

SHETH L.U.J AND SIR M.V COLLEGE

PRACTICAL NO: 1

Generating descriptive statistics using summary () or describe()(R)

CODE:

```
# =====
# R Script: Descriptive Statistics
# Functions: summary(), describe()
# Dataset: globalAirQuality.csv
#
# -----
# 1. Install Required Packages
# -----
install.packages("psych")
install.packages("dplyr")

# -----
# 2. Load Libraries
# -----
library(psych)
library(dplyr)

# -----
# 3. Set Working Directory (CHANGE PATH IF NEEDED)
# Use forward slashes to avoid '\U' error

# -----
# 4. Import Dataset

air <- read.csv("C:/Users/vibro/Downloads/globalAirQuality.csv")

# -----
# 5. View Dataset Structure
# -----
str(air)

# -----
# 6. Descriptive Statistics using summary()
```

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```
# -----
summary(air)

# -----
# 7. Select Only Numeric Columns
# -----
air_numeric <- air %>% select(where(is.numeric))

# -----
# 8. Descriptive Statistics (Numeric Data Only)
# -----
summary(air_numeric)

# -----
# 9. Detailed Descriptive Statistics using describe()
# -----
describe(air_numeric)
```

OUTPUT:

The screenshot shows the RStudio interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, Help, and a Go to file/function button. The top right corner shows 'Project: (None)'. The left pane contains the 'Console' tab with R code and its output. The right pane contains the 'Environment' tab showing global variables and their descriptions, and the 'File' tab showing a list of files in the current directory.

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function | Addins |
Source
Console Background Jobs
> air <- read.csv("C:/Users/vibro/Downloads/globalAirquality.csv")
Error: '\u' used without hex digits in character string
(<input>:1:21)

> # 4. Import Dataset
>
> air <- read.csv("C:/Users/vibro/Downloads/globalAirquality.csv")
> # 5. View Dataset Structure
> # -----
> str(air)
'data.frame': 18000 obs. of 15 variables:
 $ timestamp : chr "2025-11-04 18:25:17.554219" "2025-11-04 19:25:17.554219" ...
 $ country   : chr "US" "US" "US" ...
 $ city      : chr "New York" "New York" "New York" ...
 $ latitude  : num 40.7 40.7 40.7 40.7 ...
 $ longitude : num -74 -74 -74 -74 ...
 $ pm25      : num 50.3 32.1 42.2 30.4 21.1 ...
 $ pm10      : num 108.9 63 82.6 80 66.4 ...
 $ no2       : num 28.36.1 26.9 63.5 39 ...
 $ so2       : num 6.54 4.02 9.54 7.61 6.92 ...
 $ o3        : num 52.6 43.5 23.3 31.4 45.6 ...
 $ co        : num 1.096 1.075 0.977 0.23 1.085 ...
 $ aqi       : int 108 90 84 158 97 92 155 115 121 76 ...
 $ temperature: num 18.5 5.84 31.83 23.14 13.63 ...
 $ humidity   : num 70.2 80.1 62.8 89.2 76.5 ...
 $ wind_speed : num 3.73 8.97 9.65 8.96 4.02 ...
> # 6. Descriptive Statistics using summary()
> # -----
```

Environment

Name	Description
air	18000 obs. of 15 variables
air_numeric	18000 obs. of 12 variables
cat_filter	3891 obs. of 18 variables
furniture_high	460 obs. of 18 variables
globalAirquality	18001 obs. of 15 variables
high_sales	1146 obs. of 18 variables

Data

Name	Description
.Data	1.2 MB
.Rhistory	3 KB
Custom Office Templates	
desktop.ini	418 B
JAVA PROJECT by S094 and S107 (Shivam Mane and ...	11 MB
java project clip 1.mp4	5.4 MB
java project clip 2.mp4	7.2 MB
NetBeansProjects	
prac4.R	799 B
prac8 java- Construct a GUI using Java Swing to acc	0 B
raneS107	
UltraViewer	

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Home

Name	Size	Modified
.Data	1.2 MB	Dec 1, 2025, 7:20 PM
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prac8 java- Construct a GUI using Java Swing to acc	0 B	Sep 11, 2025, 7:08 PM
raneS107		
UltraViewer		

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ENG IN 10:45 PM 13-12-2025

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RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Console Background Jobs

```
R > R4.52 . ~/ ~
> # 6. Descriptive Statistics using summary()
> # -----
> summary(air)
  timestamp      country       city      latitude
Length:18000    Length:18000    Length:18000    Min. :-37.81
Class :character Class :character Class :character  1st Qu.: 12.97
Mode  :character Mode  :character Mode  :character   Median : 29.23
                                         Mean  : 23.07
                                         3rd Qu.: 41.01
                                         Max.  : 60.17
longitude      pm25        pm10      no2
Min. :-123.121 Min. : 0.025 Min. : 0.061 Min. : 0.013
1st Qu.: 2.352  1st Qu.: 27.904 1st Qu.: 53.126 1st Qu.: 22.363
Median : 42.146 Median : 40.286 Median : 69.961 Median : 32.020
Mean   : 37.656 Mean   : 40.369 Mean   : 70.152 Mean   : 32.055
3rd Qu.: 103.820 3rd Qu.: 52.436 3rd Qu.: 87.257 3rd Qu.: 41.364
Max.   : 174.763 Max.   :115.683 Max.   :161.810 Max.   : 90.019
so2          o3           co         aqi
Min. : 0.003 Min. : 0.114 Min. : 0.0000 Min. : 16.0
1st Qu.: 4.361 1st Qu.: 38.029 1st Qu.: 0.6330 1st Qu.: 87.0
Median : 6.026 Median : 48.142 Median : 0.8005 Median : 103.0
Mean   : 6.036 Mean   : 48.065 Mean   : 0.8006 Mean   : 104.6
3rd Qu.: 7.715 3rd Qu.: 58.258 3rd Qu.: 0.9690 3rd Qu.: 121.0
Max.   :16.559 Max.   :103.016 Max.   :1.8320 Max.   :231.0
temperature   humidity   wind_speed
Min. : 5.00  Min. :25.00  Min. : 0.500
1st Qu.:13.36 1st Qu.:41.32  1st Qu.: 2.937
Median :21.46  Median :57.85  Median : 5.297
Mean   :21.51  Mean   :57.71  Mean   : 5.284
3rd Qu.:29.69 3rd Qu.:74.23  3rd Qu.: 7.662
Max.   :38.00  Max.   :90.00  Max.   : 9.999
```

Files Plots Packages Help Viewer Presentation

Environment History Connections Tutorial

Project: (None)

Data

- air 18000 obs. of 15 variables
- air_numeric 18000 obs. of 12 variables
- cat_filter 3891 obs. of 18 variables
- furniture_high 460 obs. of 18 variables
- globalAirquality 18001 obs. of 15 variables
- high_sales 1146 obs. of 18 variables

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prac8 java - Construct a GUI using Java Swing to acc	0 B	Sep 11, 2025, 7:08 PM
raneS107		
UltraViewer		

10:45 PM 13-12-2025

RStudio

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Console Background Jobs

```
R > R4.52 . ~/ ~
Mean :21.51  Mean :57.71  Mean : 5.284
3rd Qu.:29.69 3rd Qu.:74.23  3rd Qu.: 7.662
Max. :38.00  Max. :90.00  Max. : 9.999
> # 7. select only Numeric columns
> # -----
> air_numeric <- air %>% select(where(is.numeric))
> # 8. descriptive statistics (Numeric Data Only)
> # -----
> summary(air_numeric)
  latitude      longitude      pm25        pm10      no2
Min. :-37.81  Min. :-123.121 Min. : 0.025 Min. : 0.061
1st Qu.: 12.97 1st Qu.: 2.352  1st Qu.: 27.904 1st Qu.: 53.126
Median : 29.23 Median : 42.146 Median : 40.286 Median : 69.961
Mean   : 23.07 Mean   : 37.656 Mean   : 40.369 Mean   : 70.152
3rd Qu.: 41.01 3rd Qu.: 103.820 3rd Qu.: 52.436 3rd Qu.: 87.257
Max.   : 60.17 Max.   :174.763 Max.   :115.683 Max.   :161.810
no2          so2          o3           co
Min. : 0.013 Min. : 0.003 Min. : 0.114 Min. : 0.0000
1st Qu.: 22.363 1st Qu.: 4.361 1st Qu.: 38.029 1st Qu.: 0.6330
Median : 32.020 Median : 6.026 Median : 48.142 Median : 0.8005
Mean   : 32.055 Mean   : 6.036 Mean   : 48.065 Mean   : 0.8006
3rd Qu.: 41.364 3rd Qu.: 7.715 3rd Qu.: 58.258 3rd Qu.: 0.9690
Max.   : 90.019 Max.   :16.559 Max.   :103.016 Max.   :1.8320
aqi          temperature   humidity   wind_speed
Min. : 16.0  Min. : 5.00  Min. :25.00  Min. : 0.500
1st Qu.: 87.0 1st Qu.:13.36  1st Qu.:41.32  1st Qu.: 2.937
Median :104.6 Median :21.46  Median :57.85  Median : 5.297
Mean   :104.6 Mean   :21.51  Mean   :57.71  Mean   : 5.284
3rd Qu.:121.0 3rd Qu.:29.69  3rd Qu.:74.23  3rd Qu.: 7.662
Max.   :231.0  Max.   :38.00  Max.   :90.00  Max.   : 9.999
> # 9. detailed Descriptive Statistics using describe()
```

Files Plots Packages Help Viewer Presentation

Environment History Connections Tutorial

Project: (None)

Data

- air 18000 obs. of 15 variables
- air_numeric 18000 obs. of 12 variables
- cat_filter 3891 obs. of 18 variables
- furniture_high 460 obs. of 18 variables
- globalAirquality 18001 obs. of 15 variables
- high_sales 1146 obs. of 18 variables

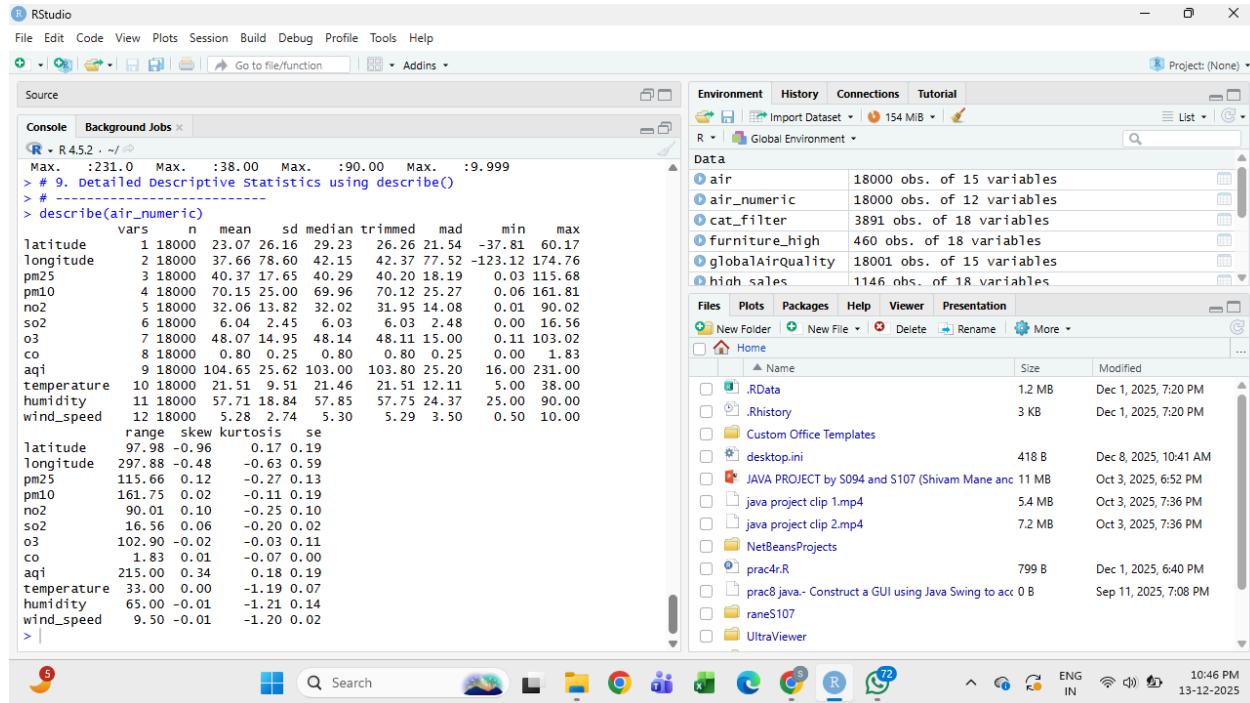
Files Plots Packages Help Viewer Presentation

Home

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PRACTICAL NO:2

GENERATING FREQUENCY TABLE USING TABLE() OR COUNT().

CODE:

```
#  
=====  
=====  
# R Script: Frequency Table Generation  
# Functions Used: table(), count()  
# Dataset: car_price_prediction_.csv  
#  
=====  
=====  
  
# -----  
# 1. Install Required Package (Run Once)  
# -----  
install.packages("dplyr")  
  
# -----  
# 2. Load Library (Must Run Every Time)  
# -----  
library(dplyr)
```

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```
# -----
# 3. Import Dataset
# Use forward slashes to avoid '\U' error
# -----
car <- read.csv("C:/Users/vibro/Downloads/car_price_prediction_.csv")

# -----
# 4. Clean Column Names (IMPORTANT)
# Converts names like "Fuel Type" -> Fuel_Type
# -----
names(car) <- make.names(names(car))

# -----
# 5. Verify Column Names
# -----
names(car)

#
=====

# FREQUENCY TABLE USING table() (Base R)
#
=====

table(car$Fuel_Type)
table(car$Transmission)
table(car$Owner)

#
=====

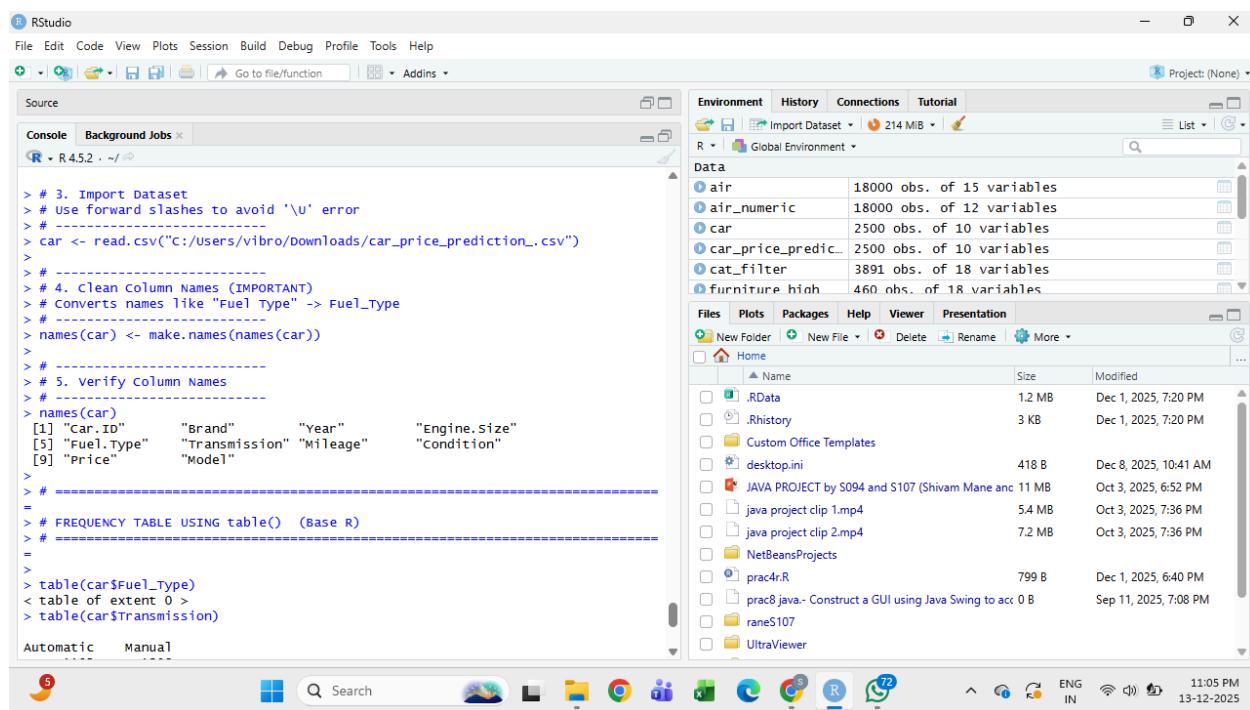
# FREQUENCY TABLE USING count() (dplyr)
#
=====

count(car, Fuel_Type)
count(car, Transmission)
count(car, Owner)
```

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```
#  
=====  
=====  
# SORTED FREQUENCY TABLE (Descending Order)  
#  
=====  
=====  
  
count(car, Fuel_Type, sort = TRUE)  
count(car, Transmission, sort = TRUE)  
count(car, Owner, sort = TRUE)
```

OUTPUT:



The screenshot shows the RStudio interface. The left pane contains the R console with the following code and output:

```
> # 3. Import Dataset  
> # Use forward slashes to avoid '\u' error  
> # -----  
> car <- read.csv("c:/users/vibro/downloads/car_price_prediction_.csv")  
> # -----  
> # 4. Clean Column Names (IMPORTANT)  
> # Converts names like "Fuel.Type" -> Fuel_Type  
> # -----  
> names(car) <- make.names(names(car))  
>  
> # -----  
> # 5. Verify Column Names  
> # -----  
> names(car)  
[1] "Car.Id"      "Brand"        "Year"         "Engine.Size"  
[5] "Fuel.Type"    "Transmission"  "Mileage"       "Condition"  
[9] "Price"        "Model"  
>  
> # -----  
=  
> # FREQUENCY TABLE USING table() (Base R)  
> # -----  
=  
>  
> table(car$Fuel_Type)  
< table of extent 0 >  
> table(car$Transmission)
```

The right pane shows the Environment tab with a list of objects and their details:

Object	Description
air	18000 obs. of 15 variables
air_numeric	18000 obs. of 12 variables
car	2500 obs. of 10 variables
car_price_predic...	2500 obs. of 10 variables
cat_filter	3891 obs. of 18 variables
furniture_high	460 obs. of 18 variables

The bottom right corner of the screen shows system status: ENG IN, 11:05 PM, 13-12-2025.

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```
- car[car$Fuel_Type]
: table of extent 0 >
- table(car$Transmission)

Automatic    Manual
      1192      1308
- table(car$Owner)
: table of extent 0 >
-
- # =====
-
- # FREQUENCY TABLE USING count() (dplyr)
- # =====
-
-
- count(car, Fuel_Type)
```

Error in `count()`:
! Must group by variables found in `.data`.
✖ Column `Fuel_Type` is not found.
Run `rlang:::last_trace()` to see where the error occurred.

```
- |
```



PRACTICAL NO: 3

CREATING CROSS TABULATION AND TWO WAY TABLES USING TABLES()(R)

CODE:

```
# =====
=====
# R Script: Cross Tabulation using table()
#
=====
```

1. Read the dataset

```
data <- read.csv("C:/Users/vibro/Downloads/data_date.csv", stringsAsFactors = FALSE)
```

2. Check column names

```
names(data)
```

3. Create Two-Way Cross Tabulation

```
# Replace Column1 and Column2 with actual column names
cross_tab <- table(data$Column1, data$Column2)
```

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```
# 4. Display Cross Tabulation
cross_tab

#
=====
=====

# 5. Row-wise Percentages
row_percent <- prop.table(cross_tab, 1) * 100
row_percent

#
=====
=====

# 6. Column-wise Percentages
col_percent <- prop.table(cross_tab, 2) * 100
col_percent

#
=====
=====

# 7. Overall Percentages
overall_percent <- prop.table(cross_tab) * 100
overall_percent

#
=====
=====

# 8. Cross Tabulation Including Missing Values
cross_tab_na <- table(data$Column1, data$Column2, useNA = "ifany")
cross_tab_na
```

OUTPUT:

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```

RStudio
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> # Frequency table for a column (example: drug_type)
> freq_table <- table(data$drug_type)
>
> # View result
> freq_table
<table of extent 0 >
> data_date <- read.csv("C:/Users/vibro/Downloads/data_date.csv")
> view(data_date)
> # 1. Read the dataset
> data <- read.csv("C:/Users/vibro/Downloads/data_date.csv", stringsAsFactors = FALSE)
>
> # 2. Check column names
> names(data)
[1] "date"      "country"    "status"     "AQI.value"
>
> # 3. Create Two-way Cross Tabulation
> # Replace Column1 and Column2 with actual column names
> cross_tab <- table(data$Column1, data$Column2)
>
> # 4. Display Cross Tabulation
> cross_tab
<table of extent 0 x 0 >
>
> # =====
> # 5. Row-wise Percentages
> row_percent <- prop.table(cross_tab, 1) * 100
> row_percent
<0 x 0 matrix>

RStudio
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> cross_tab
<table of extent 0 x 0 >
>
> # =====
> # 5. Row-wise Percentages
> row_percent <- prop.table(cross_tab, 1) * 100
> row_percent
<0 x 0 matrix>
>
> # =====
> # 6. Column-wise Percentages
> col_percent <- prop.table(cross_tab, 2) * 100
> col_percent
<0 x 0 matrix>
>
> # =====
> # 7. Overall Percentages
> overall_percent <- prop.table(cross_tab) * 100
> overall_percent
<0 x 0 matrix>
>
> # =====
> # 8. Cross Tabulation Including Missing values
> cross_tab_na <- table(data$Column1, data$Column2, useNA = "ifany")
> cross_tab_na
<table of extent 0 x 0 >
>

```

PRACTICAL NO: 4

PERFORMING ONE SAMPLE T-TESTS USING T.TESTS()..GIVE CODE

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CODE:

```
# -----
# ONE-SAMPLE T-TEST IN R
# -----  
  
# Clear workspace
rm(list = ls())  
  
# -----
# STEP 1: Load required libraries
# -----  
# (No extra packages required for t.test)  
  
# -----
# STEP 2: Import data (CSV file)
# -----  
# Replace file path and column name as needed
data <- read.csv("C:/Users/vibro/Downloads/HR_Analytics.csv.csv")  
  
# View structure
str(data)
summary(data)  
  
# -----
# STEP 3: Select the variable for test
# -----  
# Example: Monthly Income
x <- data$MonthlyIncome  
  
# Remove missing values
x <- na.omit(x)  
  
# -----  
# -----
# STEP 5: One-Sample t-Test
# -----  
# H0: Mean Monthly Income = 6500  
  
t_test_re
```

OUTPUT:

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RStudio

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Console Background Jobs

```
> # STEP 2: Import data (csv file)
> #
> # Replace file path and column name as needed
> data <- read.csv("C:/Users/vibro/Downloads/HR_Analytics.csv.csv")
>
> # View structure
> str(data)
'data.frame': 1470 obs. of 35 variables:
 $ Age : int 41 49 37 33 27 32 59 30 38 36 ...
 $ Attrition : chr "Yes" "No" "Yes" "No" ...
 $ BusinessTravel : chr "Travel_Rarely" "Travel_Frequently" "Travel_Rarely" "Travel_Frequently" ...
 $ DailyRate : int 1102 279 1373 1392 591 1005 1324 1358 216 1299 ...
 ...
 $ Department : chr "Sales" "Research & Development" "Research & Development" "Research & Development" ...
 $ DistanceFromHome : int 1 8 2 3 2 2 3 24 23 27 ...
 $ Education : int 2 1 2 4 1 2 3 1 3 3 ...
 $ EducationField : chr "Life Sciences" "Life Sciences" "Other" "Life Sciences" ...
 $ EmployeeCount : int 1 1 1 1 1 1 1 1 1 ...
 $ EmployeeNumber : int 1 2 4 5 7 8 10 11 12 13 ...
 $ EnvironmentSatisfaction : int 2 3 4 4 1 4 3 4 4 3 ...
 $ Gender : chr "Female" "Male" "Male" "Female" ...
 $ HourlyRate : int 94 61 92 56 40 79 81 67 44 94 ...
 $ JobInvolvement : int 3 2 2 3 3 3 4 3 2 3 ...
 $ JobLevel : int 2 2 1 1 1 1 1 1 3 2 ...
 $ JobRole : chr "Sales Executive" "Research Scientist" "Research Scientist" "Research Technician" ...
 $ JobSatisfaction : int 4 2 3 3 2 4 1 3 3 3 ...
 $ MaritalStatus : chr "Single" "Married" "Single" "Married" ...
```

Environment History Connections Tutorial Project: (None)

Global Environment

wine_quality_mer... 6497 obs. of 13 variables

Values	age	int [1:270] 70 67 57 64 74 65 56 59 60 63 ...
cross_tab	'table' int[0 , 0]	
cross_tab_na	'table' int[0 , 0]	
freq_table	'table' int[0 (1d)]	
x	int [1:1470] 5993 5130 2090 2909 3468 3068 267...	

Files Plots Packages Help Viewer Presentation

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prac8 java- Construct a GUI using Java Swing to acc	0 B	Sep 11, 2025, 7:08 PM
raneS107		
UltraViewer		

11:51 PM 13-12-2025

RStudio

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```
> R 4.5.2 . ~/...
$ PerformanceRating : int 3 4 3 3 3 3 4 4 4 3 ...
$ RelationshipSatisfaction: int 1 4 2 3 4 3 1 2 2 2 ...
$ StandardHours : int 80 80 80 80 80 80 80 80 80 80 ...
$ StockOptionLevel : int 0 1 0 0 1 0 3 1 0 2 ...
$ TotalWorkingYears : int 8 10 7 6 8 12 1 10 17 ...
$ TrainingTimesLastYear : int 0 3 3 3 3 2 3 2 2 3 ...
$ WorkLifeBalance : int 1 3 3 3 3 2 2 3 3 2 ...
$ YearsAtCompany : int 6 10 0 8 2 7 1 1 9 7 ...
$ YearsInCurrentRole : int 4 7 0 7 2 7 0 0 7 7 ...
$ YearsSinceLastPromotion : int 0 1 0 3 2 3 0 0 1 7 ...
$ YearsWithCurrManager : int 5 7 0 0 2 6 0 0 8 7 ...
> summary(data)
   Age Attrition BusinessTravel DailyRate
Min. :18.00 Length:1470 Length:1470 Min. : 102.0
1st Qu.:30.00 Class :character Class :character 1st Qu.: 465.0
Median :36.00 Mode :character Mode :character Median : 802.0
Mean : 36.92
3rd Qu.:43.00
Max. :60.00
   Department DistanceFromHome Education EducationField
Length:1470 Min. : 1.000 Min. :1.000 Length:1470
Class :character 1st Qu.: 2.000 1st Qu.:2.000 Class :character
Mode :character Median : 7.000 Median :3.000 Mode :character
   Mean : 9.193 Mean :12.913
   3rd Qu.:14.000 3rd Qu.:4.000
   Max. :29.000 Max. :5.000
   EmployeeCount EmployeeNumber EnvironmentSatisfaction Gender
Min. :1 Min. : 1.0 Min. :1.000 Length:1470
1st Qu.:1 1st Qu.: 491.2 1st Qu.:2.000 Class :character
Median :1 Median :1020.5 Median :3.000 Mode :character
Mean :1 Mean :1024.9 Mean :2.722
```

Environment History Connections Tutorial Project: (None)

Global Environment

wine_quality_mer... 6497 obs. of 13 variables

Values	age	int [1:270] 70 67 57 64 74 65 56 59 60 63 ...
cross_tab	'table' int[0 , 0]	
cross_tab_na	'table' int[0 , 0]	
freq_table	'table' int[0 (1d)]	
x	int [1:1470] 5993 5130 2090 2909 3468 3068 267...	

Files Plots Packages Help Viewer Presentation

New Folder New File Delete Rename More

Home

Name	Size	Modified
.RData	1.2 MB	Dec 1, 2025, 7:20 PM
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UltraViewer		

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SHETH L.U.J AND SIR M.V COLLEGE

RStudio Session 1 (Top):

```

EmployeeCount EmployeeNumber EnvironmentSatisfaction Gender
Min. :1 Min. : 1.0 Min. :1.000 Length:1470
1st Qu.:1 1st Qu.: 491.2 1st Qu.:2.000 Class :character
Median :1 Median :1020.5 Median :3.000 Mode :character
Mean : 1 Mean :1024.9 Mean :2.722
3rd Qu.:1 3rd Qu.:1555.8 3rd Qu.:4.000
Max. :1 Max. :2068.0 Max. :4.000

HourlyRate JobInvolvement JobLevel JobRole
Min. : 30.00 Min. :1.00 Min. :1.000 Length:1470
1st Qu.: 48.00 1st Qu.:2.00 1st Qu.:1.000 Class :character
Median : 66.00 Median :3.00 Median :2.000 Mode :character
Mean : 65.89 Mean :2.73 Mean :2.064
3rd Qu.: 83.75 3rd Qu.:3.00 3rd Qu.:3.000
Max. :100.00 Max. :4.00 Max. :5.000

Jobsatisfaction MaritalStatus MonthlyIncome MonthlyRate
Min. :1.000 Length:1470 Min. : 1009 Min. : 2094
1st Qu.:2.000 Class :character 1st Qu.: 2911 1st Qu.: 8047
Median :3.000 Mode :character Median : 4919 Median :14236
Mean : 2.729 Mean : 6503 Mean :14313
3rd Qu.: 4.000 3rd Qu.: 8379 3rd Qu.:20462
Max. :4.000 Max. :19999 Max. :26999

NumCompaniesworked Over18 Overtime PercentSalaryHike
Min. : 0.000 Length:1470 Length:1470 Min. :11.00
1st Qu.:1.000 Class :character Class :character 1st Qu.:12.00
Median :2.000 Mode :character Mode :character Median :14.00
Mean : 2.693 Mean : 15.21
3rd Qu.: 4.000 3rd Qu.:18.00 Max. :25.00
Max. :9.000 Max. :25.00

PerformanceRating RelationshipSatisfaction StandardHours StockOptionLevel
Min. : 3.000 Min. :1.000 Min. :80 Min. :0.0000
1st Qu.:3.000 1st Qu.:2.000 1st Qu.:80 1st Qu.:0.0000

```

RStudio Session 2 (Bottom):

```

YearsInCurrentRole YearssinceLastPromotion YearsWithCurrManager
Min. : 0.000 Min. : 0.000 Min. : 0.000
1st Qu.: 2.000 1st Qu.: 0.000 1st Qu.: 2.000
Median : 3.000 Median : 1.000 Median : 3.000
Mean : 4.229 Mean : 2.188 Mean : 4.123
3rd Qu.: 7.000 3rd Qu.: 3.000 3rd Qu.: 7.000
Max. :18.000 Max. :15.000 Max. :17.000

> # -----
> # STEP 3: Select the variable for test
> # -----
> # Example: Monthly Income
> x <- data$MonthlyIncome
>
> # Remove missing values
> x <- na.omit(x)
>
> # -----
> # -----
> # STEP 5: One-Sample t-Test
> # -----
> # H0: Mean Monthly Income = 6500
> # -----
> t_test_re

```

Error: object 't_test_re' not found

PRACTICAL NO:5

PERFORMING INDEPENDENT TWO SAMPLE T-TESTS USING T.TESTS() WITH GROUPING

SHETH L.U.J AND SIR M.V COLLEGE

CODE:

```
# -----
# INDEPENDENT TWO SAMPLE T-TEST USING t.test()
# -----  
  
# 1. Create / Load Data  
# Example dataset  
data <- data.frame(  
  Score = c(45, 50, 48, 52, 47, 60, 62, 58, 65, 61),  
  Group = c("A", "A", "A", "A", "A", "B", "B", "B", "B", "B")  
)  
  
# View data  
print(data)  
  
# -----  
# 2. Check structure  
# -----  
str(data)  
  
# -----  
# 3. Descriptive statistics  
# -----  
aggregate(Score ~ Group, data = data,  
  FUN = function(x) c(  
    Mean = mean(x),  
    SD = sd(x),  
    N = length(x)  
  ))  
  
# -----  
# 4. Normality Test (Shapiro-Wilk)  
# -----  
shapiro.test(data$Score[data$Group == "A"])  
shapiro.test(data$Score[data$Group == "B"])  
  
# -----  
# 5. Equality of Variance Test (F-test)  
# -----  
var.test(Score ~ Group, data = data)  
  
# -----
```

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```
# 6. Independent Two Sample t-test
# -----
# 6a. Welch t-test (Unequal variance) - DEFAULT
t_test_result <- t.test(Score ~ Group, data = data)

# Print result
print(t_test_result)

# -----
# 6b. Equal variance assumed
# -----
t_test_equal_var <- t.test(Score ~ Group, data = data, var.equal = TRUE)

print(t_test_equal_var)

# -----
# 7. Manual Method (Subsetting)
# -----
group_A <- data$Score[data$Group == "A"]
group_B <- data$Score[data$Group == "B"]

t.test(group_A, group_B)

# -----
# END OF CODE
# -----
```

OUTPUT:

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RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Console Background Jobs R 4.5.2 ~ ↻ Rerun with Debug

```

> # Step 1: Load dataset
> # -----
> data <- read.csv("C:/users/vibro/Downloads/top_rated_2000websries.csv")
>
> # View structure and column names
> str(data)
'data.frame': 2000 obs. of 11 variables:
 $ id      : int 1 2 3 4 5 6 7 8 9 ...
 $ title   : chr "Breaking Bad" "Avatar: The Last Airbender" "Arcane"
 "When Life Gives You Tangerines" ...
 $ original_title : chr "Breaking Bad" "Avatar: The Last Airbender" "Arcane"
 "짜증 속았습니다" ...
 $ overview  : chr "Walter White, a New Mexico chemistry teacher, is diagnosed with Stage III cancer and given a prognosis of only | __truncated__ "In a war-torn world of elemental magic, a young boy reawakens to undertake a dangerous mystic quest to fulfill | __truncated__ "Amid the stark discord of twin cities Piltover and Zaun, two sisters fight on rival sides of a war between magi" | __truncated__ "In Jeju, a spirited girl and a steadfast boy's island story blossoms into a lifelong tale of setbacks and triumph" | __truncated__ ...
 $ premiere_date : chr "2008-01-20" "2005-02-21" "2021-11-06" "2025-03-07"
 ...
 $ popularity   : num 108.8 12.5 22.6 18.6 28.4 ...
 $ genre        : chr "Drama, Crime" "Animation, Action & Adventure, Sci-Fi & Fantasy" "Animation, Sci-Fi & Fantasy, Drama, Action & Adventure" "Drama" ...
 $ country_origin : chr "United States" "United States" "United States" "South Korea" ...
 $ original_language: chr "English" "English" "English" "Korean" ...
 $ rating       : num 8.9 8.8 8.8 8.75 8.73 ...
 $ votes        : int 16556 1557 581 423 565 5043 2291 689 5992 7275

```

Environment History Connections Tutorial Project: (None)

t_test_result List of 10
train107 9800 obs. of 18 variables
wine 6497 obs. of 13 variables
wine_numeric 6497 obs. of 12 variables
wine_quality_mer... 6497 obs. of 13 variables

Values ade int [1:2701] 70 67 57 64 74 65 56 59 60 63 ...

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- raneS107
- UltraViewer

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RStudio

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Console Background Jobs R 4.5.2 ~ ↻ Rerun with Debug

```

...
$ popularity   : num 108.8 12.5 22.6 18.6 28.4 ...
$ genre        : chr "Drama, Crime" "Animation, Action & Adventure, Sci-Fi & Fantasy" "Animation, Sci-Fi & Fantasy, Drama, Action & Adventure" "Drama" ...
$ country_origin : chr "United States" "United States" "United States" "South Korea" ...
$ original_language: chr "English" "English" "English" "Korean" ...
$ rating       : num 8.9 8.8 8.8 8.75 8.73 ...
$ votes        : int 16556 1557 581 423 565 5043 2291 689 5992 7275 ...
> colnames(data)
[1] "id"          "title"        "original_title"
[4] "overview"    "premiere_date" "popularity"
[7] "genre"       "country_origin" "original_language"
[10] "rating"     "votes"
> summary(data)
   id          title      original_title      overview
Min. : 1.0 Length:2000 Length:2000 Length:2000
1st Qu.: 500.8 Class :character Class :character Class :character
Median :1000.5 Mode  :character Mode  :character Mode  :character
Mean  :1000.5
3rd Qu.:1500.2
Max. :2000.0
premiere_date    popularity      genre      country_origin
Length:2000 Min. : 0.3921 Length:2000 Length:2000
Class :character 1st Qu.: 4.8211 Class :character Class :character
Mode  :character Median : 8.2478 Mode  :character Mode  :character
Mean  :13.5572
3rd Qu.:15.1774
Max. :338.2498
original_language   rating      votes
Length:2000 Min. :7.086  Min. : 200.0
Class :character 1st Qu.:7.500  1st Qu.: 201.8

```

Environment History Connections Tutorial Project: (None)

t_test_result List of 10
train107 9800 obs. of 18 variables
wine 6497 obs. of 13 variables
wine_numeric 6497 obs. of 12 variables
wine_quality_mer... 6497 obs. of 13 variables

Values ade int [1:2701] 70 67 57 64 74 65 56 59 60 63 ...

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- UltraViewer

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RStudio Environment

```
> # Example dataset
> data <- data.frame(
+   Score = c(45, 50, 48, 52, 47, 60, 62, 58, 65, 61),
+   Group = c("A", "A", "A", "A", "B", "B", "B", "B", "B")
+ )
>
> # View data
> print(data)
  Score Group
1     45     A
2     50     A
3     48     A
4     52     A
5     47     A
6     60     B
7     62     B
8     58     B
9     65     B
10    61     B
> #
> # 2. Check structure
> #
> str(data)
'data.frame': 10 obs. of 2 variables:
$ score: num 45 50 48 52 47 60 62 58 65 61
$ Group: chr "A" "A" "A" "A" ...
> #
> # 3. Descriptive statistics
```

RStudio Files

- .RData
- .Rhistory
- Custom Office Templates
- desktop.ini
- JAVA PROJECT by S094 and S107 (Shivam Mane anc)
- java project clip 1.mp4
- java project clip 2.mp4
- NetBeansProjects
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- UltraViewer

RStudio Environment

```
> #
> # 3. Descriptive statistics
> #
> aggregate(score ~ Group, data = data,
+            FUN = function(x) c(
+              Mean = mean(x),
+              SD = sd(x),
+              N = length(x)
+            ))
  Group Score.Mean Score.SD Score.N
1     A      48.400000  2.701851  5.000000
2     B      61.200000  2.588436  5.000000
> #
> # 4. Normality Test (Shapiro-wilk)
> #
> shapiro.test(data$score[data$Group == "A"])
  Shapiro-Wilk normality test
data: data$score[data$Group == "A"]
W = 0.98998, p-value = 0.9796
> shapiro.test(data$score[data$Group == "B"])
  Shapiro-Wilk normality test
data: data$score[data$Group == "B"]
W = 0.98396, p-value = 0.9546
>
```

RStudio Files

- .RData
- .Rhistory
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- desktop.ini
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RStudio

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Console Background Jobs

R 4.5.2 . ~/

```

data: data$score[data$Group == "B"]
W = 0.98396, p-value = 0.9546

> # -----
> # 5. Equality of Variance Test (F-test)
> # -----
> var.test(score ~ Group, data = data)

F test to compare two variances

data: Score by Group
F = 1.0896, num df = 4, denom df = 4, p-value = 0.9358
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
0.1134415 10.4646370
sample estimates:
ratio of variances
1.089552

> # -----
> # 6. Independent Two Sample t-test
> # -----
> # 6a. Welch t-test (Unequal variance) - DEFAULT
> t_test_result <- t.test(Score ~ Group, data = data)
>
> # Print result
> print(t_test_result)

```

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RStudio

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Console Background Jobs

R 4.5.2 . ~/

```

mean in group A mean in group B
48.4 61.2

> # -----
> # 6b. Equal variance assumed
> # -----
> t_test_equal_var <- t.test(Score ~ Group, data = data, var.equal = TRUE)
>
> print(t_test_equal_var)

Two Sample t-test

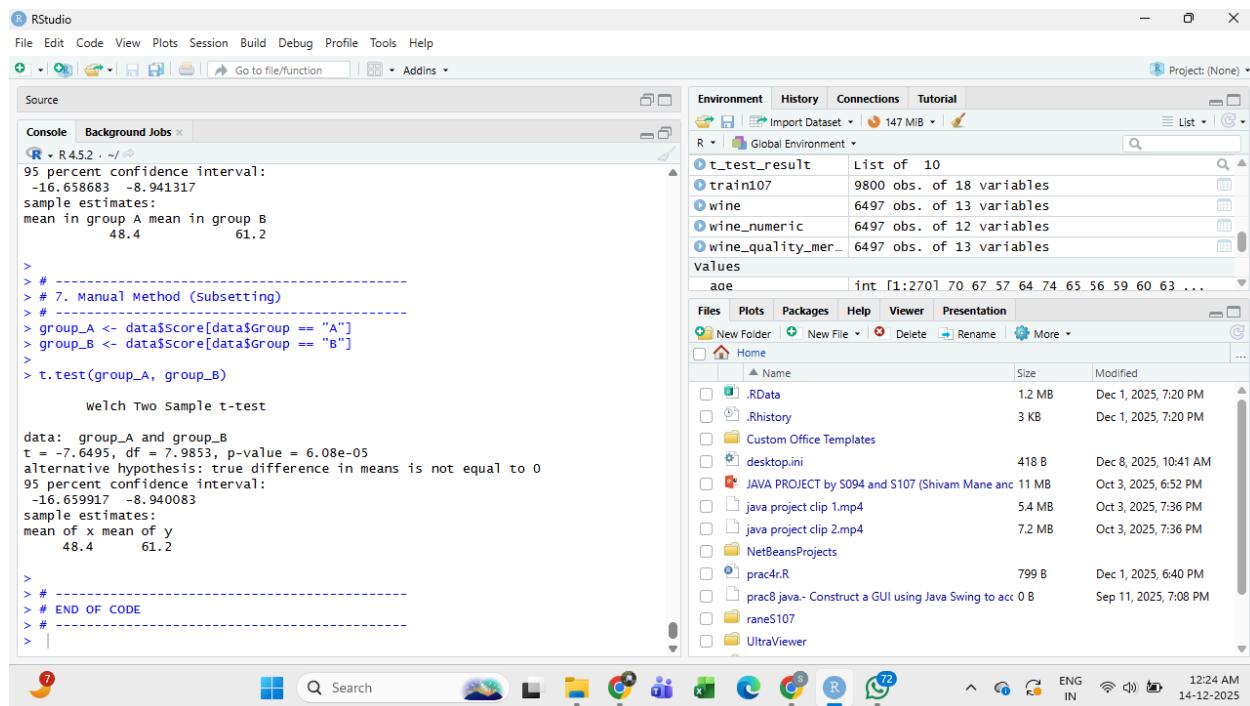
data: Score by Group
t = -7.6495, df = 8, p-value = 6.02e-05
alternative hypothesis: true difference in means between group A and group B is not equal to 0
95 percent confidence interval:
-16.658683 -8.941317
sample estimates:
mean in group A mean in group B
48.4 61.2

> # -----
> # 7. Manual Method (Subsetting)
> # -----
> group_A <- data$score[data$Group == "A"]
> group_B <- data$score[data$Group == "B"]
>
> t.test(group_A, group_B)

```

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PRACTICAL NO: 6

PERFORMING PAIRED T.TESTS USING T.TESTS(PAIRED=TRUE)

CODE:

```
# 1. Create Own Dataset (Before–After Example)
data <- data.frame(
  Subject = 1:10,
  Before = c(65, 70, 68, 72, 66, 75, 78, 74, 80, 77),
  After = c(70, 75, 72, 78, 71, 80, 82, 79, 85, 83)
)

# View data
print(data)

# -----
# 2. Check structure
# -----
str(data)

# -----
# 3. Descriptive statistics
# -----
```

RIYA RANE
S107 SYCS

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```
mean(data$Before)
mean(data$After)

sd(data$Before)
sd(data$After)

# -----
# 4. Normality Test on Differences
# -----
difference <- data$After - data$Before
shapiro.test(difference)

# -----
# 5. Paired t-test
# -----
paired_t_test <- t.test(
  data$Before,
  data$After,
  paired = TRUE
)

# Print result
print(paired_t_test)

# -----
# 6. Alternative way (Formula method)
# -----
# Convert to long format
long_data <- data.frame(
  Score = c(data$Before, data$After),
  Time = rep(c("Before", "After"), each = nrow(data))
)

t.test(Score ~ Time, data = long_data, paired = TRUE)

# -----
# END OF CODE
# -----
```

OUTPUT:

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RStudio

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```
R > # View data
> print(data)
  Subject Before After
1          1   65    70
2          2   70    75
3          3   68    72
4          4   72    78
5          5   66    71
6          6   75    80
7          7   78    82
8          8   74    79
9          9   80    85
10         10  77    83

>
> # -----
> # 2. Check structure
> #
> str(data)
'data.frame': 10 obs. of 3 variables:
$ Subject: int 1 2 3 4 5 6 7 8 9 10
$ Before : num 65 70 68 72 66 75 78 74 80 77
$ After  : num 70 75 72 78 71 80 82 79 85 83

>
> # -----
> # 3. Descriptive statistics
> #
> mean(data$Before)
[1] 72.5
> mean(data$After)
[1] 77.5
> cd(data$Before)
```

Environment History Connections Tutorial

Import Dataset Global Environment

- paired_t_test List of 10
- real_drug_dataset 1000 obs. of 9 variables
- row_percent num[0 , 0]
- sales 9800 obs. of 18 variables
- special_rows 5151 obs. of 18 variables
- t_test_equal_var List of 10
- t test result List of 10

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RStudio

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Console Background Jobs

```
R > # -----
> # 3. Descriptive statistics
> #
> mean(data$Before)
[1] 72.5
> mean(data$After)
[1] 77.5
>
> sd(data$Before)
[1] 5.169354
> sd(data$After)
[1] 5.275731
>
> # -----
> # 4. Normality Test on Differences
> #
> difference <- data$After - data$Before
> shapiro.test(difference)

  Shapiro-Wilk normality test

data: difference
W = 0.81484, p-value = 0.02195

>
> # -----
> # 5. Paired t-test
> #
> paired_t_test <- t.test(
+   data$Before,
+   data$After,
```

Environment History Connections Tutorial

Import Dataset Global Environment

- paired_t_test List of 10
- real_drug_dataset 1000 obs. of 9 variables
- row_percent num[0 , 0]
- sales 9800 obs. of 18 variables
- special_rows 5151 obs. of 18 variables
- t_test_equal_var List of 10
- t test result List of 10

Files Plots Packages Help Viewer Presentation

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UltraViewer		

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SHETH L.U.J AND SIR M.V COLLEGE

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Source

Console Background Jobs

```
R > Shapiro-Wilk normality test
data: difference
W = 0.81484, p-value = 0.02195
> # -----
> # 5. Paired t-test
> # -----
> paired_t_test <- t.test(
+   data$Before,
+   data$After,
+   paired = TRUE
+ )
> # Print result
> print(paired_t_test)

Paired t-test

data: data$Before and data$After
t = -23.717, df = 9, p-value = 2.01e-09
alternative hypothesis: true mean difference is not equal to 0
95 percent confidence interval:
-5.476905 -4.523095
sample estimates:
mean difference
      -5

> # -----
> # 6. Alternative way (Formula method)
```

Environment History Connections Tutorial

Project: (None)

Files Plots Packages Help Viewer Presentation

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UltraViewer		

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RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Source

Console Background Jobs

```
R > print(result)
> print(paired_t_test)

Paired t-test

data: data$Before and data$After
t = -23.717, df = 9, p-value = 2.01e-09
alternative hypothesis: true mean difference is not equal to 0
95 percent confidence interval:
-5.476905 -4.523095
sample estimates:
mean difference
      -5

> # -----
> # 6. Alternative way (Formula method)
> #
> # Convert to long format
> long_data <- data.frame(
+   Score = c(data$Before, data$After),
+   Time = rep(c("Before", "After"), each = nrow(data))
+ )
> t.test(score ~ Time, data = long_data, paired = TRUE)

Error in t.test.formula(score ~ Time, data = long_data, paired = TRUE) :
  cannot use 'paired' in formula method
```

Show Traceback Rerun with Debug

Environment History Connections Tutorial

Project: (None)

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