NavCity Correlation Analyses with FDR Correction

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2025-10-10

Contents

Load Required Libraries

```r
library(tidyverse)
library(broom)
library(knitr)
library(kableExtra)
library(reshape2)
library(corrplot)
```

Data Import and Preparation

```r
# Load all data files
demographic_data <- read_csv("/Volumes/YB_Drive/NavAging_Paper/data/demographic_data.csv")
non_nav <- read_csv("/Volumes/YB_Drive/NavAging_Paper/data/non_nav_data.csv")
```

```r
ya_nav <- read_csv("/Volumes/YB_Drive/NavAging_Paper/data/ya_averaged_results.csv")
oa_nav <- read_csv("/Volumes/YB_Drive/NavAging_Paper/data/oa_averaged_results.csv")

# Combine YA and OA navigation data
nav_data <- bind_rows(
  ya_nav %>% mutate(Group = "YA"),
  oa_nav %>% mutate(Group = "OA")
)

# Average navigation metrics across all blocks for each participant
nav_averaged <- nav_data %>%
  group_by(Participant, Group) %>%
  summarise(
    Mean_Speed = mean(Speed, na.rm = TRUE),
    Mean_Distance = mean(Distance, na.rm = TRUE),
    Mean_Navigation_Time = mean(Navigation_Time, na.rm = TRUE),
    .groups = "drop"
  )

# Merge all datasets
merged_temp <- demographic_data %>%
  full_join(non_nav, by = "Participant", suffix = c("_demo", "_non_nav")) %>%
  mutate(Group = coalesce(Group_non_nav,
                          if_else(Group_demo == 1, "YA", "OA"))) %>%
  select(-Group_demo, -Group_non_nav)

merged_data <- merged_temp %>%
  left_join(nav_averaged, by = c("Participant", "Group"))

cat("Total participants:", nrow(merged_data), "\n")
```

```
## Total participants: 60
```

```r
cat("YA participants:", sum(merged_data$Group == "YA", na.rm = TRUE), "\n")
```

```
## YA participants: 30
```

```r
cat("OA participants:", sum(merged_data$Group == "OA", na.rm = TRUE), "\n")
```

```
## OA participants: 30
```

Create Numeric Variables for Correlation

```r
# Create numeric versions of variables for correlation
merged_data <- merged_data %>%
  mutate(
    # VR Experience already numeric (0, 1, 2)
    VR_Experience_numeric = VR_Experience_Quantified,
```

```r
    # Calculate Trails B-A difference (switching cost)
    Trails_BA_Diff = Trails_B_CT - Trails_A_CT
  )

# Show coding scheme
cat("Variable Information:\n")
```

Variable Information:

```r
cat("- VR Experience: 0 (never), 1 (1-3 times), 2 (>3 times)\n")
```

- VR Experience: 0 (never), 1 (1-3 times), 2 (>3 times)

```r
cat("- Video Game Usage: Continuous (hours per week or similar)\n")
```

- Video Game Usage: Continuous (hours per week or similar)

```r
cat("- SSS Pre: Stanford Sleepiness Scale baseline (1-7)\n")
```

- SSS Pre: Stanford Sleepiness Scale baseline (1-7)

```r
cat("- SBSOD: Santa Barbara Sense of Direction Scale (higher = better)\n")
```

- SBSOD: Santa Barbara Sense of Direction Scale (higher = better)

```r
cat("- Trails A: Completion time (lower = better)\n")
```

- Trails A: Completion time (lower = better)

```r
cat("- Trails B: Completion time (lower = better)\n")
```

- Trails B: Completion time (lower = better)

```r
cat("- Trails B-A: Cognitive switching cost (higher = worse)\n")
```

- Trails B-A: Cognitive switching cost (higher = worse)

```r
cat("- Corsi Blocks: Total score (higher = better)\n\n")
```

- Corsi Blocks: Total score (higher = better)

```r
# Define predictors and outcomes
predictors <- c(
  "VR_Experience_numeric",
  "Video_Game_Experience_Quantified",
  "SSS_Pre",
```

```r
  "SBSOD",
  "Trails_A_CT",
  "Trails_B_CT",
  "Trails_BA_Diff",
  "Corsi_Score_Total"
)

predictor_labels <- c(
  "VR Experience",
  "Video Game Usage",
  "SSS Pre",
  "SBSOD",
  "Trails A",
  "Trails B",
  "Trails B-A (Switch Cost)",
  "Corsi Total"
)

outcomes <- c(
  "Mean_Speed",
  "Mean_Distance",
  "Mean_Navigation_Time"
)

outcome_labels <- c(
  "Mean Speed",
  "Mean Distance",
  "Mean Nav Time"
)

cat("8 Predictors × 3 Outcomes = 24 correlations per group\n")
```

```
## 8 Predictors × 3 Outcomes = 24 correlations per group
```

```r
cat("Total correlations: 48 (24 YA + 24 OA)\n")
```

```
## Total correlations: 48 (24 YA + 24 OA)
```

```r
cat("FDR correction applied within each age group (24 tests each)\n")
```

```
## FDR correction applied within each age group (24 tests each)
```

YA Group Correlations with FDR Correction

```r
cat("=== YOUNGER ADULTS (YA) CORRELATIONS ===\n\n")
```

```
## === YOUNGER ADULTS (YA) CORRELATIONS ===
```

```r
# Filter YA data
ya_data <- merged_data %>% filter(Group == "YA")

cat("YA sample size:", nrow(ya_data), "\n\n")
```

```
## YA sample size: 30
```

```r
# Function to compute correlations
compute_correlations <- function(data, predictors, outcomes) {
  results <- expand_grid(
    predictor = predictors,
    outcome = outcomes
  ) %>%
    mutate(
      correlation = map2(predictor, outcome, function(pred_var, out_var) {
        # Filter to complete cases for this pair
        valid_indices <- !is.na(data[[pred_var]]) & !is.na(data[[out_var]])

        if (sum(valid_indices) < 3) {
          return(tibble(r = NA, p_value = NA, n = 0))
        }

        test <- cor.test(data[[pred_var]][valid_indices],
                         data[[out_var]][valid_indices],
                         method = "pearson")
        tibble(
          r = test$estimate,
          p_value = test$p.value,
          n = sum(valid_indices)
        )
      })
    ) %>%
    unnest(correlation)

  return(results)
}

# Compute all YA correlations
ya_correlations <- compute_correlations(ya_data, predictors, outcomes)

# Add FDR correction within YA group
ya_correlations <- ya_correlations %>%
  mutate(
    p_fdr = p.adjust(p_value, method = "fdr")
  )

# Add labels for better readability
ya_correlations <- ya_correlations %>%
  mutate(
    predictor_label = predictor_labels[match(predictor, predictors)],
    outcome_label = outcome_labels[match(outcome, outcomes)]
  )
```

```r
# Display correlation table with both raw and FDR-corrected p-values
cat("YA Correlation Results (with FDR correction):\n\n")
```

YA Correlation Results (with FDR correction):

```r
ya_correlations %>%
  select(Predictor = predictor_label,
         Outcome = outcome_label,
         r, p_raw = p_value, p_fdr, n) %>%
  mutate(
    r = round(r, 3),
    p_raw = format(p_raw, scientific = FALSE, digits = 4),
    p_fdr = format(p_fdr, scientific = FALSE, digits = 4),
    sig_raw = case_when(
      as.numeric(p_raw) < 0.001 ~ "***",
      as.numeric(p_raw) < 0.01 ~ "**",
      as.numeric(p_raw) < 0.05 ~ "*",
      TRUE ~ ""
    ),
    sig_fdr = case_when(
      as.numeric(p_fdr) < 0.001 ~ "***",
      as.numeric(p_fdr) < 0.01 ~ "**",
      as.numeric(p_fdr) < 0.05 ~ "*",
      TRUE ~ ""
    )
  ) %>%
  kable(caption = "YA Group: Correlations with Raw and FDR-Corrected P-values") %>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed")) %>%
  scroll_box(height = "600px")
```

Table 1: YA Group: Correlations with Raw and FDR-Corrected P-values

Predictor	Outcome	r	p_raw	p_fdr	n	sig_raw	sig_fdr
VR Experience	Mean Speed	0.402	0.02760	0.3497	30	*	
VR Experience	Mean Distance	-0.023	0.90590	0.9748	30		
VR Experience	Mean Nav Time	-0.094	0.62181	0.9723	30		
Video Game Usage	Mean Speed	0.110	0.56271	0.9723	30		
Video Game Usage	Mean Distance	0.127	0.50527	0.9723	30		
Video Game Usage	Mean Nav Time	0.010	0.95938	0.9748	30		
SSS Pre	Mean Speed	0.089	0.64180	0.9723	30		
SSS Pre	Mean Distance	0.399	0.02914	0.3497	30	*	
SSS Pre	Mean Nav Time	0.128	0.49883	0.9723	30		
SBSOD	Mean Speed	0.161	0.39468	0.9723	30		
SBSOD	Mean Distance	-0.053	0.78117	0.9748	30		
SBSOD	Mean Nav Time	-0.153	0.41852	0.9723	30		
Trails A	Mean Speed	-0.293	0.11662	0.9329	30		
Trails A	Mean Distance	0.056	0.77071	0.9748	30		
Trails A	Mean Nav Time	0.160	0.39931	0.9723	30		
Trails B	Mean Speed	-0.043	0.82026	0.9748	30		

Trails B	Mean Distance	0.017	0.92706	0.9748	30
Trails B	Mean Nav Time	-0.076	0.69046	0.9748	30
Trails B-A (Switch Cost)	Mean Speed	0.087	0.64819	0.9723	30
Trails B-A (Switch Cost)	Mean Distance	-0.006	0.97482	0.9748	30
Trails B-A (Switch Cost)	Mean Nav Time	-0.160	0.39818	0.9723	30
Corsi Total	Mean Speed	0.216	0.25109	0.9723	30
Corsi Total	Mean Distance	-0.196	0.29998	0.9723	30
Corsi Total	Mean Nav Time	-0.213	0.25853	0.9723	30

```r
# Count significant correlations (using FDR-corrected p-values)
ya_sig_summary <- ya_correlations %>%
  summarise(
    total = n(),
    raw_p_05 = sum(p_value < 0.05, na.rm = TRUE),
    raw_p_01 = sum(p_value < 0.01, na.rm = TRUE),
    raw_p_001 = sum(p_value < 0.001, na.rm = TRUE),
    fdr_p_05 = sum(p_fdr < 0.05, na.rm = TRUE),
    fdr_p_01 = sum(p_fdr < 0.01, na.rm = TRUE),
    fdr_p_001 = sum(p_fdr < 0.001, na.rm = TRUE)
  )

cat("\n\nYA Significant Correlations (Raw p-values):\n")
```

```
##
##
## YA Significant Correlations (Raw p-values):
```

```r
cat("p < 0.05:", ya_sig_summary$raw_p_05, "out of", ya_sig_summary$total, "\n")
```

```
## p < 0.05: 2 out of 24
```

```r
cat("p < 0.01:", ya_sig_summary$raw_p_01, "out of", ya_sig_summary$total, "\n")
```

```
## p < 0.01: 0 out of 24
```

```r
cat("p < 0.001:", ya_sig_summary$raw_p_001, "out of", ya_sig_summary$total, "\n")
```

```
## p < 0.001: 0 out of 24
```

```r
cat("\n\nYA Significant Correlations (FDR-corrected):\n")
```

```
##
##
## YA Significant Correlations (FDR-corrected):
```

```r
cat("p < 0.05:", ya_sig_summary$fdr_p_05, "out of", ya_sig_summary$total, "\n")
```

```
## p < 0.05: 0 out of 24
```

```
cat("p < 0.01:", ya_sig_summary$fdr_p_01, "out of", ya_sig_summary$total, "\n")
```

p < 0.01: 0 out of 24

```
cat("p < 0.001:", ya_sig_summary$fdr_p_001, "out of", ya_sig_summary$total, "\n")
```

p < 0.001: 0 out of 24

YA Correlation Heatmap (FDR-corrected)

```
# Create correlation matrix for heatmap
ya_corr_matrix <- ya_correlations %>%
  select(predictor_label, outcome_label, r) %>%
  pivot_wider(names_from = outcome_label, values_from = r) %>%
  column_to_rownames("predictor_label") %>%
  as.matrix()

ya_pval_matrix <- ya_correlations %>%
  select(predictor_label, outcome_label, p_fdr) %>%
  pivot_wider(names_from = outcome_label, values_from = p_fdr) %>%
  column_to_rownames("predictor_label") %>%
  as.matrix()

# Create significance annotations (using FDR-corrected p-values)
ya_sig_text <- matrix("", nrow = nrow(ya_pval_matrix), ncol = ncol(ya_pval_matrix))
rownames(ya_sig_text) <- rownames(ya_pval_matrix)
colnames(ya_sig_text) <- colnames(ya_pval_matrix)
ya_sig_text[ya_pval_matrix < 0.001] <- "***"
ya_sig_text[ya_pval_matrix >= 0.001 & ya_pval_matrix < 0.01] <- "**"
ya_sig_text[ya_pval_matrix >= 0.01 & ya_pval_matrix < 0.05] <- "*"

# Prepare data for ggplot
ya_corr_df <- as.data.frame(ya_corr_matrix) %>%
  rownames_to_column("Predictor") %>%
  pivot_longer(cols = -Predictor, names_to = "Outcome", values_to = "correlation")

ya_sig_df <- as.data.frame(ya_sig_text, stringsAsFactors = FALSE) %>%
  rownames_to_column("Predictor") %>%
  pivot_longer(cols = -Predictor, names_to = "Outcome", values_to = "sig")

plot_data <- ya_corr_df %>%
  left_join(ya_sig_df, by = c("Predictor", "Outcome"))

# Create heatmap
ggplot(plot_data, aes(x = Outcome, y = Predictor, fill = correlation)) +
  geom_tile(color = "white", size = 1) +
  geom_text(aes(label = sig), size = 6, vjust = 0.7, fontface = "bold") +
  scale_fill_gradient2(
    low = "blue", mid = "white", high = "red",
    midpoint = 0, limit = c(-1, 1), na.value = "grey90",
```

```
    name = "Pearson r"
) +
theme_minimal(base_size = 13) +
labs(
    title = "YA Group: Correlation Heatmap (FDR-corrected)",
    subtitle = "Predictors × Navigation Outcomes\n* p < 0.05, ** p < 0.01, *** p < 0.001 (FDR-corrected)
    x = "Navigation Outcomes",
    y = "Predictors"
) +
theme(
    axis.text.x = element_text(angle = 45, hjust = 1, size = 12, face = "bold"),
    axis.text.y = element_text(size = 11),
    plot.title = element_text(hjust = 0.5, size = 16, face = "bold"),
    plot.subtitle = element_text(hjust = 0.5, size = 11),
    legend.position = "right"
)
```


YA Group: Correlation Heatmap (FDR−corrected)

Predictors × Navigation Outcomes
* p < 0.05, ** p < 0.01, *** p < 0.001 (FDR−corrected)
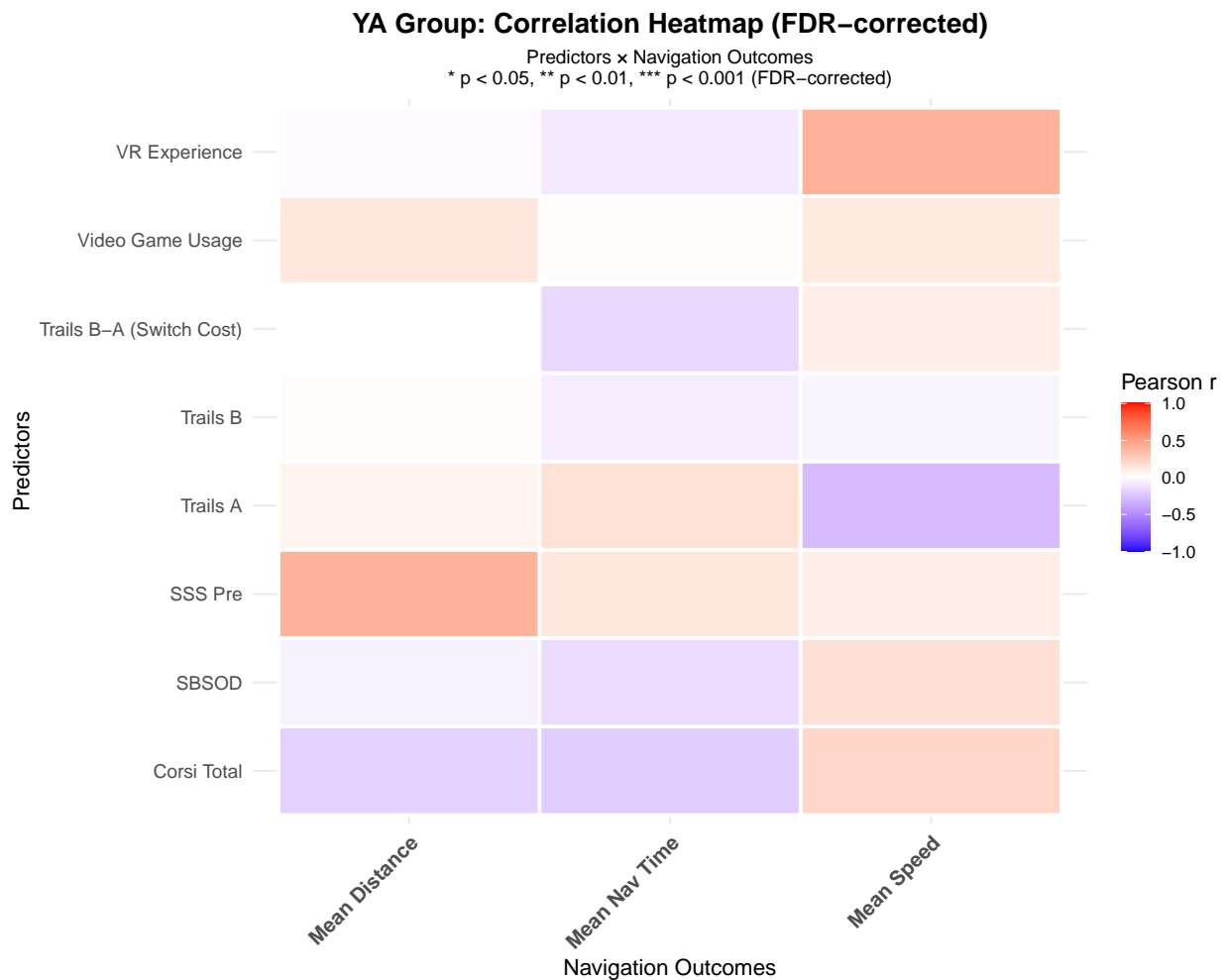
OA Group Correlations with FDR Correction

```
cat("=== OLDER ADULTS (OA) CORRELATIONS ===\n\n")
```

=== OLDER ADULTS (OA) CORRELATIONS ===

```
# Filter OA data
oa_data <- merged_data %>% filter(Group == "OA")

cat("OA sample size:", nrow(oa_data), "\n\n")
```

OA sample size: 30

```
# Compute all OA correlations
oa_correlations <- compute_correlations(oa_data, predictors, outcomes)

# Add FDR correction within OA group
oa_correlations <- oa_correlations %>%
  mutate(
    p_fdr = p.adjust(p_value, method = "fdr")
  )

# Add labels
oa_correlations <- oa_correlations %>%
  mutate(
    predictor_label = predictor_labels[match(predictor, predictors)],
    outcome_label = outcome_labels[match(outcome, outcomes)]
  )

# Display correlation table
cat("OA Correlation Results (with FDR correction):\n\n")
```

OA Correlation Results (with FDR correction):

```
oa_correlations %>%
  select(Predictor = predictor_label,
         Outcome = outcome_label,
         r, p_raw = p_value, p_fdr, n) %>%
  mutate(
    r = round(r, 3),
    p_raw = format(p_raw, scientific = FALSE, digits = 4),
    p_fdr = format(p_fdr, scientific = FALSE, digits = 4),
    sig_raw = case_when(
      as.numeric(p_raw) < 0.001 ~ "***",
      as.numeric(p_raw) < 0.01 ~ "**",
      as.numeric(p_raw) < 0.05 ~ "*",
      TRUE ~ ""
    ),
    sig_fdr = case_when(
      as.numeric(p_fdr) < 0.001 ~ "***",
      as.numeric(p_fdr) < 0.01 ~ "**",
```

```
      as.numeric(p_fdr) < 0.05 ~ "*",
      TRUE ~ ""
    )
  ) %>%
  kable(caption = "OA Group: Correlations with Raw and FDR-Corrected P-values") %>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed")) %>%
  scroll_box(height = "600px")
```

Table 2: OA Group: Correlations with Raw and FDR-Corrected
P-values

Predictor	Outcome	r	p_raw	p_fdr	n	sig_raw	sig_fdr
VR Experience	Mean Speed	0.123	0.51684	0.8677	30		
VR Experience	Mean Distance	-0.015	0.93791	0.9700	30		
VR Experience	Mean Nav Time	-0.150	0.42962	0.8242	30		
Video Game Usage	Mean Speed	-0.007	0.97000	0.9700	30		
Video Game Usage	Mean Distance	0.098	0.60687	0.8677	30		
Video Game Usage	Mean Nav Time	0.164	0.38569	0.8242	30		
SSS Pre	Mean Speed	-0.066	0.72830	0.8677	30		
SSS Pre	Mean Distance	-0.058	0.75925	0.8677	30		
SSS Pre	Mean Nav Time	-0.030	0.87410	0.9536	30		
SBSOD	Mean Speed	0.215	0.25448	0.8242	30		
SBSOD	Mean Distance	-0.311	0.09453	0.5958	30		
SBSOD	Mean Nav Time	-0.318	0.08690	0.5958	30		
Trails A	Mean Speed	-0.307	0.09931	0.5958	30		
Trails A	Mean Distance	0.080	0.67399	0.8677	30		
Trails A	Mean Nav Time	0.144	0.44645	0.8242	30		
Trails B	Mean Speed	-0.209	0.26781	0.8242	30		
Trails B	Mean Distance	0.088	0.64224	0.8677	30		
Trails B	Mean Nav Time	0.183	0.33295	0.8242	30		
Trails B-A (Switch Cost)	Mean Speed	-0.149	0.43099	0.8242	30		
Trails B-A (Switch Cost)	Mean Distance	0.076	0.68948	0.8677	30		
Trails B-A (Switch Cost)	Mean Nav Time	0.163	0.38923	0.8242	30		
Corsi Total	Mean Speed	0.387	0.03463	0.5958	30	*	
Corsi Total	Mean Distance	-0.104	0.58606	0.8677	30		
Corsi Total	Mean Nav Time	-0.233	0.21487	0.8242	30		

```
# Count significant correlations
oa_sig_summary <- oa_correlations %>%
  summarise(
    total = n(),
    raw_p_05 = sum(p_value < 0.05, na.rm = TRUE),
    raw_p_01 = sum(p_value < 0.01, na.rm = TRUE),
    raw_p_001 = sum(p_value < 0.001, na.rm = TRUE),
    fdr_p_05 = sum(p_fdr < 0.05, na.rm = TRUE),
    fdr_p_01 = sum(p_fdr < 0.01, na.rm = TRUE),
    fdr_p_001 = sum(p_fdr < 0.001, na.rm = TRUE)
  )

cat("\n\nOA Significant Correlations (Raw p-values):\n")
```

```
##
##
## OA Significant Correlations (Raw p-values):
```

```r
cat("p < 0.05:", oa_sig_summary$raw_p_05, "out of", oa_sig_summary$total, "\n")
```

```
## p < 0.05: 1 out of 24
```

```r
cat("p < 0.01:", oa_sig_summary$raw_p_01, "out of", oa_sig_summary$total, "\n")
```

```
## p < 0.01: 0 out of 24
```

```r
cat("p < 0.001:", oa_sig_summary$raw_p_001, "out of", oa_sig_summary$total, "\n")
```

```
## p < 0.001: 0 out of 24
```

```r
cat("\n\nOA Significant Correlations (FDR-corrected):\n")
```

```
##
##
## OA Significant Correlations (FDR-corrected):
```

```r
cat("p < 0.05:", oa_sig_summary$fdr_p_05, "out of", oa_sig_summary$total, "\n")
```

```
## p < 0.05: 0 out of 24
```

```r
cat("p < 0.01:", oa_sig_summary$fdr_p_01, "out of", oa_sig_summary$total, "\n")
```

```
## p < 0.01: 0 out of 24
```

```r
cat("p < 0.001:", oa_sig_summary$fdr_p_001, "out of", oa_sig_summary$total, "\n")
```

```
## p < 0.001: 0 out of 24
```

OA Correlation Heatmap (FDR-corrected)

```r
# Create correlation matrix for heatmap
oa_corr_matrix <- oa_correlations %>%
  select(predictor_label, outcome_label, r) %>%
  pivot_wider(names_from = outcome_label, values_from = r) %>%
  column_to_rownames("predictor_label") %>%
  as.matrix()

oa_pval_matrix <- oa_correlations %>%
  select(predictor_label, outcome_label, p_fdr) %>%
  pivot_wider(names_from = outcome_label, values_from = p_fdr) %>%
```

```r
  column_to_rownames("predictor_label") %>%
  as.matrix()

# Create significance annotations (using FDR-corrected p-values)
oa_sig_text <- matrix("", nrow = nrow(oa_pval_matrix), ncol = ncol(oa_pval_matrix))
oa_sig_text[oa_pval_matrix < 0.001] <- "***"
oa_sig_text[oa_pval_matrix >= 0.001 & oa_pval_matrix < 0.01] <- "**"
oa_sig_text[oa_pval_matrix >= 0.01 & oa_pval_matrix < 0.05] <- "*"

# Prepare data for ggplot
oa_corr_long <- melt(oa_corr_matrix, value.name = "correlation")
oa_sig_long <- melt(oa_sig_text, value.name = "sig")

# Convert factors to character
oa_corr_long <- oa_corr_long %>%
  mutate(Var1 = as.character(Var1), Var2 = as.character(Var2))
oa_sig_long <- oa_sig_long %>%
  mutate(Var1 = as.character(Var1), Var2 = as.character(Var2))

plot_data <- oa_corr_long %>%
  left_join(oa_sig_long, by = c("Var1", "Var2"))

# Create heatmap
ggplot(plot_data, aes(x = Var2, y = Var1, fill = correlation)) +
  geom_tile(color = "white", size = 1) +
  geom_text(aes(label = sig), size = 6, vjust = 0.7, fontface = "bold") +
  scale_fill_gradient2(
    low = "blue", mid = "white", high = "red",
    midpoint = 0, limit = c(-1, 1), na.value = "grey90",
    name = "Pearson r"
  ) +
  theme_minimal(base_size = 13) +
  labs(
    title = "OA Group: Correlation Heatmap (FDR-corrected)",
    subtitle = "Predictors × Navigation Outcomes\n* p < 0.05, ** p < 0.01, *** p < 0.001 (FDR-corrected)
    x = "Navigation Outcomes",
    y = "Predictors"
  ) +
  theme(
    axis.text.x = element_text(angle = 45, hjust = 1, size = 12, face = "bold"),
    axis.text.y = element_text(size = 11),
    plot.title = element_text(hjust = 0.5, size = 16, face = "bold"),
    plot.subtitle = element_text(hjust = 0.5, size = 11),
    legend.position = "right"
  )
```
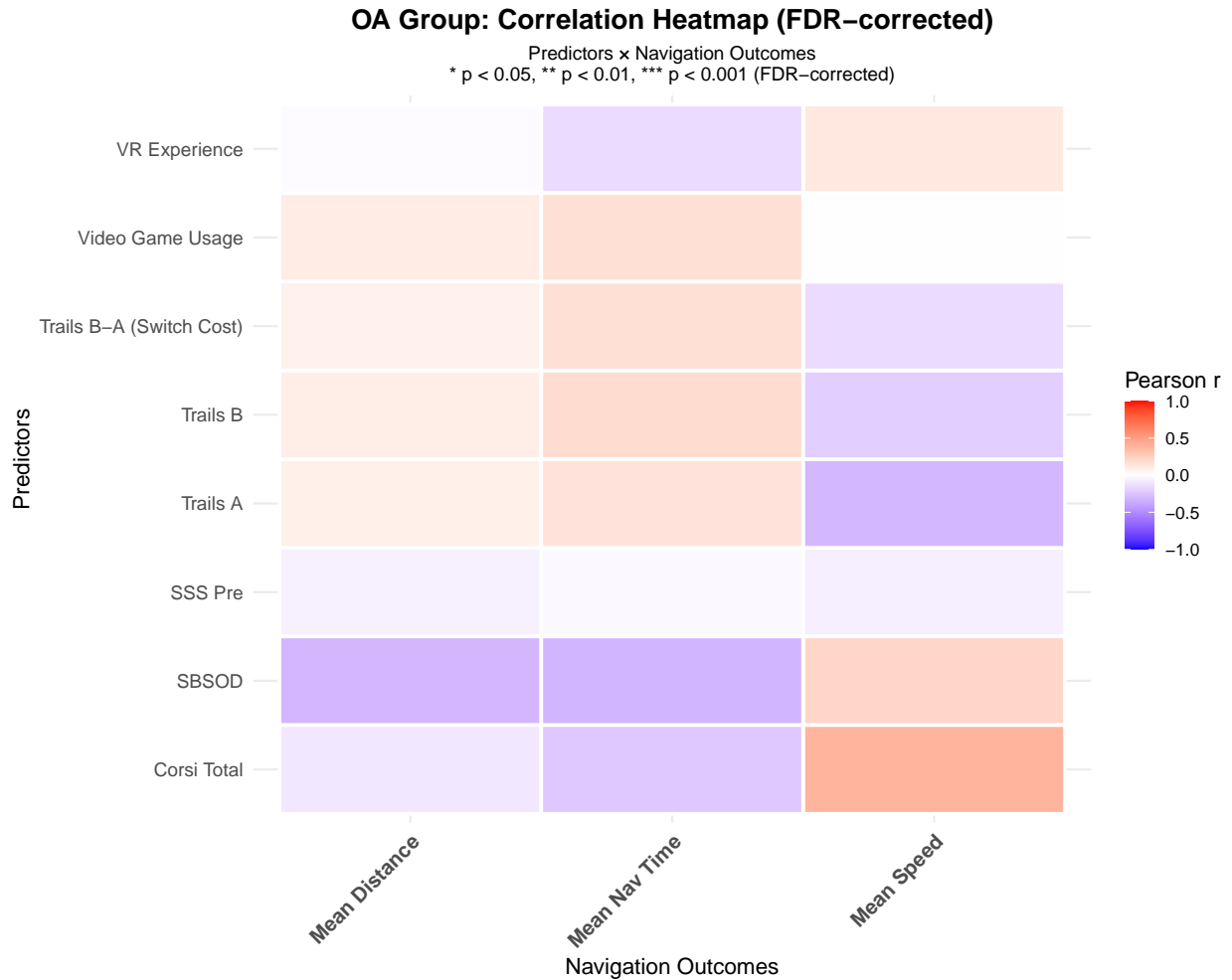
OA Group: Correlation Heatmap (FDR−corrected)

Predictors × Navigation Outcomes
* p < 0.05, ** p < 0.01, *** p < 0.001 (FDR−corrected)

Summary Comparison

```r
cat("=== SUMMARY: YA vs OA CORRELATIONS (FDR-corrected) ===\n\n")
```

```
## === SUMMARY: YA vs OA CORRELATIONS (FDR-corrected) ===
```

```r
# Combine results for comparison
combined_summary <- bind_rows(
  ya_sig_summary %>% mutate(Group = "YA"),
  oa_sig_summary %>% mutate(Group = "OA")
) %>%
  select(Group, total,
         raw_p_05, raw_p_01, raw_p_001,
         fdr_p_05, fdr_p_01, fdr_p_001)

cat("Significant Correlations by Group:\n")
```

```
## Significant Correlations by Group:
```

```r
print(combined_summary)
```

```
## # A tibble: 2 x 8
##    Group total raw_p_05 raw_p_01 raw_p_001 fdr_p_05 fdr_p_01 fdr_p_001
##    <chr> <int>    <int>    <int>     <int>    <int>    <int>     <int>
## 1 YA       24        2        0         0        0        0         0
## 2 OA       24        1        0         0        0        0         0
```

```r
# Identify strongest correlations that survive FDR correction
cat("\n\nStrongest FDR-Significant Positive Correlations:\n\n")
```

```
##
##
## Strongest FDR-Significant Positive Correlations:
```

```r
cat("YA Group:\n")
```

```
## YA Group:
```

```r
ya_correlations %>%
  filter(p_fdr < 0.05) %>%
  arrange(desc(r)) %>%
  head(5) %>%
  select(Predictor = predictor_label, Outcome = outcome_label, r, p_fdr, n) %>%
  mutate(r = round(r, 3), p_fdr = round(p_fdr, 4)) %>%
  kable() %>%
  kable_styling()
```

Predictor	Outcome	r	p_fdr	n
NA	NA	NA	NA	NA

```r
cat("\n\nOA Group:\n")
```

```
##
##
## OA Group:
```

```r
oa_correlations %>%
  filter(p_fdr < 0.05) %>%
  arrange(desc(r)) %>%
  head(5) %>%
  select(Predictor = predictor_label, Outcome = outcome_label, r, p_fdr, n) %>%
  mutate(r = round(r, 3), p_fdr = round(p_fdr, 4)) %>%
  kable() %>%
  kable_styling()
```

Predictor	Outcome	r	p_fdr	n
NA	NA	NA	NA	NA

```r
cat("\n\nStrongest FDR-Significant Negative Correlations:\n\n")
```

```
## 
## 
## Strongest FDR-Significant Negative Correlations:
```

```r
cat("YA Group:\n")
```

```
## YA Group:
```

```r
ya_correlations %>%
  filter(p_fdr < 0.05) %>%
  arrange(r) %>%
  head(5) %>%
  select(Predictor = predictor_label, Outcome = outcome_label, r, p_fdr, n) %>%
  mutate(r = round(r, 3), p_fdr = round(p_fdr, 4)) %>%
  kable() %>%
  kable_styling()
```

Predictor	Outcome	r	p_fdr	n
NA	NA	NA	NA	NA

```r
cat("\n\nOA Group:\n")
```

```
## 
## 
## OA Group:
```

```r
oa_correlations %>%
  filter(p_fdr < 0.05) %>%
  arrange(r) %>%
  head(5) %>%
  select(Predictor = predictor_label, Outcome = outcome_label, r, p_fdr, n) %>%
  mutate(r = round(r, 3), p_fdr = round(p_fdr, 4)) %>%
  kable() %>%
  kable_styling()
```

Predictor	Outcome	r	p_fdr	n
NA	NA	NA	NA	NA

Session Information

```
sessionInfo()
```

```
## R version 4.3.1 (2023-06-16)
## Platform: x86_64-apple-darwin20 (64-bit)
## Running under: macOS Ventura 13.2.1
##
## Matrix products: default
## BLAS:   /Library/Frameworks/R.framework/Versions/4.3-x86_64/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.3-x86_64/Resources/lib/libRlapack.dylib;  LAPACK
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## time zone: America/New_York
## tzcode source: internal
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
##  [1] corrplot_0.92    reshape2_1.4.4   kableExtra_1.4.0 knitr_1.43
##  [5] broom_1.0.5      lubridate_1.9.2  forcats_1.0.0    stringr_1.5.0
##  [9] dplyr_1.1.2      purrr_1.0.1      readr_2.1.4      tidyr_1.3.0
## [13] tibble_3.2.1     ggplot2_3.5.1    tidyverse_2.0.0
##
## loaded via a namespace (and not attached):
##  [1] utf8_1.2.3       generics_0.1.3   xml2_1.3.4       stringi_1.7.12
##  [5] hms_1.1.3        digest_0.6.32    magrittr_2.0.3   evaluate_0.21
##  [9] grid_4.3.1       timechange_0.2.0 fastmap_1.1.1    plyr_1.8.8
## [13] backports_1.4.1  fansi_1.0.4      viridisLite_0.4.2 scales_1.3.0
## [17] cli_3.6.1        crayon_1.5.2     rlang_1.1.6      bit64_4.0.5
## [21] munsell_0.5.0    withr_2.5.0      yaml_2.3.7       parallel_4.3.1
## [25] tools_4.3.1      tzdb_0.4.0       colorspace_2.1-0 vctrs_0.6.3
## [29] R6_2.5.1         lifecycle_1.0.3  bit_4.0.5        vroom_1.6.3
## [33] pkgconfig_2.0.3  pillar_1.9.0     gtable_0.3.3     glue_1.6.2
## [37] Rcpp_1.0.10      systemfonts_1.0.4 highr_0.10      xfun_0.39
## [41] tidyselect_1.2.0 rstudioapi_0.14  farver_2.1.1     htmltools_0.5.5
## [45] labeling_0.4.2   rmarkdown_2.23   svglite_2.1.2    compiler_4.3.1
```