

# Final Project Communication

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**This document is used to generate the plots shown in the infographic**

## Load the Data

```
library(tidyverse)

## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   4.0.0     v tibble    3.2.1
## v lubridate 1.9.4     v tidyr    1.3.1
## v purrr    1.0.4
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()   masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
data <- read_csv("raw_memory_data_study1.csv")

## Rows: 5372 Columns: 42
## -- Column specification -----
## Delimiter: ","
## chr (1): Word
## dbl (41): both_hit, both_fa, both_h_fa, d_both, c_both, img, Bird2001, Brist...
## 
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

## Removing Missing Data

```
data_clean <- data |>
  filter(!is.na(Body) & !is.na(Object))
nrow(data_clean)

## [1] 5311
nrow(data)

## [1] 5372
```

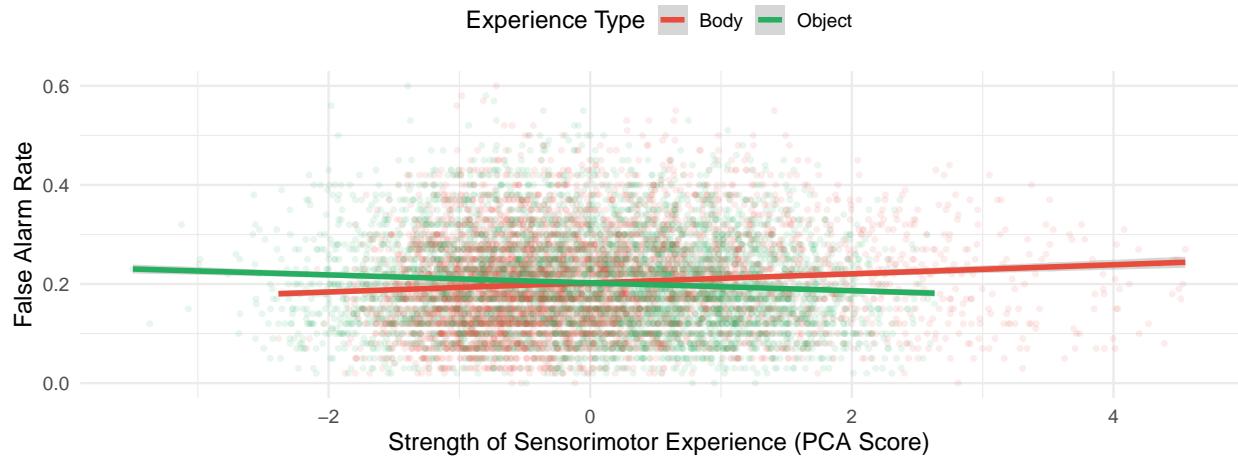
## Analysis: Testing the Embodiment Paradox

To answer my research question, I am comparing the False Alarm rates of words with **High** vs. **Low** sensorimotor experience.

```
## `geom_smooth()` using formula = 'y ~ x'
```

### The Divergence: Internal vs. External Experience

Body experience (Red) increases errors, while Object experience (Green) reduces them.



### Analysis Cont.

To further confirm my theory I want to

- **High Group:** Words in the top 25% of scores (Strongest experience).
- **Low Group:** Words in the bottom 25% of scores (Weakest experience).

```
# Define High/Low Cutoffs (Top 25% and Bottom 25%)
body_quants <- quantile(data_clean$Body, probs = c(0.25, 0.75))
obj_quants <- quantile(data_clean$Object, probs = c(0.25, 0.75))

# We calculate the Mean False Alarm Rate (both_fa) for High/Low groups in both dimensions

# Analyze Body
body_summary <- data_clean |>
  mutate(Group = case_when(
    Body >= body_quants[2] ~ "High",
    Body <= body_quants[1] ~ "Low",
    TRUE ~ "Medium"
  )) |>
  filter(Group != "Medium") |>
  group_by(Group) |>
  summarise(
    Mean_FA = mean(both_fa, na.rm = TRUE),
    SE_FA = sd(both_fa, na.rm = TRUE) / sqrt(n()), # Standard Error for error bars
    Dimension = "Internal (Body)"
  )

# Analyze Object
object_summary <- data_clean |>
  mutate(Group = case_when(
    Object >= obj_quants[2] ~ "High",
    Object <= obj_quants[1] ~ "Low",
    TRUE ~ "Medium"
  )) |>
  filter(Group != "Medium") |>
  group_by(Group) |>
  summarise(
    Mean_FA = mean(both_fa, na.rm = TRUE),
    SE_FA = sd(both_fa, na.rm = TRUE) / sqrt(n()), # Standard Error for error bars
    Dimension = "External (Object)"
  )
```

```

)) |>
filter(Group != "Medium") |>
group_by(Group) |>
summarise(
  Mean_FA = mean(both_fa, na.rm = TRUE),
  SE_FA = sd(both_fa, na.rm = TRUE) / sqrt(n()),
  Dimension = "External (Object)"
)

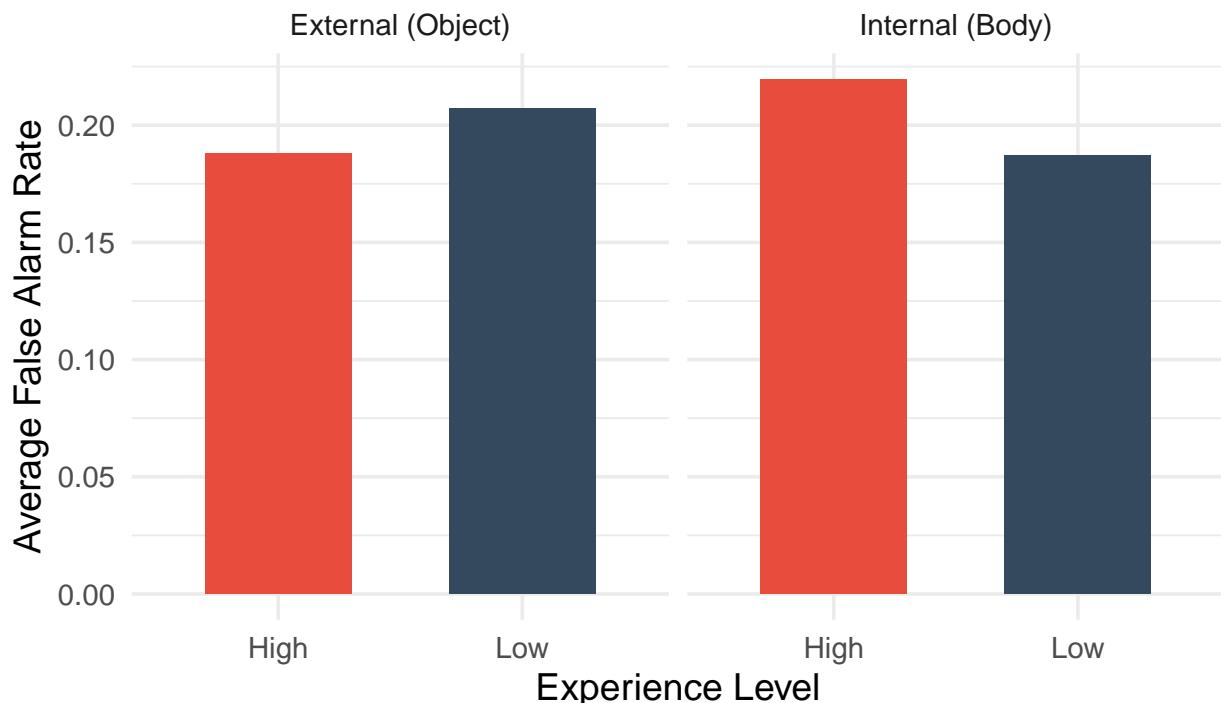
# Combine into one plot-ready dataframe
plot_data <- bind_rows(body_summary, object_summary)

# Generate the Comparative Bar Chart
ggplot(plot_data, aes(x = Group, y = Mean_FA, fill = Group)) +
  geom_bar(stat = "identity", width = 0.6) +
  facet_wrap(~Dimension) # Creates side-by-side panels
  scale_fill_manual(values = c("High" = "#e74c3c", "Low" = "#34495e")) +
  labs(title = "The Paradox: Effect of Experience on False Alarms",
       subtitle = "High Body experience increases errors; High Object experience does not.",
       x = "Experience Level",
       y = "Average False Alarm Rate") +
  theme_minimal(base_size = 14) +
  theme(legend.position = "none")

```

## The Paradox: Effect of Experience on False Alarms

High Body experience increases errors; High Object experience does not.



## Plot Creations for Canva

```

# Cleaned scatter plot (The Trend)
plot_trend <- ggplot(plot_data_long, aes(x = Score, y = both_fa, color = Experience_Type)) +
  geom_point(alpha = 0.1, size = 1) +
  geom_smooth(method = "lm", se = TRUE, size = 2) +
  scale_color_manual(values = c("Body" = "#e74c3c", "Object" = "#27ae60")) +
  # Remove all titles/labels (will add these in Canva)
  labs(x = NULL, y = NULL, title = NULL) +
  theme_minimal(base_size = 18) + # Larger text for readability
  theme(
    legend.position = "none", # Remove legend (will make a custom key in Canva)
    panel.grid.minor = element_blank(),
    plot.background = element_rect(fill = "transparent", color = NA), # Transparent
    panel.background = element_rect(fill = "transparent", color = NA)
  )

# Cleaned bar chart (The Evidence)
plot_bar <- ggplot(plot_data, aes(x = Group, y = Mean_FA, fill = Group)) +
  geom_bar(stat = "identity", width = 0.6) +
  geom_errorbar(aes(ymin = Mean_FA - SE_FA, ymax = Mean_FA + SE_FA), width = 0.2) +
  facet_wrap(~Dimension) +
  scale_fill_manual(values = c("High" = "#e74c3c", "Low" = "#34495e")) +
  labs(x = NULL, y = NULL, title = NULL) +
  theme_minimal(base_size = 18) +
  theme(
    legend.position = "none",
    strip.text = element_text(size = 20, face = "bold"), # Keep "Internal/External" labels
    plot.background = element_rect(fill = "transparent", color = NA),
    panel.background = element_rect(fill = "transparent", color = NA)
  )

# Save the plots as transparent PNGs
ggsave("canva_trend_plot.png", plot = plot_trend, width = 8, height = 5, bg = "transparent")
ggsave("canva_bar_chart.png", plot = plot_bar, width = 8, height = 5, bg = "transparent")

```