

Experiment 3: Supplementary Analyses

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Setup

Variable names:

- Experiment: exp3_
 - Data (_d_)
 - d = main df
 - Models (_m_)
 - FF = dummy coded with First + Full Name conditions as 0, Last Name condition as 1
 - L = dummy coded with Last Name condition as 0, First + Full Name conditions as 1
 - quad = quadratic effect of Name Gender
 - subjGender = participant gender
 - recenter= center name gender rating by scale (at 4)
- Plots (_p_)

Load data and select columns used in model. See data/exp3_data_about.txt for more details.

```
exp3_d <- read.csv("../data/exp3_data.csv", stringsAsFactors = TRUE) %>%
  rename("Participant" = "SubjID", "Item" = "Name") %>%
  select(Participant, SubjGenderMale, Condition,
         GenderRating, Item, He, She, Other)

str(exp3_d)
```

```
## 'data.frame':      8904 obs. of  8 variables:
## $ Participant   : Factor w/ 1272 levels "Exp3_P1","Exp3_P10",...: 974 974 974 974 974 974 974 330 330 ...
## $ SubjGenderMale: int   1 1 1 1 1 1 1 0 0 0 ...
## $ Condition     : Factor w/ 3 levels "first","full",...: 1 1 1 1 1 1 1 1 1 ...
## $ GenderRating  : num   5.22 1.24 5.86 3.75 6.78 4.34 2.41 6.24 2.61 6.82 ...
## $ Item          : Factor w/ 63 levels "Ashley Cook",...: 6 9 13 43 47 52 62 2 16 20 ...
## $ He           : int   0 1 0 0 0 0 1 0 1 0 ...
## $ She          : int   0 0 1 0 1 1 0 0 0 1 ...
## $ Other        : int   1 0 0 1 0 0 0 1 0 0 ...
```

Center gender rating for names: Original scale from 1 to 7, with 1 as most masculine and 7 as most feminine. Mean-centered with higher still as more feminine.

```
exp3_d %<>% mutate(GenderRatingCentered =
  scale(GenderRating, scale = FALSE))
```

Set contrasts for name conditions. This uses Scott Fraundorf's function for weighted contrasts. (The psycholing package version doesn't support doing 2v1 comparisons, only 1v1.) Condition1 is Last vs First+Full. Condition2 is First vs Full.

```
source("centerfactor.R")
contrasts(exp3_d$Condition) <- centerfactor(
  exp3_d$Condition, c("last", "first"))
contrasts(exp3_d$Condition)
```

```
##           [,1]      [,2]
## first  0.4009434 -0.48113208
## full   0.4009434  0.51886792
## last  -0.5990566  0.01886792
```

Quadratic Name Gender Rating

The second supplementary analysis tested the quadratic effect of name gender rating, such that larger values meant names with stronger gender associations (masc or fem), and smaller values meant names with weaker gender associations.

```
exp3_d %<>% mutate(GenderRatingSquared = GenderRatingCentered^2)
```

Model

Quadratic name gender effect on the likelihood of *she* responses, as opposed to *he* and *other* responses. The maximal model includes random intercepts by item, but not by participant.

```
exp3_m_quad <- buildmer(
  formula = She ~ Condition*GenderRatingCentered +
    Condition*GenderRatingSquared +
    (1|Participant) + (1|Item),
  data = exp3_d, family = binomial,
  buildmerControl(direction = "order", quiet = TRUE))
summary(exp3_m_quad)
```

```

## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) (p-values based on Wald z-scores) [glmerMod]
## Family: binomial ( logit )
## Formula: She ~ 1 + GenderRatingCentered + GenderRatingSquared + Condition +
## GenderRatingCentered:Condition + GenderRatingSquared:Condition +
## (1 | Item)
## Data: exp3_d
##
##      AIC      BIC    logLik deviance df.resid
##  7979.5   8050.4  -3979.7   7959.5     8894
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.1120 -0.5443 -0.1467  0.6532 15.2267
##
## Random effects:
## Groups Name          Variance Std.Dev.
## Item (Intercept) 0.3002   0.5479
## Number of obs: 8904, groups: Item, 63
##
## Fixed effects:
##
##              Estimate Std. Error z value Pr(>|z|) Pr(>|t|)
## (Intercept)      -1.09643    0.11101 -9.87643   0.000   < 2e-16
## GenderRatingCentered      1.06982    0.05554 19.26236   0.000   < 2e-16
## GenderRatingSquared     -0.11378    0.03102 -3.66732   0.000 0.000245
## Condition1           0.23784    0.07935  2.99748   0.003 0.002722
## Condition2           0.05570    0.09965  0.55893   0.576 0.576208
## GenderRatingCentered:Condition1 0.22179    0.06115  3.62713   0.000 0.000287
## GenderRatingCentered:Condition2 -0.11288    0.08816 -1.28044   0.200 0.200391
## GenderRatingSquared:Condition1 -0.09635    0.02976 -3.23767   0.001 0.001205
## GenderRatingSquared:Condition2  0.03866    0.04184  0.92410   0.355 0.355432
##
## (Intercept)          ***
## GenderRatingCentered      ***
## GenderRatingSquared      ***
## Condition1             **
## Condition2
## GenderRatingCentered:Condition1 ***
## GenderRatingCentered:Condition2
## GenderRatingSquared:Condition1 **
## GenderRatingSquared:Condition2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) GndrRC GndrRS Cndtn1 Cndtn2 GRC:C1 GRC:C2 GRS:C1
## GndrRtnGnt -0.093
## GndrRtnGSqr -0.638 -0.252
## Condition1 -0.005 -0.007 0.007
## Condition2 -0.007 0.014 -0.005 0.029
## GndrRtnC:C1 0.021 0.212 -0.189 -0.143 0.018
## GndrRtnC:C2 0.001 -0.099 0.078 0.018 -0.146 -0.090
## GndrRtnS:C1 -0.018 -0.191 0.175 -0.424 -0.032 -0.657 0.078
## GndrRtnS:C2 0.003 0.086 -0.073 -0.031 -0.361 0.081 -0.723 -0.053

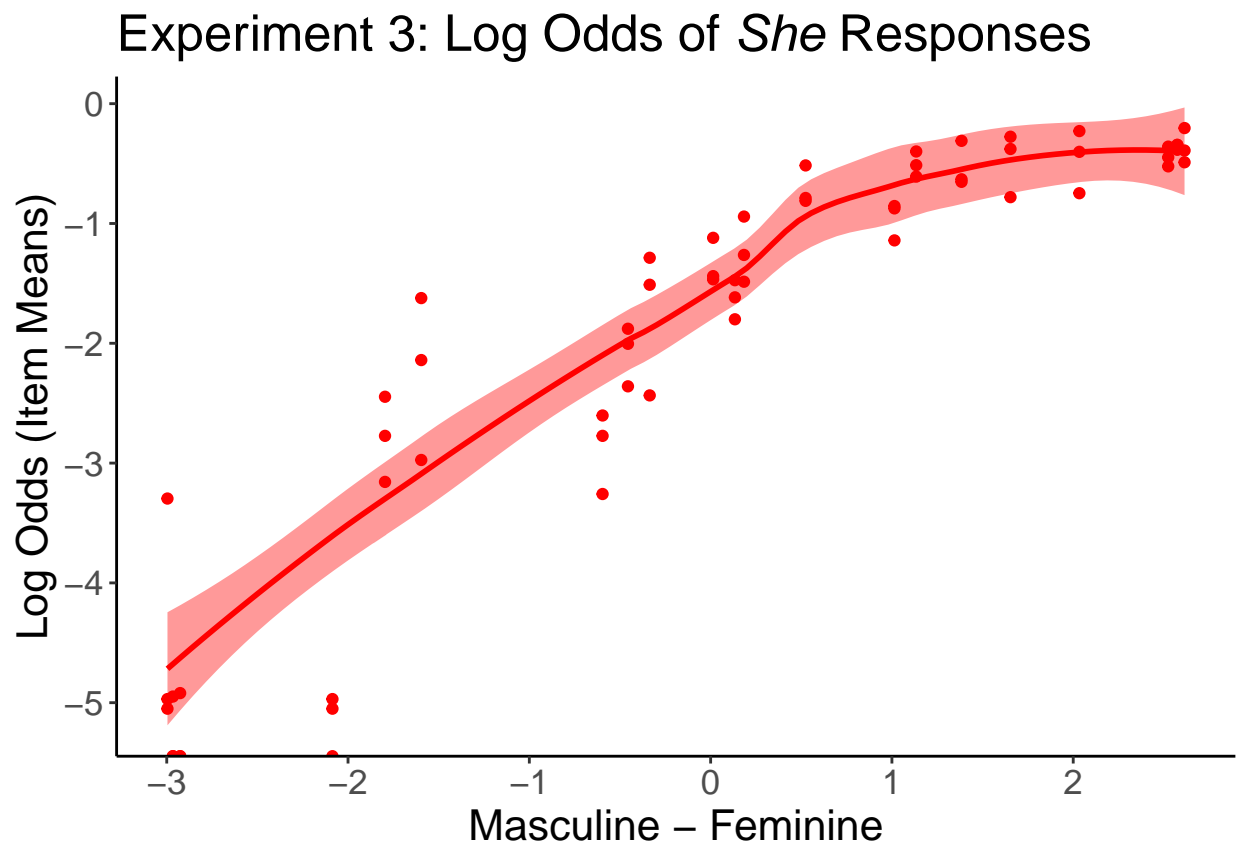
```

Main quadratic effect

To make this easier to understand, plot the data converted to log odds. This includes just what the model is testing: *she* responses, no effects of Condition included yet.

```
exp3_p_log <- exp3_d %>%
  group_by(GenderRatingCentered, Item) %>%
  summarise(She.Mean = mean(She)) %>%
  mutate(She.Log = log(She.Mean)) %>%
  ggplot(aes(x = GenderRatingCentered, y = She.Log)) +
  geom_smooth(fill="red", color="red") +
  geom_point(fill="red", color="red") +
  theme_classic() +
  labs(title = "Experiment 3: Log Odds of *She* Responses",
       x = "Masculine - Feminine",
       y = "Log Odds (Item Means)") +
  theme(text = element_text(size = 16),
        plot.title = element_markdown())
exp3_p_log
```

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



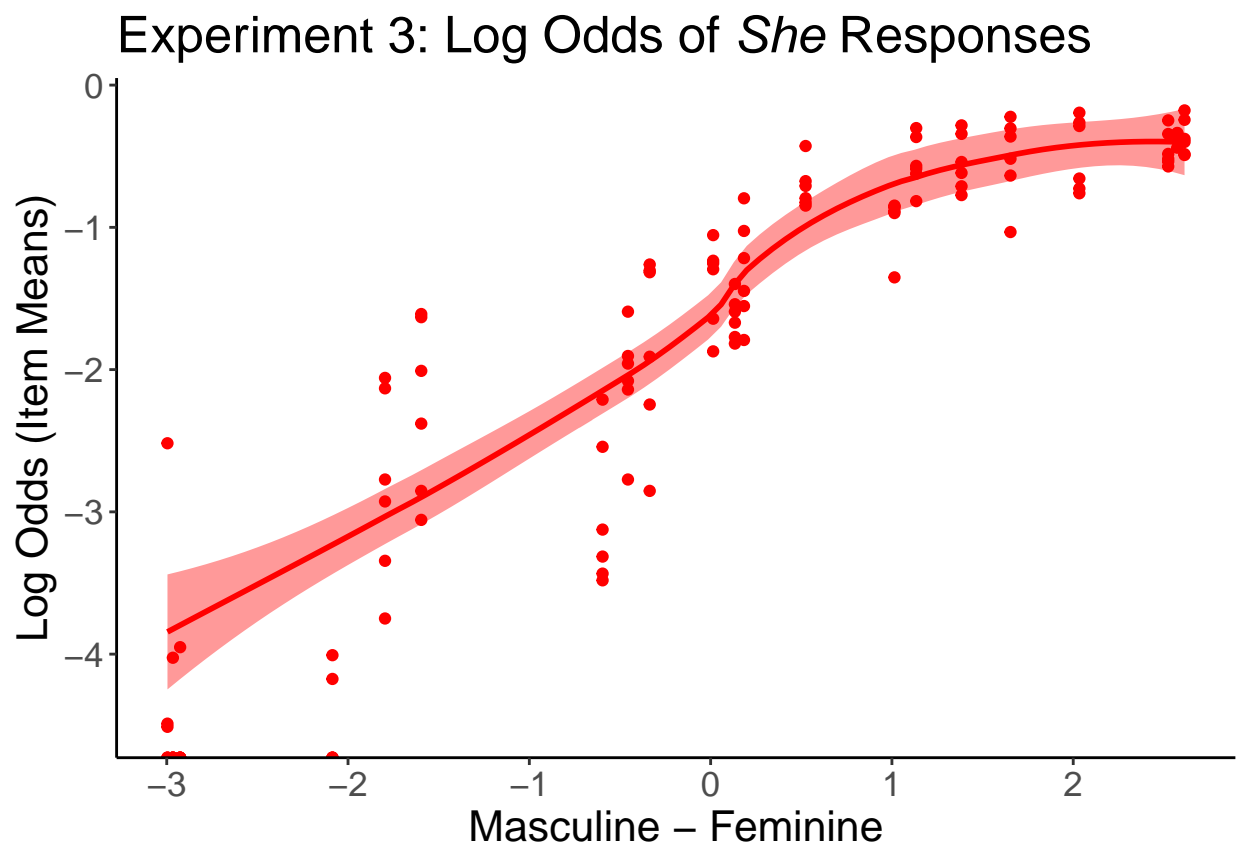
At the masculine end of the scale, *she* responses decrease more linearly. At the feminine end of the scale, *she* responses level off at around 5.5 (mostly feminine), then don't ever reach 0. Fewer *she* responses in 6-7 range than *he* responses in 1-2 range.

Quadratic interaction

Now, plot the comparison for the Last vs First+Full condition interaction.

```
exp3_p_quadCond <- exp3_d %>%
  mutate(Condition_Model = case_when(
    Condition == "first" ~ "First + Full",
    Condition == "full" ~ "First + Full",
    Condition == "last" ~ "Last")) %>%
  group_by(Condition_Model, Item, GenderRatingCentered) %>%
  summarise(She.Mean = mean(She)) %>%
  mutate(She.Log = log(She.Mean)) %>%
  ggplot(aes(x = GenderRatingCentered, y = She.Log)) +
  geom_smooth(fill="red", color="red") +
  geom_point(fill="red", color="red") +
  theme_classic() +
  labs(title = "Experiment 3: Log Odds of *She* Responses",
       x = "Masculine - Feminine",
       y = "Log Odds (Item Means)") +
  theme(text = element_text(size = 16),
        plot.title = element_markdown())
exp3_p_quadCond
```

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



Dummy code to get the quadratic effect just for First and Full Name conditions.

```

exp3_d %<>% mutate(Condition_FF = case_when(
  Condition == "first" ~ 0,
  Condition == "full" ~ 0,
  Condition == "last" ~ 1))
exp3_d$Condition_FF %<>% as.factor()

exp3_m_FF_quad <- glmer(
  She ~ 1 + GenderRatingCentered + GenderRatingSquared +
    Condition_FF + GenderRatingCentered:Condition_FF +
    GenderRatingSquared:Condition_FF + (1|Participant) + (1|Item),
  data = exp3_d, family = binomial)

summary(exp3_m_FF_quad)

## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: She ~ 1 + GenderRatingCentered + GenderRatingSquared + Condition_FF +
## GenderRatingCentered:Condition_FF + GenderRatingSquared:Condition_FF +
## (1 | Participant) + (1 | Item)
## Data: exp3_d
##
##      AIC      BIC   logLik deviance df.resid
##  7806.7   7863.5  -3895.4   7790.7     8896
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.9048 -0.4902 -0.1312  0.5281 18.6250
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.7876   0.8875
## Item         (Intercept) 0.3740   0.6116
## Number of obs: 8904, groups: Participant, 1272; Item, 63
##
## Fixed effects:
##
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -1.15152    0.13250  -8.691  < 2e-16 ***
## GenderRatingCentered      1.28256    0.07173  17.881  < 2e-16 ***
## GenderRatingSquared     -0.15083    0.03826  -3.942  8.09e-05 ***
## Condition_FF1         -0.27707    0.09986  -2.774  0.005529 **
## GenderRatingCentered:Condition_FF1 -0.24465    0.06485  -3.773  0.000162 ***
## GenderRatingSquared:Condition_FF1  0.10652    0.03171   3.359  0.000782 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) GndrRC GndrRS Cn_FF1 GRC:C_
## GndrRtngCnt -0.101
## GndrRtngSqr -0.575 -0.359
## Conditn_FF1 -0.294  0.039  0.124
## GndRC:C_FF1  0.018 -0.549  0.385 -0.122
## GndRS:C_FF1  0.131  0.403 -0.494 -0.378 -0.641

```

Dummy code to get the quadratic effect just for Last Name condition.

```
exp3_d %<>% mutate(Condition_Last = case_when(
  Condition == "first" ~ 1,
  Condition == "full" ~ 1,
  Condition == "last" ~ 0))
exp3_d$Condition_Last %<>% as.factor()

exp3_m_L_quad <- glmer(
  She ~ 1 + GenderRatingCentered + GenderRatingSquared +
    Condition_Last + GenderRatingCentered:Condition_Last +
    GenderRatingSquared:Condition_Last + (1|Participant) + (1|Item),
  data = exp3_d, family = binomial)
summary(exp3_m_L_quad)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula:
## She ~ 1 + GenderRatingCentered + GenderRatingSquared + Condition_Last +
##   GenderRatingCentered:Condition_Last + GenderRatingSquared:Condition_Last +
##   (1 | Participant) + (1 | Item)
## Data: exp3_d
##
##      AIC      BIC   logLik deviance df.resid
##  7806.7   7863.5  -3895.4   7790.7     8896
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.9048 -0.4902 -0.1312   0.5281  18.6243
##
## Random effects:
## Groups      Name                Variance Std.Dev.
## Participant (Intercept) 0.7876   0.8875
## Item         (Intercept) 0.3740   0.6116
## Number of obs: 8904, groups: Participant, 1272; Item, 63
##
## Fixed effects:
##                                     Estimate Std. Error z value Pr(>|z|)
## (Intercept)                       -1.42860    0.14054 -10.165 < 2e-16 ***
## GenderRatingCentered                 1.03790    0.06514  15.933 < 2e-16 ***
## GenderRatingSquared                 -0.04431    0.03565  -1.243  0.213896
## Condition_Last1                     0.27707    0.09987   2.774  0.005531 **
## GenderRatingCentered:Condition_Last1 0.24465    0.06485   3.773  0.000162 ***
## GenderRatingSquared:Condition_Last1 -0.10651    0.03171  -3.359  0.000782 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) GndrRC GndrRS Cnd_L1 GRC:C_
## GndrRtngCnt -0.144
## GndrRtngSqr -0.616 -0.186
## Condttn_Lst1 -0.434  0.078  0.204
## GndrRC:C_L1  0.070 -0.391  0.157 -0.122
```

```
## GndrRS:C_L1  0.145  0.194 -0.359 -0.378 -0.641
```

```
exp3_m_FF_quad %>% tidy() %>%
  filter(term == "GenderRatingSquared") %>% pull(estimate)
```

```
## [1] -0.1508263
```

```
exp3_m_L_quad %>% tidy() %>%
  filter(term == "GenderRatingSquared") %>% pull(estimate)
```

```
## [1] -0.04430599
```

- Beta for quadratic gender rating in First + Full: -0.15***
- Beta for quadratic gender rating in Last: -0.05508 .

Participant Gender

Setup/Data Summary

The third supplementary analysis looks at participant gender: if male participants show a larger bias towards *he* responses than non-male participants.

Participants entered their gender in a free-response box.

```
exp3_d %>% group_by(SubjGenderMale) %>%
  summarise(total = n_distinct(Participant)) %>% kable()
```

SubjGenderMale	total
0	642
1	514
NA	116

For this analysis, we exclude participants who did not respond (N=116).. Because there are not enough participants to create 3 groups, we compare male to non-male participants. Male participants (N=514) are coded as 1 and female (N=638), nonbinary (N=2), agender (N=1), and asexual (N=1) participants are coded as 0.

Summary of responses by condition and participant gender:

```
exp3_d_subjGender <- exp3_d %>% filter(!is.na(SubjGenderMale))
exp3_d_subjGender %<>% mutate(ResponseAll = case_when(
  He == 1 ~ "He",
  She == 1 ~ "She",
  Other == 1 ~ "Other"))
```

Participant gender is mean centered effects coded, comparing non-male participants to male participants.

```
exp3_d_subjGender$SubjGenderMale %<>% as.factor()
contrasts(exp3_d_subjGender$SubjGenderMale) = cbind("NM_M"=c(-.5, .5))
contrasts(exp3_d_subjGender$SubjGenderMale)
```

```
## NM_M
## 0 -0.5
## 1 0.5
```


Model

Effects of Name Condition (first name, full name), the first name's Gender Rating (centered, positive=more feminine), and Participant Gender (non-male vs. male) on the likelihood of a *she* response as opposed to *he* or *other* responses. The maximal model contains random intercepts by item and by participant.

```
exp3_m_subjGender <- buildmer(
  formula = She ~ Condition * GenderRatingCentered * SubjGenderMale +
    (1|Participant) + (1|Item),
  data = exp3_d_subjGender, family = binomial,
  buildmerControl(direction = "order", quiet = TRUE))

summary(exp3_m_subjGender)
```



```
## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) (p-values based on Wald z-scores) [glmerMod]
## Family: binomial ( logit )
## Formula: She ~ 1 + GenderRatingCentered + SubjGenderMale + Condition +
##           GenderRatingCentered:Condition + SubjGenderMale:Condition +
##           GenderRatingCentered:SubjGenderMale + GenderRatingCentered:SubjGenderMale:Condition +
##           (1 | Item) + (1 | Participant)
## Data: exp3_d_subjGender
##
##           AIC          BIC    logLik deviance df.resid
##    7061.6     7159.6   -3516.8   7033.6     8078
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.0837 -0.4716 -0.1392  0.5318  9.8645
##
## Random effects:
##  Groups      Name          Variance Std.Dev.
## Participant (Intercept) 0.7527   0.8676
## Item          (Intercept) 0.4478   0.6692
## Number of obs: 8092, groups: Participant, 1156; Item, 63
##
## Fixed effects:
##
##                                     Estimate Std. Error
## (Intercept)                        -1.58004    0.10544
## GenderRatingCentered                 1.14763    0.06289
## SubjGenderMaleNM_M                  -0.33908    0.09599
## Condition1                          0.19527    0.09835
## Condition2                          0.13618    0.12205
## GenderRatingCentered:Condition1      0.11311    0.05254
## GenderRatingCentered:Condition2     -0.07906    0.06655
## SubjGenderMaleNM_M:Condition1        0.12026    0.19712
## SubjGenderMaleNM_M:Condition2        0.04672    0.24324
## GenderRatingCentered:SubjGenderMaleNM_M -0.01729    0.05160
## GenderRatingCentered:SubjGenderMaleNM_M:Condition1 0.09438    0.10525
## GenderRatingCentered:SubjGenderMaleNM_M:Condition2 -0.04578    0.13264
##
##                                     z value Pr(>|z|) Pr(>|t|)
## (Intercept)                     -14.98481   0.000 < 2e-16
## GenderRatingCentered              18.24838   0.000 < 2e-16
## SubjGenderMaleNM_M               -3.53250   0.000 0.000412
```

```

## Condition1                1.98537    0.047 0.047104
## Condition2                1.11579    0.265 0.264510
## GenderRatingCentered:Condition1    2.15269    0.031 0.031343
## GenderRatingCentered:Condition2   -1.18805    0.235 0.234816
## SubjGenderMaleNM_M:Condition1     0.61010    0.542 0.541795
## SubjGenderMaleNM_M:Condition2     0.19208    0.848 0.847682
## GenderRatingCentered:SubjGenderMaleNM_M   -0.33513    0.738 0.737525
## GenderRatingCentered:SubjGenderMaleNM_M:Condition1  0.89671    0.370 0.369876
## GenderRatingCentered:SubjGenderMaleNM_M:Condition2 -0.34513    0.730 0.729996
##
## (Intercept)                ***
## GenderRatingCentered        ***
## SubjGenderMaleNM_M          ***
## Condition1                  *
## Condition2
## GenderRatingCentered:Condition1        *
## GenderRatingCentered:Condition2
## SubjGenderMaleNM_M:Condition1
## SubjGenderMaleNM_M:Condition2
## GenderRatingCentered:SubjGenderMaleNM_M
## GenderRatingCentered:SubjGenderMaleNM_M:Condition1
## GenderRatingCentered:SubjGenderMaleNM_M:Condition2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) GndrRC SbGMNM_M Cndtn1 Cndtn2 GRC:C1 GRC:C2 SGMNM_M:C1
## GndrRtnGnt -0.300
## SbJGndMNM_M  0.090 -0.063
## Condition1 -0.016  0.005 -0.054
## Condition2 -0.032  0.029  0.012  0.002
## GndrRtnC:C1 -0.001  0.014  0.022 -0.519  0.015
## GndrRtnC:C2  0.030 -0.042  0.001  0.014 -0.507 -0.015
## SbGMNM_M:C1 -0.027  0.012 -0.036  0.191  0.017 -0.125 -0.004
## SbGMNM_M:C2  0.005  0.002 -0.047  0.017  0.133 -0.004 -0.100 -0.001
## GnRC:SGMNM_M -0.062  0.074 -0.517  0.023  0.001 -0.039  0.008  0.019
## GRC:SGMNM_M:C1  0.008 -0.011  0.018 -0.125 -0.003  0.176  0.012 -0.520
## GRC:SGMNM_M:C2  0.003  0.000  0.042 -0.004 -0.100  0.013  0.129  0.015
##      SGMNM_M:C2 GnRC:SGMNM_M GRC:SGMNM_M:C1
## GndrRtnGnt
## SbJGndMNM_M
## Condition1
## Condition2
## GndrRtnC:C1
## GndrRtnC:C2
## SbGMNM_M:C1
## SbGMNM_M:C2
## GnRC:SGMNM_M  0.042
## GRC:SGMNM_M:C1  0.015 -0.001
## GRC:SGMNM_M:C2 -0.506 -0.066 -0.016

```

- Male participants less likely to produce *she* responses overall
- No interactions with participant gender significant

Gender Rating Centering

The first name gender ratings aren't perfectly centered, partially because mostly-feminine/somewhat-masculine names are much less common than mostly-masculine/somewhat-feminine names.

```
mean(exp3_d$GenderRating, na.rm = TRUE)
```

```
## [1] 4.206009
```

Does it make a difference if we center it on 4, the mean of the scale, instead of 4.21, the mean of the items?

```
exp3_d %<>% mutate(GenderRating4 = GenderRating - 4)
```

```
exp3_m_recenter <- glmer(
  She ~ Condition * GenderRating4 + (1|Participant) + (1|Item),
  exp3_d, family = binomial)
summary(exp3_m_recenter)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: She ~ Condition * GenderRating4 + (1 | Participant) + (1 | Item)
## Data: exp3_d
##
##      AIC      BIC   logLik deviance df.resid
##  7825.8   7882.5  -3904.9   7809.8     8896
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.0250 -0.4836 -0.1394  0.5355  9.7282
##
## Random effects:
##  Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.7931   0.8905
## Item          (Intercept) 0.4209   0.6488
## Number of obs: 8904, groups: Participant, 1272; Item, 63
##
## Fixed effects:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -1.76079    0.10526  -16.728  <2e-16 ***
## Condition1       0.13163    0.09692   1.358   0.1744
## Condition2       0.10279    0.12280   0.837   0.4026
## GenderRating4     1.14844    0.06039  19.017  <2e-16 ***
## Condition1:GenderRating4  0.10498    0.04875   2.153   0.0313 *
## Condition2:GenderRating4 -0.05627    0.06294  -0.894   0.3713
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) Cndtn1 Cndtn2 GndrR4 C1:GR4
## Condition1    0.001
## Condition2  -0.017  0.021
```

```
## GenderRtnG4 -0.394 -0.006 0.018
## Cndtn1:GnR4 -0.011 -0.572 -0.001 0.025
## Cndtn2:GnR4 0.019 -0.001 -0.566 -0.023 0.009
```

Here, the beta estimate for the intercept has a larger absolute value (-1.76 vs -1.52), and the beta estimates for the condition effects is slightly different (0.13 vs 0.15; 0.10 vs 0.09).