

# Study 5

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## Read Data

```
# Set this to TRUE if you have API access, FALSE if using CSV
USE_API <- FALSE

if(USE_API) {
  ## Pull directly from Qualtrics API
  d0 <- fetch_survey(surveyID='SV_1BJC5tq7iCTDLpk',
    label = T,
    convert = F,
    start_date = "2024-03-27",
    end_date = "2024-05-15",
    force_request = T)
} else {
  # Read the processed data directly from CSV
  d0 <- read.csv('Study5.csv', check.names = F)
}

# Define the categories
women <- c('Anne Frank', 'Tina Fey', 'Jackie Kennedy', 'Helen Keller', 'Barbra
  ↪ Streisand')
pages <- c('Tina Fey', 'Keith Richards', 'Andre Agassi', 'Henry Winkler', 'Willie
  ↪ Nelson', 'Michael J. Fox', 'John Stamos')
year <- c('Steve Jobs', 'J. Robert Oppenheimer', 'Mark Twain', 'Anthony Bourdain',
  ↪ 'Andrew Jackson', 'Tina Fey', 'Johnny Cash', 'Jackie Kennedy', 'Theodore
  ↪ Roosevelt', 'Che Guevara', 'Tennessee Williams', 'Keith Richards', 'Napoleon
  ↪ Bonaparte', 'Andre Agassi', 'Henry Winkler', 'Robin Williams', 'Willie Nelson',
  ↪ 'Michael J. Fox', 'John Stamos')
entertainer <- c('Anthony Bourdain', 'Tina Fey', 'Johnny Cash', 'Jim Carroll', 'Keith
  ↪ Richards', 'Henry Winkler', 'Robin Williams', 'Willie Nelson', 'Michael J. Fox',
  ↪ 'John Stamos', 'Barbra Streisand')

if(USE_API) {
  d0 <- d0 |>
  filter(!is.na(`choice-7`)) |>
  mutate(
    gender_feedback = as.numeric(grepl("feature a female protagonist", feedbackItem1) |
      grepl("feature a female protagonist", feedbackItem2) |
      grepl("feature a female protagonist", feedbackItem3)),
    pages_shown = as.numeric(grepl("are over 500 pages", feedbackItem1) |
      grepl("are over 500 pages", feedbackItem2) |
      grepl("are over 500 pages", feedbackItem3)),
    year_shown = as.numeric(grepl("were written in the past 25 years", feedbackItem1) |
      grepl("were written in the past 25 years", feedbackItem2) |
      grepl("were written in the past 25 years", feedbackItem3)),
    entertainer_shown = as.numeric(grepl("feature an entertainer", feedbackItem1) |
      grepl("feature an entertainer", feedbackItem2) |
      grepl("feature an entertainer", feedbackItem3)),
    female_pick = case_when(`choice-7` %in% women ~ 1,
      TRUE ~ 0),
    pages_pick = case_when(`choice-7` %in% pages ~ 1,
      TRUE ~ 0),
    year_pick = case_when(`choice-7` %in% year ~ 1,
```

```

        TRUE ~ 0),
    entertainer_pick = case_when(`choice-7` %in% entertainer ~ 1,
        TRUE ~ 0),
    base_gender = rowSums(across(`choice-1`:`choice-6`, ~ . %in% women)),
    gender_code = case_when(gender=="Man" ~ 1, TRUE ~ 0),
    race_code = case_when(race=="White / Caucasian" ~ 1, TRUE ~ 0),
  ) |>
  dplyr::select(gender_feedback:entertainer_pick, gender, base_gender,
    ↪ `choice-1`:`choice-7`, race,age, gender_code, race_code)

  # Write the API-pulled data into a CSV file
  write.csv(d0, 'Study5.csv', row.names = FALSE, quote = TRUE)
}

```

## Variable Names

Variable	Description
gender_feedback	Binary indicator of whether a participant was randomly assigned to gender feedback condition.
female_pick	Binary indicator of whether a participant selected a biopic with a female protagonist for their seventh selection.
budget_shown	Binary indicator of whether a participant was randomly assigned to receive budget feedback.
budget_pick	Binary indicator of whether a participant selected a film with a big budget for their seventh selection.
year_shown	Binary indicator of whether a participant was randomly assigned to receive film year feedback.
year_pick	Binary indicator of whether a participant selected a film released after 2010 for their seventh selection.
poli_shown	Binary indicator of whether a participant was randomly assigned to receive political leader feedback
poli_pick	Binary indicator of whether a participant selected a film with a political protagonist for their seventh selection.
base_gender	Count of the number of films with female protagonists selected in the initial six films.
choice-1 to choice-7	The selected biographies
gender	Self-selected gender.
race	Self-selected race.
age	Self-entered age.
gender_code	Dummy code for gender (male = 1).
race_code	Dummy code for race (white = 1).

## Demographics

```
##                               Percentage gender
## 1 Another gender not listed here:  0.36
## 2                               Man   52.52
## 3                               Non-binary  2.16
## 4                               Woman  44.96

##                               Percentage  Race
## 1 American Indian or Alaskan Native  0.36
## 2           Asian / Pacific Islander 42.81
## 3           Black or African American 10.79
## 4           Hispanic / Latinx       4.68
## 5           White / Caucasian      41.37

## Mean (age):  25.11

## SD (age):  10.87

## Mean (num of initial women selected):  1.51

## SD (num of initial women selected):  1.15
```

```

## Percentage (initial women selected): 0.2516667

## SD (initial women selected): 0.1916667

## # A tibble: 2 x 2
##   gender_feedback mean
##   <int> <dbl>
## 1      0 0.230
## 2      1 0.273

##
## Welch Two Sample t-test
##
## data: base_gender/6 by gender_feedback
## t = -1.9672, df = 288.06, p-value = 0.05012
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0
## 95 percent confidence interval:
##  -8.611628e-02 2.356926e-05
## sample estimates:
## mean in group 0 mean in group 1
##      0.2295806      0.2726269

```

## Primary Analysis

```
# primary model
r1 <- lm(female_pick ~ gender_feedback, data=d0)
```

```
# robust standard errors
robust_summary(r1)
```

```
##
## Call:
## lm(formula = female_pick ~ gender_feedback, data = d0)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.3510 -0.3510 -0.2185  0.6490  0.7815
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.21854    0.03385   6.455 4.34e-10 ***
## gender_feedback 0.13245    0.05172   2.561  0.0109 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4479 on 300 degrees of freedom
## Multiple R-squared:  0.02153,    Adjusted R-squared:  0.01827
## F-statistic: 6.602 on 1 and 300 DF,  p-value: 0.01067
```

```
robust_confint(r1)
```

```
##              2.5 %    97.5 %
## (Intercept)    0.15192039 0.2851657
## gender_feedback 0.03067135 0.2342293
```

```
# robustness test
```

```
# primary model
r_robust <- lm(female_pick ~ gender_feedback + base_gender, data=d0)
```

```
# robust standard errors
robust_summary(r_robust)
```

```
##
## Call:
## lm(formula = female_pick ~ gender_feedback + base_gender, data = d0)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.3558 -0.3470 -0.2197  0.6442  0.7892
##
## Coefficients:
```

```
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.222608   0.043876   5.074 6.87e-07 ***
## gender_feedback 0.133213   0.052968   2.515  0.0124 *
## base_gender    -0.002951   0.023299  -0.127  0.8993
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4486 on 299 degrees of freedom
## Multiple R-squared:  0.02159,    Adjusted R-squared:  0.01504
## F-statistic: 3.299 on 2 and 299 DF,  p-value: 0.03828
```

```
robust_confint(r_robust)
```

```
##               2.5 %    97.5 %
## (Intercept)    0.13626369 0.30895301
## gender_feedback 0.02897536 0.23744980
## base_gender    -0.04880113 0.04289862
```

## Robustness

```
## which feedback was shown with gender, remove constant due to olinearity
r2 <- lm(female_pick ~ gender_feedback + pages_shown + year_shown + entertainer_shown -
  ↪ 1, data=d0)

# Display the robust_summary with robust standard errors
robust_summary(r2)
```

```
##
## Call:
## lm(formula = female_pick ~ gender_feedback + pages_shown + year_shown +
##     entertainer_shown - 1, data = d0)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.3770 -0.3276 -0.2185  0.6230  0.7815
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## gender_feedback    0.20377    0.04715   4.322 2.11e-05 ***
## pages_shown        0.09472    0.05614   1.687  0.0926 .
## year_shown         0.04526    0.05628   0.804  0.4219
## entertainer_shown  0.07856    0.06592   1.192  0.2343
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4491 on 298 degrees of freedom
## Multiple R-squared:  0.301, Adjusted R-squared:  0.2917
## F-statistic: 32.09 on 4 and 298 DF, p-value: < 2.2e-16
```

```
robust_confint(r2)
```

```
##              2.5 %    97.5 %
## gender_feedback  0.11097645 0.2965564
## pages_shown     -0.01576071 0.2052072
## year_shown      -0.06550212 0.1560227
## entertainer_shown -0.05116184 0.2082808
```

```
## robust to demographic controls
```

```
r3 <- lm(female_pick ~ gender_feedback + gender_code + race_code + age, data=d0)

# Display the robust_summary with robust standard errors
robust_summary(r3)
```

```
##
## Call:
## lm(formula = female_pick ~ gender_feedback + gender_code + race_code +
##     age, data = d0)
```



```
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.5613 -0.3016 -0.1894  0.5678  0.9084
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.157807   0.090183   1.750   0.0815 .
## gender_feedback 0.135678   0.057372   2.365   0.0189 *
## gender_code   -0.085584   0.058297  -1.468   0.1434
## race_code     -0.079007   0.058126  -1.359   0.1754
## age           0.004687   0.003045   1.539   0.1251
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.436 on 234 degrees of freedom
## (63 observations deleted due to missingness)
## Multiple R-squared:  0.05085,    Adjusted R-squared:  0.03463
## F-statistic: 3.134 on 4 and 234 DF,  p-value: 0.01548
```

```
robust_confint(r3)
```

```
##              2.5 %      97.5 %
## (Intercept)  -0.019868533 0.33548194
## gender_feedback 0.022645502 0.24871006
## gender_code   -0.200438565 0.02927120
## race_code     -0.193524563 0.03551136
## age          -0.001312344 0.01068566
```

```
## logistic regression
# Fit the logistic regression model
r4 <- glm(female_pick ~ gender_feedback, family = binomial, data=d0)

# Odds ratio
tidy_r4 <- tidy(r4, exponentiate = TRUE, conf.int = T)
print(tidy_r4)
```

```
## # A tibble: 2 x 7
##   term          estimate std.error statistic  p.value conf.low conf.high
##   <chr>          <dbl>    <dbl>    <dbl>    <dbl>    <dbl>    <dbl>
## 1 (Intercept)    0.280    0.197    -6.47 9.77e-11  0.187    0.406
## 2 gender_feedback 1.93     0.260     2.53 1.13e- 2  1.17    3.24
```

```
summary(r4)
```

```
##
## Call:
## glm(formula = female_pick ~ gender_feedback, family = binomial,
##      data = d0)
##
## Coefficients:
```

```

##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -1.2742     0.1969  -6.471 9.77e-11 ***
## gender_feedback  0.6595     0.2605   2.532  0.0113 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 360.83  on 301  degrees of freedom
## Residual deviance: 354.28  on 300  degrees of freedom
## AIC: 358.28
##
## Number of Fisher Scoring iterations: 4

```

```

##
## Call:
## lm(formula = pages_pick ~ pages_shown, data = d0)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.1680 -0.1680 -0.1680 -0.1552  0.8448
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.15517    0.04838   3.208  0.00148 **
## pages_shown  0.01286    0.05402   0.238  0.81198
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3729 on 300 degrees of freedom
## Multiple R-squared:  0.0001858, Adjusted R-squared:  -0.003147
## F-statistic: 0.05574 on 1 and 300 DF, p-value: 0.8135

##              2.5 %    97.5 %
## (Intercept)  0.05997303 0.2503718
## pages_shown -0.09344118 0.1191619

##
## Call:
## lm(formula = year_pick ~ year_shown, data = d0)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.7178 -0.6721  0.2822  0.2822  0.3279
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.67213    0.06111  10.999 <2e-16 ***
## year_shown   0.04571    0.06769   0.675    0.5
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4555 on 300 degrees of freedom
## Multiple R-squared:  0.001631, Adjusted R-squared:  -0.001697
## F-statistic: 0.4901 on 1 and 300 DF, p-value: 0.4844

##              2.5 %    97.5 %
## (Intercept)  0.55187855 0.7923837
## year_shown  -0.08749005 0.1789124

##
## Call:
## lm(formula = entertainer_pick ~ entertainer_shown, data = d0)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.3370 -0.3370 -0.3370  0.6630  0.7188

```

```
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.28125    0.08204   3.428 0.000693 ***
## entertainer_shown 0.05579    0.08698   0.641 0.521753
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4719 on 300 degrees of freedom
## Multiple R-squared:  0.001331,    Adjusted R-squared:  -0.001998
## F-statistic: 0.3999 on 1 and 300 DF,  p-value: 0.5276

##              2.5 %    97.5 %
## (Intercept)    0.1197947 0.4427053
## entertainer_shown -0.1153753 0.2269494
```

Figure 6 Code

```
dfemale_plot <- d0 |>
  dplyr::select(gender_feedback, female_pick) |>
  dplyr::group_by(gender_feedback) |>
  dplyr::summarise(
    n = n(),
    freq = mean(female_pick),
    sd = sd(female_pick) * 100,
    se = (sd(female_pick) / sqrt(n())) * 100
  ) |>
  dplyr::mutate(gender_feedback = case_when(gender_feedback==1 ~ "\"Treatment\"",
                                           TRUE ~ "\"Control\"")) |>
  rename(Condition = gender_feedback)

##### entertainer

dentertainer_plot <- d0 |>
  dplyr::select(entertainer_shown, entertainer_pick) |>
  dplyr::group_by(entertainer_shown) |>
  dplyr::summarise(
    n = n(),
    freq = mean(entertainer_pick),
    sd = sd(entertainer_pick) * 100,
    se = (sd(entertainer_pick) / sqrt(n())) * 100
  ) |>
  dplyr::mutate(entertainer_shown = case_when(entertainer_shown==1 ~ "\"Treatment\"",
                                           TRUE ~ "\"Control\"")) |>
  rename(Condition = entertainer_shown)

##### year

dyear_plot <- d0 |>
  dplyr::select(year_shown, year_pick) |>
  dplyr::group_by(year_shown) |>
  dplyr::summarise(
    n = n(),
    freq = mean(year_pick),
    sd = sd(year_pick) * 100,
    se = (sd(year_pick) / sqrt(n())) * 100
  ) |>
  dplyr::mutate(year_shown = case_when(year_shown==1 ~ "\"Treatment\"",
                                           TRUE ~ "\"Control\"")) |>
  rename(Condition = year_shown)

#### pages

dpages_plot <- d0 |>
  dplyr::select(pages_shown, pages_pick) |>
```

```

dplyr::group_by(pages_shown) |>
dplyr::summarise(
  n = n(),
  freq = mean(pages_pick),
  sd = sd(pages_pick) * 100,
  se = (sd(pages_pick) / sqrt(n())) * 100
) |>
dplyr::mutate(pages_shown = case_when(pages_shown==1 ~ "\"Treatment\"",
                                     TRUE ~ "\"Control\"")) |>
rename(Condition = pages_shown)

## Combine plots

df_combined <- dplyr::bind_rows(
  denterainer_plot %>% dplyr::mutate(Category = "\"Featured anEntertainer\""),
  dyear_plot %>% dplyr::mutate(Category = "\"Were Written inthe Past 25 Years\""),
  dpages_plot %>% dplyr::mutate(Category = "\"Were Over n500 Pages\""),
  dfemale_plot %>% dplyr::mutate(Category = "\"Featured aWoman\"")
, .id = "id") %>%
mutate(Category = factor(Category, levels = c('\"Featured anEntertainer', '\"Were
  Written inthe Past 25 Years', '\"Were Over n500 Pages', '\"Featured aWoman')))

p_combined <- ggplot(df_combined, aes(x = Condition, y = freq*100, fill = Condition)) +
  geom_bar(stat="identity", width = 0.85, position = position_dodge(width = 0.7)) +
  geom_text(data = df_combined %>% filter(Category %in% c('\"Were Over n500 Pages')),
    ↪ aes(label=paste0(sprintf("%.1f", freq*100), "%")),
    ↪ position=position_dodge(width=0.7), vjust=5, size = 5, color = "white", family =
    ↪ "Times New Roman") +
  geom_text(data = df_combined %>% filter(!Category %in% c('\"Were Over n500 Pages')),
    ↪ aes(label=paste0(sprintf("%.1f", freq*100), "%")),
    ↪ position=position_dodge(width=0.7), vjust=5, size = 5, color = "white", family =
    ↪ "Times New Roman") +
  geom_errorbar(aes(ymin=freq*100-se, ymax=freq*100+se), width = .1, position =
    ↪ position_dodge(width = 0.7)) +
  facet_wrap(~factor(Category, c('\"Featured anEntertainer', '\"Were Written inthe
    ↪ Past 25 Years', '\"Were Over n500 Pages', '\"Featured aWoman')), nrow = 1,
    ↪ strip.position = "bottom") +
  geom_segment(data = df_combined %>% filter(Condition == "\"Treatment\""),
    ↪ aes(x = 1, xend = 2, y = freq*100 + se + 5, yend = freq*100 + se + 5),
    ↪ inherit.aes = FALSE) +
  geom_text(data = df_combined %>% filter(Category %in% c('\"Were Over n500 Pages',
    ↪ '\"Featured anEntertainer', '\"Were Written inthe Past 25 Years') & Condition
    ↪ == "\"Treatment\""),
    ↪ aes(x = 1.5, xend = 1.5, y = freq*100 + se + 7, yend = freq*100 + se + 7,
    ↪ label = "n.s."),
    ↪ inherit.aes = FALSE, vjust = 0, family = "Times New Roman", size = 6) +
  geom_text(data = df_combined %>% filter(Category %in% c('\"Featured aWoman') &
    ↪ Condition == "\"Treatment\""),
    ↪ aes(x = 1.5, xend = 1.5, y = freq*100 + se + 5, yend = freq*100 + se + 5,
    ↪ label = "***"),
    ↪ inherit.aes = FALSE, vjust = 0, family = "Times New Roman", size = 6) +
  theme_bw() +
  scale_fill_manual(values = c("#990000", "#011F5B"), labels = c("No feedback provided",
    ↪ "Feedback provided"), "Feedback") +

```

```

scale_y_continuous(labels = function(x) paste0(x,"%"), limits = c(0,100)) +
scale_x_discrete(labels = c("\Control\" = "Not\nShown", "\Treatment\" = "Shown")) +
labs(x = "Feedback on % of biographies that...", y = "% of Final Biographies with the
↳ Target Attribute",
     title = "The Effect of Getting Feedback on Your Biography Selections") +
theme(text = element_text(family = "Times New Roman"),
      plot.caption = element_text(face = "italic", family = "Times New Roman"),
      legend.position = c(0.5, 0.95),
      legend.title = element_blank(),
      legend.direction = "horizontal",
      legend.text = element_text(size = 16, family = "Times New Roman"),
      legend.key.size = unit(7, 'mm'),
      legend.background = element_rect(fill = "white"),
      panel.grid.minor = element_blank(),
      panel.grid = element_blank(),
      panel.border = element_rect(fill= NA, color = "white"),
      plot.background = element_rect(fill = "white"),
      panel.background = element_rect(fill = "white"),
      axis.title.x = element_text(face="bold", size = 16, vjust = 19, family = "Times
↳ New Roman"),
      plot.title = element_blank(),
      axis.title.y = element_text(size = 16, color = "black", family = "Times New
↳ Roman"),
      axis.text.x = element_blank(),
      axis.ticks = element_blank(),
      axis.text.y = element_text(size = 16, color = "black", family = "Times New
↳ Roman"),
      strip.text = element_text(size = 16, color = "black", family = "Times New
↳ Roman"),
      strip.background = element_rect(colour = "white", fill = "white"))

# Save the plot with Times New Roman font
ggsave("../Manuscript_Figures/Figure-6.pdf", plot = p_combined, width = 10, height = 8,
↳ units = "in", device = cairo_pdf, family = "Times New Roman")

```

## System of Equations

##		Test	Wald.Coefficient	P_Value
## 1	Female Feedback - Pages		30.233954	5.686358e-08
## 2	Female Feedback - Year		2.391022	1.225646e-01
## 3	Female Feedback - Entertainer		1.752781	1.860351e-01