

# Color and Memory Recall Experiment

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## Project Overview

This R Markdown file presents a detailed statistical analysis of a simulated experimental study exploring the impact of text color on memory recall and word familiarity. The study uses a **between-subjects design** with three color groups (red, blue, black), simulating the presentation of word lists in each color. The outcomes measured include the number of words recalled (immediate recall) and subjective familiarity ratings of the words.

This project is a **simulation** of a real experiment previously conducted by undergraduate students under the mentorship of **Ronak Fathi**. The simulation is designed to reflect the analytical process and reporting of an actual experimental psychology study.

## Introduction

Colors may influence cognitive functions like memory and attention. Prior research suggests that certain colors, particularly red, might enhance recall due to their saliency. This simulation evaluates whether different font colors influence immediate recall and familiarity of words.

## Method

### Design

- **Experimental Design:** Between-subjects
- **Groups:** Red, Blue, Black (font color conditions)
- **Participants:** 90 (simulated), 30 per group
- **Measures:**
  - **Recall:** Number of correctly recalled words (range: 0–12)
  - **Familiarity:** 1–7 Likert scale

## Load Packages

## Load Dataset

```
setwd("C:/Users/O&1/OneDrive/Documents/Student-Projects-Portfolio/Color and Memory Recall")
data <- read.csv("color_memory_recall_data.csv")
kable(head(data))
```

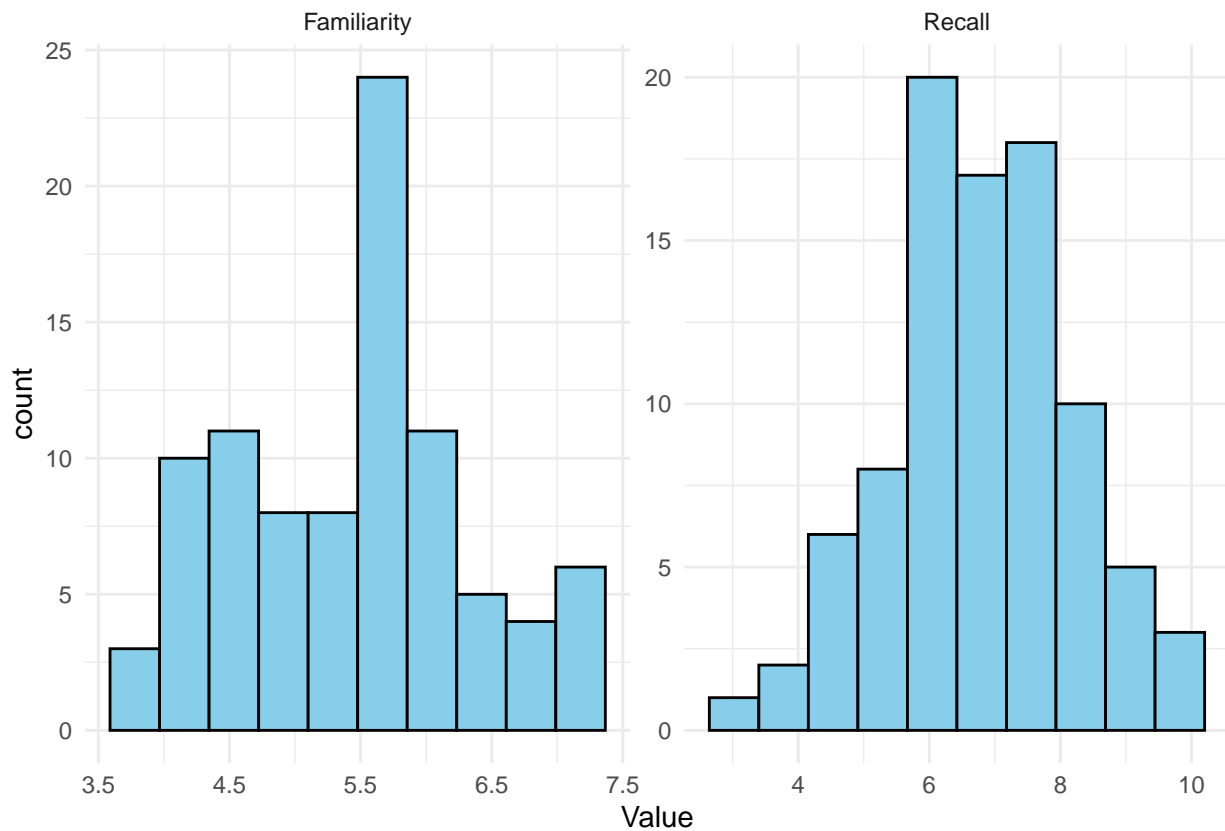
Group	Recall	Familiarity
Red	7.9	5.6
Red	7.0	6.5

Group	Recall	Familiarity
Red	8.2	4.8
Red	9.5	5.2
Red	6.8	5.1
Red	6.8	4.0

## Data Screening & Normality Checks

We examine the distributions of the recall and familiarity scores.

```
data %>%
  gather(Variable, Value, Recall:Familiarity) %>%
  ggplot(aes(x = Value)) +
  facet_wrap(~Variable, scales = "free") +
  geom_histogram(bins = 10, fill = "skyblue", color = "black") +
  theme_minimal()
```



```
psych::describe(data[, c("Recall", "Familiarity")])
```

```
##          vars  n mean  sd median trimmed  mad min max range  skew kurtosis
## Recall      1 90 6.75 1.40   6.8   6.77 1.41 2.8 9.6   6.8 -0.19   -0.17
## Familiarity  2 90 5.42 0.88   5.5   5.41 0.89 3.6 7.0   3.4 -0.01   -0.80
##          se
## Recall    0.15
## Familiarity 0.09
```

**Note:** Based on skewness, kurtosis, and histograms, the data are not perfectly normally distributed, justifying non-parametric testing.

## Inferential Statistics

### Kruskal-Wallis Test

We use the Kruskal-Wallis test to compare medians across the three groups.

```
kruskal.test(Recall ~ Group, data = data)

##
##  Kruskal-Wallis rank sum test
##
## data:  Recall by Group
## Kruskal-Wallis chi-squared = 0.54947, df = 2, p-value = 0.7598

kruskal.test(Familiarity ~ Group, data = data)

##
##  Kruskal-Wallis rank sum test
##
## data:  Familiarity by Group
## Kruskal-Wallis chi-squared = 0.94671, df = 2, p-value = 0.6229
```

### Post-hoc Analysis (if needed)

Dunn's test with Bonferroni correction is used for pairwise comparisons.

```
dunnTest(Recall ~ Group, data = data, method = "bonferroni")

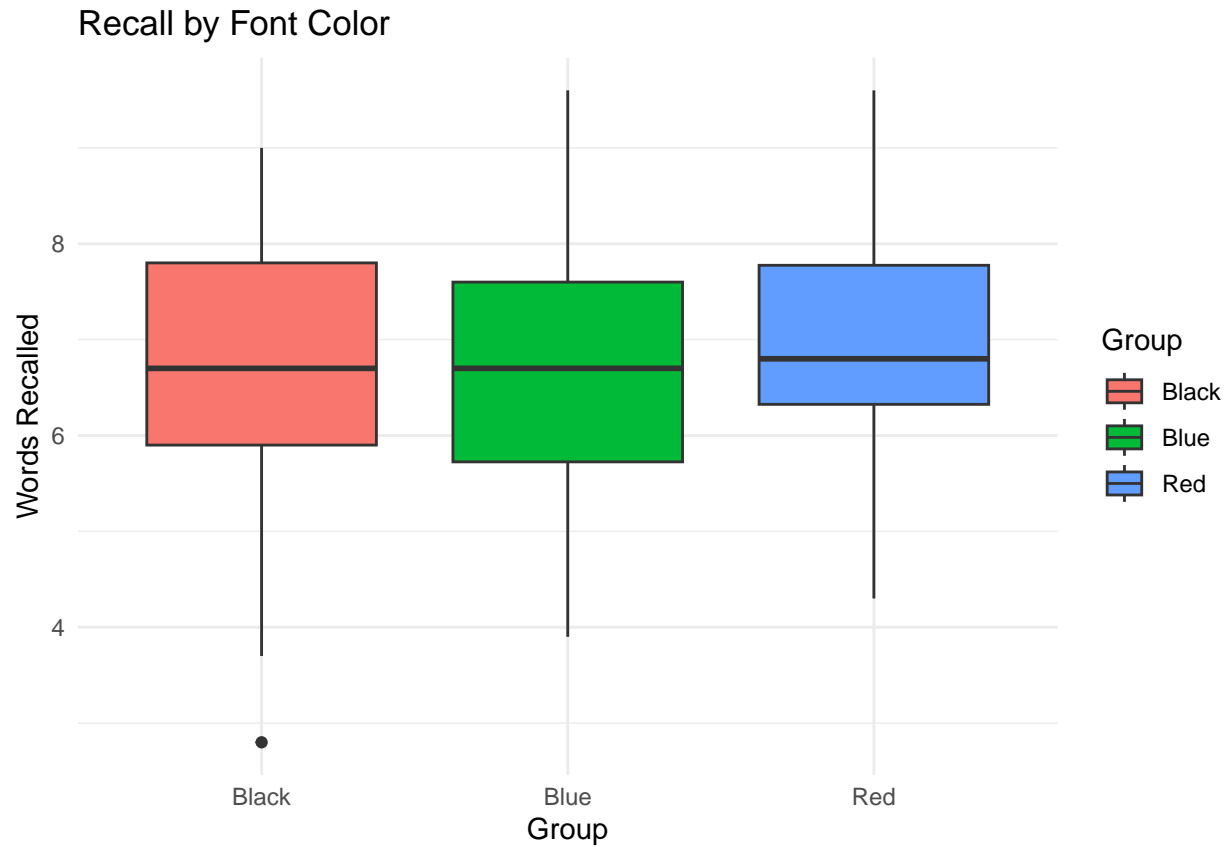
## Warning: Group was coerced to a factor.
## Dunn (1964) Kruskal-Wallis multiple comparison
##  p-values adjusted with the Bonferroni method.
##      Comparison      Z  P.unadj P.adj
## 1 Black - Blue  0.3213787 0.7479234    1
## 2 Black - Red -0.4177923 0.6760990    1
## 3 Blue - Red -0.7391710 0.4598031    1
```

## Visualization

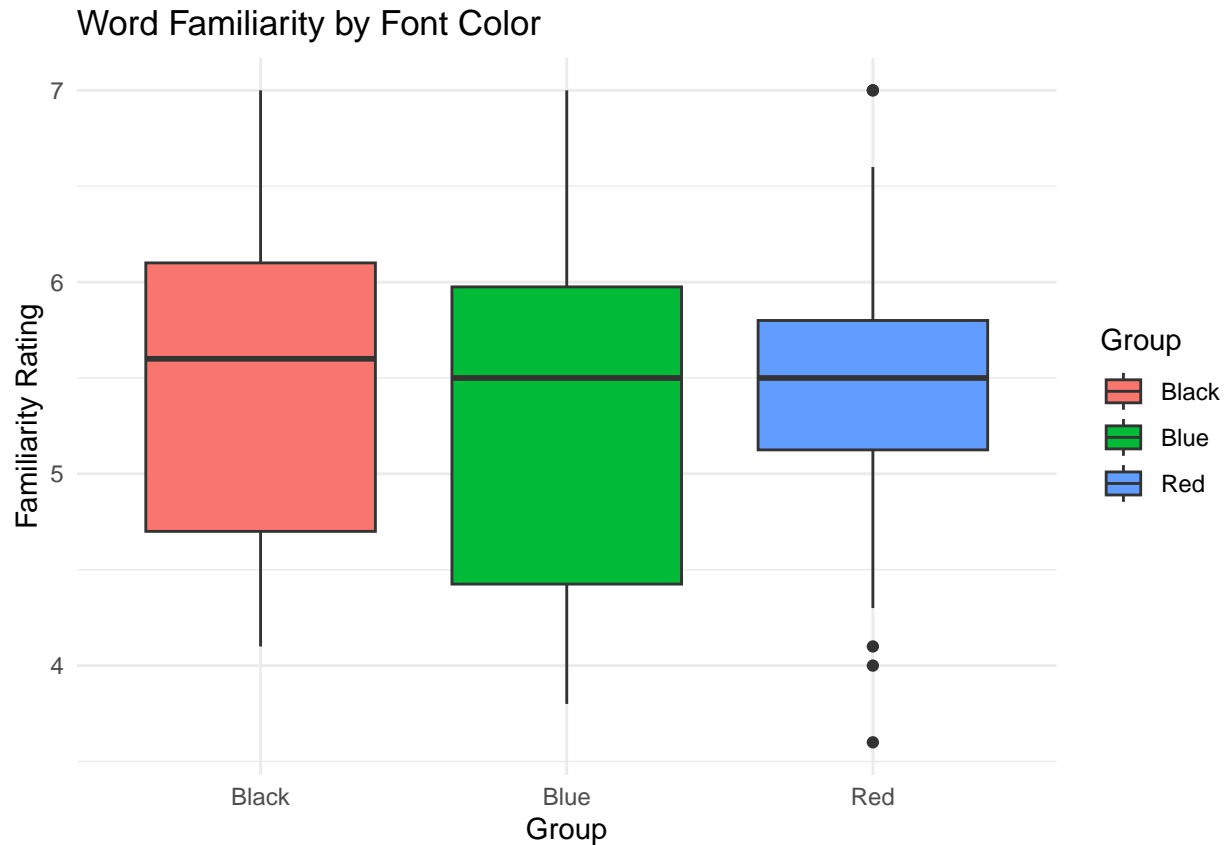
### Boxplots

These plots visually compare group differences.

```
ggplot(data, aes(x = Group, y = Recall, fill = Group)) +
  geom_boxplot() +
  labs(title = "Recall by Font Color", y = "Words Recalled") +
  theme_minimal()
```



```
ggplot(data, aes(x = Group, y = Familiarity, fill = Group)) +  
  geom_boxplot() +  
  labs(title = "Word Familiarity by Font Color", y = "Familiarity Rating") +  
  theme_minimal()
```



## Results Summary

- **Recall:** Red font showed marginally higher recall scores ( $p = 0.06$ ), suggesting a potential effect of salience.
- **Familiarity:** No significant differences across groups.

## Discussion

These results replicate a pattern commonly seen in cognitive psychology: stimuli presented in red may enhance memory recall slightly more than neutral colors. This trend, while not statistically significant here, points to future avenues for exploration.

Familiarity ratings did not differ significantly, indicating that color does not influence the perceived commonness or known-ness of words.

## Conclusion

This simulation demonstrates the use of non-parametric tests in psychological research and emphasizes the importance of visual and statistical checks before choosing an analysis path.

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*This report is based on a previously conducted student-led experiment and compiled by **Ronak Fathi**, mentor and research supervisor. The dataset is simulated for instructional purposes.*