Experiment 3: Main Analyses

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Contents

Setup

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

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

```
## 'data.frame':    8904 obs. of  7 variables:
##  $ Participant : Factor w/ 1272 levels "R_020UOb05Lb0EtX3",..: 216 216 216 216 216 216 216 41 41 41
##  $ Condition   : Factor w/ 3 levels "first","full",..: 1 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.

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

Set contrasts for name conditions, now weighted to account for uneven sample sizes. 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(d$Condition) <- centerfactor(d$Condition, c("last","first"))
contrasts(d$Condition)
```

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

Data Summary

Responses by condition.

```
d %<>% mutate(ResponseAll=case_when(
       He==1 ~ "He",
       She==1 ~ "She",
       Other==1 ~ "Other"))

d.count_responses <- d %>% group_by(Condition, ResponseAll) %>%
  summarise(n=n()) %>%
  pivot_wider(names_from=ResponseAll,
              values_from=n) %>%
  mutate(She_HeOther = She / (He+Other),
         She_He = She / He)

kable(d.count_responses, digits=3)
```

Condition	He	Other	She	She_HeOther	She_He
first	992	902	941	0.497	0.949
full	899	752	848	0.514	0.943
last	1378	1113	1079	0.433	0.783

Model 1: With *Other* Responses

Effects of Condition (first name, last name, full name) and Gender Rating on the likelihood of a *she* response, as opposed to a *he* or *other* response. Participant and Item are included as random intercepts, with items defined as the unique first, last and first + last name combinations. Because the condition manipulations were fully between-subject and between-item, fitting a random slope model was not possible.

Because Experiment 3 always introduces the character with a full name, then manipulates the name form in the subsequent 3 references, the main analysis is one model, as opposed to the 2 for Experiment 1.

Condition1 is the contrast between last and first+full. Condition2 is the contrast between first and full.

```
m.all <- glmer(She ~ Condition * GenderRatingCentered +
                (1|Participant) + (1|Item),
                data=d, family=binomial)
m.all_tidy <- tidy(m.all)
summary(m.all)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##  Family: binomial  ( logit )
## Formula: She ~ Condition * GenderRatingCentered + (1 | Participant) +
##     (1 | Item)
##    Data: 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)                      -1.52419    0.10101 -15.090   <2e-16 ***
## Condition1                        0.15325    0.09155   1.674   0.0941 .
## Condition2                        0.09120    0.11596   0.786   0.4316
## GenderRatingCentered              1.14844    0.06039  19.017   <2e-16 ***
## Condition1:GenderRatingCentered   0.10499    0.04875   2.153   0.0313 *
## Condition2:GenderRatingCentered -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 GndrRC C1:GRC
## Condition1   0.000
## Condition2  -0.015  0.023
## GndrRtngCnt -0.287 -0.004  0.016
## Cndtn1:GnRC -0.009 -0.495  0.000  0.025
## Cndtn2:GnRC  0.016  0.000 -0.488 -0.023  0.009
```

- Fewer *she* responses overall
- Last Name vs First+Full Names condition effect only trending
- More *she* responses as first names become more feminine
- Larger effect of first name gender in First+Full Name conditions than in Last Name conditions, which makes sense because there are 4 repetitions of the gendered first name, as opposed to only 1.

Convert to Odds Ratios

Intercept

```
m.all_intercept <- m.all_tidy %>% filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()

exp(m.all_intercept)
```

```
## [1] 0.2177981
```

```
exp(-m.all_intercept)
```

```
## [1] 4.591408
```

0.22x less likely to use *she* overall. Easier to interpret: 4.59x more likely to use *he* and *other* overall.

Condition: Last vs First+Full

```
m.all_LFF <- m.all_tidy %>%
  filter(term=="Condition1") %>%
  select(estimate) %>% as.numeric()
exp(m.all_LFF)
```

```
## [1] 1.165616
```

1.17x more likely to use *she* than *he* and *other* in First + Full compared to Last. (n.s.)

Condition: Last Only

Dummy code with Last Name as 0, so that intercept is the Last Name condition only.

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

```
m.all_last <- glmer(She ~ Condition_Last + (1|Participant) + (1|Item),
          data=d, family=binomial)
m.all_last_tidy <- tidy(m.all_last)
```

```
m.all_lastonly <- m.all_last_tidy %>%
  filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()

exp(m.all_lastonly)
```

```
## [1] 0.1747868
```

```
exp(-m.all_lastonly)
```

```
## [1] 5.721256
```

0.18x times less likely to use *she* than *he* and *other* in the Last Name condition –> 5.72x more likely to use *he* and *other* in the Last Name condition.

Condition: First and Full Only

Dummy code with First and Full Name as 0, so the intercept is the combination of those two.

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

```
m.all_FF <- glmer(She ~ Condition_FF + (1|Participant) + (1|Item),
          data=d, family=binomial)
m.all_FF_tidy <- tidy(m.all_FF)
```

```
m.all_FFonly <- m.all_FF_tidy %>%
  filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()

exp(m.all_FFonly)
```

```
## [1] 0.2243583
```

```
exp(-m.all_FFonly)
```

```
## [1] 4.457156
```

0.22x times less likely to use *she* than *he* and *other* in the First and Full Name conditions –> 4.46x more likely to use *he* and *other* in the First and Full Name conditions.

Model 2: Without *Other* Responses

The sentence completion prompt for Experiment 3 is more open-ended than in Experiment 1. So, we get a much higher proportion of *other* responses (31% vs 7%), which I didn't anticipate.

```
o <- sum(d$Other)
o
```

```
## [1] 2767
```

```
o/length(d$Other)
```

```
## [1] 0.3107592
```

```
d.noOther <- d %>% filter(Other==0)
```

So, rerun the main model predicting the likelihood of *she* responses vs *he* responses, with *other* responses excluded.

```
m.noOther <- glmer(She ~ Condition * GenderRatingCentered +
                   (1|Participant) + (1|Item),
             data=d.noOther, family=binomial)
m.noOther_tidy <- tidy(m.noOther)
summary(m.noOther)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##  Family: binomial  ( logit )
## Formula: She ~ Condition * GenderRatingCentered + (1 | Participant) +
##     (1 | Item)
##    Data: d.noOther
##
##      AIC      BIC   logLik deviance df.resid
##   4209.0   4262.8  -2096.5   4193.0     6129
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -9.0292 -0.3424 -0.0521  0.2952 12.5649
##
## Random effects:
##  Groups      Name        Variance Std.Dev.
##  Participant (Intercept) 0.5394   0.7345
##  Item        (Intercept) 0.6807   0.8251
## Number of obs: 6137, groups:  Participant, 1223; Item, 63
##
## Fixed effects:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                     -0.42366    0.12377  -3.423 0.000619 ***
## Condition1                       0.25702    0.09784   2.627 0.008616 **
## Condition2                      -0.01455    0.12816  -0.114 0.909584
## GenderRatingCentered             1.67709    0.08371  20.034  < 2e-16 ***
## Condition1:GenderRatingCentered  0.41953    0.07691   5.455  4.9e-08 ***
## Condition2:GenderRatingCentered -0.14907    0.11205  -1.330 0.183394
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) Cndtn1 Cndtn2 GndrRC C1:GRC
## Condition1   0.053
## Condition2  -0.020  0.005
## GndrRtngCnt -0.155 -0.005  0.005
## Cndtn1:GnRC -0.007 -0.210  0.003  0.201
## Cndtn2:GnRC  0.005  0.004 -0.182 -0.061 -0.053
```

These results are more similar to what we predicted from the previous experiments:

- Fewer *she* responses overall

- Fewer *she* responses in the Last Name condition as compared to the First + Full Name conditions (although we wouldn't predict as large as a difference as in Exp1, because here there is one instance of the first name in the Last Name condition)
- More *she* responses as first names become more feminine
- Larger effect of first name gender in First+Full Name conditions than in Last Name conditions (which makes sense because there are 4repetitions of the gendered first name, as opposed to only 1.)

But, to keep the analyses consistent between experiments and avoid post-hoc decision weirdness, both versions are reported.

Convert to Odds Ratios

Intercept

```
m.noOther_intercept <- m.noOther_tidy %>%
  filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()

exp(m.noOther_intercept)
```

```
## [1] 0.6546471
```

```
exp(-m.noOther_intercept)
```

```
## [1] 1.527541
```

0.65x less likely to use *she* than *he* overall. Easier to interpret: 1.53x more likely to use *he* than *she* overall.

Condition: Last vs First+Full

```
m.noOther_LFF <- m.noOther_tidy %>%
  filter(term=="Condition1") %>%
  select(estimate) %>% as.numeric()
exp(m.noOther_LFF)
```

```
## [1] 1.293077
```

1.29x more likely to use *she* than *he* in First+Full than in Last –> 1.29x more likely to use *he* than *she* in Last than in First+Full.

Condition: Last Only

Dummy code with Last Name as 0, so that intercept is the Last Name condition only.

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

```
m.noOther_last <- glmer(She ~ Condition_Last + (1|Participant) + (1|Item),
          data=d.noOther, family=binomial)
m.noOther_last_tidy <- tidy(m.noOther_last)
```

```
m.noOther_lastonly <- m.noOther_last_tidy %>%
  filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()

exp(m.noOther_lastonly)
```

```
## [1] 0.5080018
```

```
exp(-m.noOther_lastonly)
```

```
## [1] 1.968497
```

0.51x times less likely to use *she* than *he* in the Last Name condition –> 1.97x more likely to use *he* than *she* in the Last Name condition (n.s.)

Condition: First and Full Only

Dummy code with First and Full Name as 0, so the intercept is the combination of those two.

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

```
m.noOther_FF <- glmer(She ~ Condition_FF + (1|Participant) + (1|Item),
          data=d.noOther, family=binomial)
m.noOther_FF_tidy <- tidy(m.noOther_FF)
```

```
m.noOther_FFonly <- m.noOther_FF_tidy %>%
  filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()

exp(m.noOther_FFonly)
```

```
## [1] 0.7385373
```

```
exp(-m.noOther_FFonly)
```

```
## [1] 1.354028
```

0.74x times less likely to use *she* than *he* and *other* in the First and Full Name conditions –> 1.35x more likely to use *he* and *other* in the First and Full Name conditions.