

# Experiment 1: Supplementary Analyses

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## Setup

Load data and select columns used in model. See data/exp1\_data\_about.txt for more details.

```
d <- read.csv("../data/exp1_data.csv", stringsAsFactors=TRUE) %>%
  rename("Participant"="SubjID", "Item"="NameShown") %>%
  select(Participant, SubjGender, Condition, GenderRating, Item, He, She, Other)

str(d)
```

```
## 'data.frame':   9564 obs. of  8 variables:
## $ Participant : Factor w/ 457 levels "R_01wgzz7ygaVl8aJ",...: 278 278 278 278 278 278 278 278 278 278 ...
## $ SubjGender  : Factor w/ 5 levels "female","genderfluid",...: 1 1 1 1 1 1 1 1 1 1 ...
## $ Condition   : Factor w/ 3 levels "first","full",...: 1 1 1 1 1 1 1 1 1 1 ...
## $ GenderRating: num  1.21 1.24 1.28 2.12 2.41 2.61 3.61 3.75 3.87 4.22 ...
## $ Item        : Factor w/ 104 levels "Ashley","Ashley Cook",...: 64 11 43 18 95 29 88 71 79 92 ...
## $ He          : int   1 1 1 1 0 1 1 0 1 1 ...
## $ She         : int   0 0 0 0 1 0 0 1 0 0 ...
## $ Other       : int   0 0 0 0 0 0 0 0 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.

```
contrasts(d$Condition) = cbind("last vs first/full"=c(.33,.33,-0.66),  
                               "first vs full"=c(-.5,.5,0))  
contrasts(d$Condition)
```

```
##      last vs first/full first vs full  
## first           0.33          -0.5  
## full            0.33           0.5  
## last           -0.66           0.0
```

Subset for gender rating effects (First and Full conditions only).

```
d.FF <- d %>% filter(Condition!="last")  
d.FF$Condition <- droplevels(d.FF$Condition)  
contrasts(d.FF$Condition) = cbind("first vs full"=c(-.5,.5)) #add contrast back  
contrasts(d.FF$Condition)
```

```
##      first vs full  
## first          -0.5  
## full           0.5
```

## Without OTHER responses

The first supplementary analysis tests if excluding OTHER responses (7.12% of total responses) affects the pattern of results.

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

```
## [1] 681
```

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

```
## [1] 0.07120452
```

Exclude OTHER responses.

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

## Model 1: Condition w/o OTHER

Effect of Condition (first name, last name, full name) on likelihood of a SHE response, as opposed to a HE response, with OTHER responses excluded. Participant and Item are again included as random intercepts, with items defined as the unique first, last and first + last name combinations.

```
m.cond_other <- glmer(She ~ Condition + (1|Participant) + (1|Item),
                      data=d.heshe, family=binomial)
summary(m.cond_other)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: She ~ Condition + (1 | Participant) + (1 | Item)
## Data: d.heshe
##
##          AIC          BIC    logLik deviance df.resid
##    5795.0    5830.5  -2892.5   5785.0     8878
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -8.1910 -0.2987 -0.1446  0.1682 10.5933
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.823    0.9072
## Item          (Intercept) 9.099    3.0164
## Number of obs: 8883, groups: Participant, 456; Item, 104
##
## Fixed effects:
##
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -1.1303    0.3432  -3.294 0.000989 ***
## Conditionlast vs first/full    2.9905    0.7836   3.816 0.000135 ***
## Conditionfirst vs full    0.5548    0.7823   0.709 0.478220
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) Cvfrs/
## Cndtnvfirst/ -0.179
## Cndtnfirstvf -0.363 -0.241
```

No differences in results.

## Model 2: Condition \* Name Gender w/o OTHER

Effects of Condition (first name, full name) and the first name's Gender Rating (centered, positive=more feminine) on the likelihood of a SHE response as opposed to a HE response, with OTHER responses excluded. In Experiment 1, the Last Name condition does not include any instances of the gendered first name, so it is not included here. Participant and Item are again included as random intercepts.

```

m_namegender_other <- glmer(She ~ Condition * GenderRatingCentered +
                             (1|Participant) + (1|Item),
                             data=d.FF.heshe, family=binomial)
summary(m_namegender_other)

## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: She ~ Condition * GenderRatingCentered + (1 | Participant) +
##   (1 | Item)
## Data: d.FF.heshe
##
##      AIC      BIC   logLik deviance df.resid
##  4107.5   4147.7  -2047.7   4095.5     6010
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -8.4773 -0.3329 -0.0363  0.2865 16.3570
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.5808   0.7621
## Item          (Intercept) 0.6272   0.7920
## Number of obs: 6016, groups: Participant, 304; Item, 83
##
## Fixed effects:
##
##              Estimate Std. Error z value
## (Intercept)    -0.22358    0.12769  -1.751
## Conditionfirst vs full    0.41016    0.25611   1.602
## GenderRatingCentered      1.74039    0.08444  20.612
## Conditionfirst vs full:GenderRatingCentered -0.25145    0.16068  -1.565
##
##              Pr(>|z|)
## (Intercept)      0.080 .
## Conditionfirst vs full    0.109
## GenderRatingCentered    <2e-16 ***
## Conditionfirst vs full:GenderRatingCentered    0.118
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) Cndtvf GndrRC
## Cndtnfrstvf -0.387
## GndrRtngCnt -0.115  0.113
## Cvfl1:GndRC  0.096 -0.122 -0.426

```

Compared to the main analysis including OTHER responses, the intercept is trending instead of significant, the gender rating effect the same, and the small First vs Full effect is no longer significant.

## Quadratic Name Gender Rating

The second supplementary analysis tested the effect of squared 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.

```
d.FF %<>% mutate(GenderRatingSquared=GenderRatingCentered^2)
```

### Model 3: Quadratic

No quadratic effects.

```
m_namegender_squared <- glmer(She ~ Condition*GenderRatingCentered +
                              Condition*GenderRatingSquared +
                              (1|Participant) + (1|Item),
                              d.FF, family="binomial")
summary(m_namegender_squared)
```

  

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##   Family: binomial   ( logit )
## Formula:
## She ~ Condition * GenderRatingCentered + Condition * GenderRatingSquared +
##       (1 | Participant) + (1 | Item)
##   Data: d.FF
##
##           AIC          BIC    logLik deviance df.resid
##    4658.9     4712.9   -2321.4   4642.9     6364
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -9.1928 -0.3535 -0.0574  0.3125 14.0580
##
## Random effects:
##   Groups       Name            Variance Std.Dev.
##   Participant (Intercept) 0.8910   0.9440
##   Item          (Intercept) 0.4795   0.6925
## Number of obs: 6372, groups: Participant, 305; Item, 83
##
## Fixed effects:
##
##              Estimate Std. Error z value
## (Intercept)    -0.59972    0.15023  -3.992
## Conditionfirst vs full    0.38504    0.30017   1.283
## GenderRatingCentered      1.59657    0.07187  22.214
## GenderRatingSquared       0.03687    0.03923   0.940
## Conditionfirst vs full:GenderRatingCentered -0.16052    0.13726  -1.169
## Conditionfirst vs full:GenderRatingSquared  0.06049    0.07828   0.773
##
##              Pr(>|z|)
## (Intercept)    6.55e-05 ***
## Conditionfirst vs full    0.200
## GenderRatingCentered    < 2e-16 ***
## GenderRatingSquared      0.347
## Conditionfirst vs full:GenderRatingCentered  0.242
## Conditionfirst vs full:GenderRatingSquared  0.440
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Correlation of Fixed Effects:
##          (Intr) Cndtvf GndrRC GndrRS Cvf:GRC
## Cndtnfrstvf -0.374
## GndrRtngCnt -0.112  0.024
## GndrRtngSqr -0.617  0.267 -0.041
## Cvf11:GndRC  0.025 -0.107 -0.408  0.111
## Cvf11:GndRS  0.266 -0.618  0.120 -0.439 -0.030
```

## 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.

```
d %>% group_by(SubjGender) %>%
  summarise(total=n_distinct(Participant)) %>%
  kable()
```

SubjGender	total
female	196
genderfluid	1
male	244
N/A	15
Non-binary	1

For this analysis, we exclude participants who did not respond. Because there are not enough participants to create 3 groups, we compare male to non-male participants.

```
d.gender <- d %>% filter(SubjGender != "N/A") %>%
  mutate(SubjGenderMale=(ifelse(SubjGender=="male", 1, 0)))

d.gender %>% group_by(SubjGenderMale) %>%
  summarise(total=n_distinct(Participant)) %>%
  kable()
```

SubjGenderMale	total
0	198
1	244

Summary of responses by condition and participant gender.

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

```

      Other==1 ~ "Other"))

d.gender.count_responses <- d.gender %>%
  group_by(Condition, ResponseAll, SubjGenderMale) %>%
  summarise(n=n()) %>%
  pivot_wider(names_from=c(ResponseAll),
              values_from=n) %>%
  mutate(She_HeOther = She / (He+Other),
         She_He = She / He) %>%
  rename("ParticipantGender"="SubjGenderMale")
d.gender.count_responses$ParticipantGender %<>% recode("0"="Non-male", "1"="Male")

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

```

Condition	ParticipantGender	He	Other	She	She_HeOther	She_He
first	Non-male	680	83	644	0.844	0.947
first	Male	830	131	698	0.726	0.841
full	Non-male	656	58	648	0.908	0.988
full	Male	823	71	842	0.942	1.023
last	Non-male	1114	134	138	0.111	0.124
last	Male	1418	176	107	0.067	0.075

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

```

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

```

```

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

```

Subset First and Full conditions.

```

d.FF.gender <- d.gender %>% filter(Condition!="last")
d.FF.gender$Condition <- droplevels(d.FF.gender$Condition)
contrasts(d.FF.gender$Condition) =
  cbind("first vs full"=c(-.5,.5)) #add contrast back
contrasts(d.FF.gender$Condition)

```

```

##      first vs full
## first          -0.5
## full           0.5

```

## Model 4: Condition \* Participant Gender

Effect of Condition (first name, last name, full name) and Participant Gender (non-male vs male) on likelihood of a SHE response, as opposed to a HE response or OTHER response. Participant and Item are again included as random intercepts.

```

m_cond_subjgender <- glmer(She ~ Condition * SubjGenderMale +
  (1|Participant) + (1|Item),
  data=d.gender, family=binomial)
summary(m_cond_subjgender)

## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: She ~ Condition * SubjGenderMale + (1 | Participant) + (1 | Item)
## Data: d.gender
##
##      AIC      BIC    logLik deviance df.resid
##  6209.6   6266.7  -3096.8   6193.6     9243
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -8.9913 -0.2996 -0.1427  0.2145 10.1263
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## Participant (Intercept) 1.018    1.009
## Item          (Intercept) 7.202    2.684
## Number of obs: 9251, groups: Participant, 442; Item, 104
##
## Fixed effects:
##
##              Estimate Std. Error z value
## (Intercept)      -1.4241    0.3071  -4.637
## Conditionlast vs first/full      2.8080    0.7015   4.003
## Conditionfirst vs full      0.5860    0.6988   0.839
## SubjGenderMaleNM_M      -0.2637    0.1209  -2.181
## Conditionlast vs first/full:SubjGenderMaleNM_M  0.3958    0.2700   1.466
## Conditionfirst vs full:SubjGenderMaleNM_M  0.4309    0.2830   1.523
##
##              Pr(>|z|)
## (Intercept)      3.54e-06 ***
## Conditionlast vs first/full      6.25e-05 ***
## Conditionfirst vs full      0.4017
## SubjGenderMaleNM_M      0.0292 *
## Conditionlast vs first/full:SubjGenderMaleNM_M  0.1426
## Conditionfirst vs full:SubjGenderMaleNM_M  0.1278
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) Cvfrs/ Cndtvf SGMNM_ Cvf/:S
## Cndtnvfrst/ -0.181
## Cndtnfrstvf -0.359 -0.239
## SbjGndMNM_M -0.014 -0.006 -0.004
## Cvf/:SGMNM_ -0.006 -0.009 -0.003 -0.117
## Cvf:SGMNM_M -0.005 -0.002 -0.021 -0.008 -0.005

```

Male participants are less likely to respond SHE overall than non-male participants, but this is not significant after correcting for multiple comparisons. Neither interaction with Condition is significant.



## Model 5: Condition \* Name Gender \* Participant Gender

Effects of 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 a HE or OTHER responses. In Experiment 1, the Last Name condition does not include any instances of the gendered first name, so it is not included here. The model with random intercepts does not converge with glmer, but does when using buildmer to find the maximal model (?).

```
m_cond_name_subjgender <- buildmer(formula=
  (She ~ Condition * GenderRatingCentered * SubjGenderMale +
    (1|Participant) + (1|Item)),
  data=d.FF.gender, family=binomial,
  direction=c("order"), quiet=TRUE)
summary(m_cond_name_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 + Condition + SubjGenderMale +
##          Condition:SubjGenderMale + GenderRatingCentered:SubjGenderMale +
##          GenderRatingCentered:Condition + GenderRatingCentered:Condition:SubjGenderMale +
##          (1 | Item) + (1 | Participant)
## Data: d.FF.gender
##
##          AIC          BIC    logLik deviance df.resid
##    4505.5    4572.7   -2242.7   4485.5     6154
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -7.6662 -0.3538 -0.0522  0.3118 19.1555
##
## Random effects:
##  Groups      Name          Variance Std.Dev.
## Participant (Intercept) 0.8803   0.9382
## Item          (Intercept) 0.4716   0.6867
## Number of obs: 6164, groups: Participant, 295; Item, 83
##
## Fixed effects:
##                                     Estimate
## (Intercept)                       -0.53094
## GenderRatingCentered                1.59623
## Conditionfirst vs full              0.51484
## SubjGenderMaleNM_M                 -0.18947
## Conditionfirst vs full:SubjGenderMaleNM_M 0.55024
## GenderRatingCentered:SubjGenderMaleNM_M 0.15031
## GenderRatingCentered:Conditionfirst vs full -0.16968
## GenderRatingCentered:Conditionfirst vs full:SubjGenderMaleNM_M -0.28500
##                                     Std. Error
## (Intercept)                       0.11855
## GenderRatingCentered                0.07174
## Conditionfirst vs full              0.23736
## SubjGenderMaleNM_M                 0.13826
## Conditionfirst vs full:SubjGenderMaleNM_M 0.27654
## GenderRatingCentered:SubjGenderMaleNM_M 0.07426
```

```

## GenderRatingCentered:Conditionfirst vs full          0.13741
## GenderRatingCentered:Conditionfirst vs full:SubjGenderMaleNM_M 0.14851
##                                                    z value
## (Intercept)                                         -4.47845
## GenderRatingCentered                               22.25030
## Conditionfirst vs full                             2.16905
## SubjGenderMaleNM_M                                -1.37038
## Conditionfirst vs full:SubjGenderMaleNM_M          1.98971
## GenderRatingCentered:SubjGenderMaleNM_M            2.02406
## GenderRatingCentered:Conditionfirst vs full        -1.23482
## GenderRatingCentered:Conditionfirst vs full:SubjGenderMaleNM_M -1.91908
##                                                    Pr(>|z|)
## (Intercept)                                         0.000
## GenderRatingCentered                               0.000
## Conditionfirst vs full                             0.030
## SubjGenderMaleNM_M                                0.171
## Conditionfirst vs full:SubjGenderMaleNM_M          0.047
## GenderRatingCentered:SubjGenderMaleNM_M            0.043
## GenderRatingCentered:Conditionfirst vs full        0.217
## GenderRatingCentered:Conditionfirst vs full:SubjGenderMaleNM_M 0.055
##                                                    Pr(>|t|)
## (Intercept)                                         7.52e-06 ***
## GenderRatingCentered                               < 2e-16 ***
## Conditionfirst vs full                             0.0301 *
## SubjGenderMaleNM_M                                0.1706
## Conditionfirst vs full:SubjGenderMaleNM_M          0.0466 *
## GenderRatingCentered:SubjGenderMaleNM_M            0.0430 *
## GenderRatingCentered:Conditionfirst vs full        0.2169
## GenderRatingCentered:Conditionfirst vs full:SubjGenderMaleNM_M 0.0550 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##          (Intr) GndrRC Cndtvf SGMNM_ Cvf:SG GRC:SG GnRC:Cvf
## GndrRtngCnt -0.185
## Cndtnfrstvf -0.336  0.120
## SbjGndMNM_M -0.035 -0.022 -0.038
## Cvf:SGMNM_M -0.038  0.037 -0.035 -0.026
## GRC:SGMNM_M -0.035  0.029  0.052 -0.178  0.061
## GndrRtC:Cvf  0.109 -0.395 -0.177  0.034 -0.021 -0.086
## GRC:Cvf:SGM  0.052 -0.086 -0.035  0.061 -0.178 -0.093  0.026

```

- Participant Gender: n.s.
- Condition (First vs Full) \* Participant Gender: There is a larger difference between the First and Full Name conditions for male participants (see means above), but this is n.s. after correcting for multiple comparisons.
- Name Gender \* Participant Gender: There is a stronger effect of the first name gender rating for male participants, but this is n.s. after correction for multiple comparisons.
- Condition (First vs Full) \* Name Gender \* Participant Gender: trending