasurement <- TrueHeight_Hugo + 3
LucyMeasurement <- TrueHeight_Lucy - 2

data <- data.frame(FriendID = rep(1:20, 3),
                   Height = c(TrueHeight_Edward, HugoMeasurement, LucyMeasurement),
                   Group = rep(c("Edward", "Hugo", "Lucy"), each = 20))


t_test_result = t.test(EdwardMeasurement, TrueHeight_Edward, paired = TRUE)
measurements <- c(EdwardMeasurement, HugoMeasurement, LucyMeasurement)
groups <- factor(rep(c("Edward", "Hugo", "Lucy"), each = 20))

levene_test_result <- leveneTest(measurements, groups)


paired_test_result = t.test(EdwardMeasurement, LucyMeasurement, paired = FALSE)

results_list <- list(T_Test = t_test_result,
     Levene_Test = levene_test_result,
     Paired_Test = paired_test_result)
print(results_list)
```

$T_Test

    Paired t-test

data: EdwardMeasurement and TrueHeight_Edward
t = 0.43321, df = 19, p-value = 0.6697
alternative hypothesis: true mean difference is not equal to 0
95 percent confidence interval:
 -0.7796061 1.1865537
sample estimates:
mean difference
      0.2034738

$Levene_Test

```
Levene's Test for Homogeneity of Variance (center = median)
      Df F value Pr(>F)
group  2  0.0152 0.9849
      57


$Paired_Test

    Welch Two Sample t-test

data:  EdwardMeasurement and LucyMeasurement
t = 1.0017, df = 37.536, p-value = 0.3229
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.779781  8.221271
sample estimates:
mean of x mean of y
 172.1087   169.3880
```

introduction

In this project, we explore how three friends—Edward, Hugo, and Lucy—each measure the height of their friends using different methods. Edward's technique involves a bit of randomness, adding or subtracting small amounts almost by chance. Hugo, on the other hand, always thinks everyone is a bit taller than they are, adding an extra 3 cm to all his measurements. Lucy takes the opposite approach, deducting 2 cm from everyone, as if she believes everyone is slightly shorter. To understand the effects of their unique approaches, we simulate measuring the heights of 20 friends for each person, applying their specific method to see how it compares to the actual heights. Our goal is to analyze the accuracy and consistency of each method. To do this, we run three types of statistical tests: one to see if Edward's random adjustments make a big difference on average, another to compare the consistency of all three friends' measurements, and a third to directly compare Edward's and Lucy's results to find out whose method shows a bigger departure from reality. This way, we can get a clearer picture of how each friend's measuring technique stacks up against the others.