

# Experiment 4: Supplementary Analyses

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## Contents

<b>Setup</b>	<b>1</b>
<b>Without <i>Other</i> Responses</b>	<b>2</b>
Odds Ratios: Intercept . . . . .	4
Odds Ratios: Last vs First+Full . . . . .	4
Odds Ratios: Last Only . . . . .	5
Odds Ratios: First and Full Only . . . . .	6
<b>Quadratic Name Gender Rating</b>	<b>7</b>
<b>Participant Gender</b>	<b>8</b>
Setup/Data Summary . . . . .	8
Model: Condition * Name Gender * Participant Gender . . . . .	10

## Setup

- Variable names:
  - Experiment: exp4
  - Type
    - \* d = data
    - \* m = model
    - \* est = log odds estimate from model
    - \* OR = odds ratio converted from est
  - Analysis
    - \* count = sums of response types
    - \* cond = effect of Condition (Last vs First+Full)
    - \* nameGender = effects of Condition (First vs Full) and Name Gender Rating
  - Subset
    - \* all = including *other* responses
    - \* noOther = excluding *other* responses

- \* FF = First and Full Name conditions only
- \* Last = Last Name condition only

Load data and select columns used in model. See data/exp4\_data\_about.txt for more details.

```
exp4_d <- read.csv("../data/exp4_data.csv",
                  stringsAsFactors=TRUE) %>%
  rename("Participant"="SubjID", "Item"="Name") %>%
  select(Participant, Condition, SubjGender,
         GenderRating, Item, Male, Female, Other)
str(exp4_d)
```

```
## 'data.frame': 8771 obs. of 8 variables:
## $ Participant : Factor w/ 1253 levels "R_00dmdQaotbTidXz",...: 1001 1001 1001 1001 1001 1001 1001 1001 23
## $ Condition : Factor w/ 3 levels "first","full",...: 1 1 1 1 1 1 1 1 1 ...
## $ SubjGender : Factor w/ 5 levels "female","male",...: 2 2 2 2 2 2 2 2 2 ...
## $ GenderRating: num 6.24 2.61 6.82 5.34 1.28 4.39 3.87 5.22 1.24 5.86 ...
## $ Item : Factor w/ 63 levels "Ashley Cook",...: 1 18 21 22 25 28 50 5 7 15 ...
## $ Male : int 0 1 0 0 1 1 1 1 1 0 ...
## $ Female : int 1 0 1 1 0 0 0 0 0 1 ...
## $ 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.

```
exp4_d %<>% mutate(GenderRatingCentered=
                  scale(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(exp4_d$Condition) <- centerfactor(exp4_d$Condition, c("last","first"))
contrasts(exp4_d$Condition)
```

```
##           [,1]      [,2]
## first  0.3312051 -0.497605746
## full   0.3312051  0.502394254
## last  -0.6687949  0.002394254
```

## Without *Other* Responses

The first supplementary analysis tests if excluding *other* responses (2.99% of total responses) affects the pattern of results.

```
sum(exp4_d$Other)
```

```
## [1] 262
```

```
sum(exp4_d$Other)/length(exp4_d$Other)
```

```
## [1] 0.02987117
```

Exclude *other* responses.

```
exp4_d_noOther <- exp4_d %>% filter(Other==0)
```

Effect of Name Condition (first name, last name, full name) and first name Gender Rating on likelihood of a *female* response, as opposed to a *male* 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.

```
exp4_m_noOther <- glmer(  
  Female ~ Condition * GenderRatingCentered +  
    (1|Participant) + (1|Item),  
  data=exp4_d_noOther, family=binomial)  
summary(exp4_m_noOther)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace  
## Approximation) [glmerMod]  
## Family: binomial ( logit )  
## Formula: Female ~ Condition * GenderRatingCentered + (1 | Participant) +  
## (1 | Item)  
## Data: exp4_d_noOther  
##  
##      AIC      BIC    logLik deviance df.resid  
##  8737.3   8793.7  -4360.6   8721.3     8501  
##  
## Scaled residuals:  
##      Min       1Q   Median       3Q      Max  
## -3.4146 -0.5648 -0.2574   0.5646   4.7423  
##  
## Random effects:  
## Groups      Name      Variance Std.Dev.  
## Participant (Intercept) 0.05031  0.2243  
## Item          (Intercept) 0.36891  0.6074  
## Number of obs: 8509, groups: Participant, 1232; Item, 63  
##  
## Fixed effects:  
##  
##              Estimate Std. Error z value Pr(>|z|)  
## (Intercept)    -0.16410    0.08196  -2.002   0.0453 *  
## Condition1      0.13514    0.05783   2.337   0.0194 *  
## Condition2      0.11301    0.06837   1.653   0.0983 .  
## GenderRatingCentered 0.76972    0.04650  16.554  <2e-16 ***  
## Condition1:GenderRatingCentered 0.13700    0.03522   3.890   0.0001 ***  
## Condition2:GenderRatingCentered -0.09189    0.04315  -2.130   0.0332 *  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Correlation of Fixed Effects:  
##              (Intr) Cndtn1 Cndtn2 GndrRC C1:GRC
```

```
## Condition1    0.016
## Condition2   -0.010 -0.012
## GndrRtngCnt  -0.022  0.005  0.013
## Cndtn1:GnRC   0.004 -0.101  0.020  0.038
## Cndtn2:GnRC   0.012  0.020 -0.085 -0.025 -0.038
```

Compared to the main model:

- Intercept and Condition2:GenderRatingCentered (difference between Last Name and First+Full name conditions) potentially smaller differences
- Condition2 now trending

## Odds Ratios: Intercept

```
exp4_OR_noOther_I <- exp4_m_noOther %>%
  tidy() %>%
  filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()
exp(exp4_OR_noOther_I)
```

```
## [1] 0.8486549
```

```
exp(-exp4_OR_noOther_I)
```

```
## [1] 1.178335
```

```
#Save this for the table comparing all 4 experiments
exp4_OR_noOther_I <- exp(-exp4_OR_noOther_I) %>%
  round(2)
```

0.84x less likely to recall as female overall. Easier to interpret: 1.18x more likely to recall as male overall,  $p < .05$

## Odds Ratios: Last vs First+Full

```
exp4_est_noOther_LFF <- exp4_m_noOther %>%
  tidy() %>%
  filter(term=="Condition1") %>%
  select(estimate) %>% as.numeric()
exp(exp4_est_noOther_LFF)
```

```
## [1] 1.144702
```

```
#Save this for the table comparing all 4 experiments
exp4_OR_noOther_LFF <- exp(exp4_est_noOther_LFF) %>%
  round(2)
```

1.14x more likely to recall as female in First + Full compared to Last,  $p < .05$

## Odds Ratios: Last Only

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

```
exp4_d_noOther %<>% mutate(Condition_Last=case_when(
  Condition=="first" ~ 1,
  Condition=="full" ~ 1,
  Condition=="last" ~ 0))
exp4_d_noOther$Condition_Last %<>% as.factor()
```

```
exp4_m_noOther_L <- glmer(
  Female ~ Condition_Last + (1|Participant) + (1|Item),
  data=exp4_d_noOther, family=binomial)
summary(exp4_m_noOther_L)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: Female ~ Condition_Last + (1 | Participant) + (1 | Item)
## Data: exp4_d_noOther
##
##      AIC      BIC   logLik deviance df.resid
##  8858.6   8886.8  -4425.3   8850.6     8505
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.0926 -0.5697 -0.2723  0.5620  4.0294
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.04761  0.2182
## Item          (Intercept) 2.28035  1.5101
## Number of obs: 8509, groups: Participant, 1232; Item, 63
##
## Fixed effects:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)   -0.27233    0.19639  -1.387  0.16553
## Condition_Last1 0.16052    0.05804   2.766  0.00568 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## Condttn_Lst1 -0.198
```

```
exp4_est_noOther_L <- exp4_m_noOther_L %>%
  tidy() %>%
  filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()

exp(exp4_est_noOther_L)
```

```
## [1] 0.7616004
```

```
exp(-exp4_est_noOther_L)
```

```
## [1] 1.313025
```

```
#Save this for the table comparing all 4 experiments  
exp4_OR_noOther_L <- exp(-exp4_est_noOther_L) %>%  
  round(2)
```

0.76x times less likely to recall as female in the Last Name condition -> 1.31x more likely to recall as male in the Last Name condition,  $p=.17$

## Odds Ratios: First and Full Only

Dummy code with First and Full Name as 0, so that intercept is average for these two conditions.

```
exp4_d_noOther %<>% mutate(Condition_FF=case_when(  
  Condition=="first" ~ 0,  
  Condition=="full" ~ 0,  
  Condition=="last" ~ 1))  
exp4_d_noOther$Condition_FF %<>% as.factor()
```

```
exp4_m_noOther_FF <- glmer(  
  Female ~ Condition_FF + (1|Participant) + (1|Item),  
  data=exp4_d_noOther, family=binomial)  
summary(exp4_m_noOther_FF)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace  
## Approximation) [glmerMod]  
## Family: binomial ( logit )  
## Formula: Female ~ Condition_FF + (1 | Participant) + (1 | Item)  
## Data: exp4_d_noOther  
##  
##      AIC      BIC    logLik deviance df.resid  
##  8858.6   8886.8  -4425.3   8850.6     8505  
##  
## Scaled residuals:  
##      Min       1Q   Median       3Q      Max  
## -3.0926 -0.5697 -0.2723  0.5620  4.0294  
##  
## Random effects:  
## Groups      Name      Variance Std.Dev.  
## Participant (Intercept) 0.04761  0.2182  
## Item          (Intercept) 2.28035  1.5101  
## Number of obs: 8509, groups: Participant, 1232; Item, 63  
##  
## Fixed effects:  
##              Estimate Std. Error z value Pr(>|z|)  
## (Intercept)  -0.11182    0.19344  -0.578  0.56324  
## Condition_FF1 -0.16052    0.05804  -2.766  0.00568 **  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Correlation of Fixed Effects:
##           (Intr)
## Conditn_FF1 -0.099

exp4_est_noOther_FF <- exp4_m_noOther_FF %>%
  tidy() %>%
  filter(term=="(Intercept)") %>%
  select(estimate) %>% as.numeric()

exp(exp4_est_noOther_FF)
```

```
## [1] 0.894209
```

```
exp(-exp4_est_noOther_FF)
```

```
## [1] 1.118307
```

```
#Save this for the table comparing all 4 experiments
exp4_OR_noOther_FF <- exp(-exp4_est_noOther_FF) %>%
  round(2)
```

0.89x less likely to recall as female in First and Full Name conditions → 1.12x more likely to recall as male in First and Full Name conditions,  $p=0.56$

## 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.

```
exp4_d %<>% mutate(GenderRatingSquared=GenderRatingCentered^2)

exp4_m_nameGenderQuad <- glmer(
  Female ~ Condition*GenderRatingCentered + Condition*GenderRatingSquared +
    (1|Participant) + (1|Item),
  exp4_d, family="binomial")
summary(exp4_m_nameGenderQuad)

## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula:
## Female ~ Condition * GenderRatingCentered + Condition * GenderRatingSquared +
##   (1 | Participant) + (1 | Item)
## Data: exp4_d
##
##      AIC      BIC   logLik deviance df.resid
##  9142.9   9220.8  -4560.4   9120.9     8760
##
```

```
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.2148 -0.5741 -0.2557  0.5736  5.9912
##
## Random effects:
##   Groups      Name      Variance Std.Dev.
##   Participant (Intercept) 0.2036   0.4512
##   Item         (Intercept) 0.3482   0.5901
## Number of obs: 8771, groups: Participant, 1253; Item, 63
##
## Fixed effects:
##
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -0.36854    0.11557  -3.189 0.001429 **
## Condition1      0.16076    0.08016   2.006 0.044900 *
## Condition2     -0.07650    0.09273  -0.825 0.409405
## GenderRatingCentered 0.77986    0.04638  16.814 < 2e-16 ***
## GenderRatingSquared 0.03431    0.02628   1.306 0.191653
## Condition1:GenderRatingCentered 0.13226    0.03480   3.800 0.000145 ***
## Condition2:GenderRatingCentered -0.09191    0.04261  -2.157 0.031001 *
## Condition1:GenderRatingSquared -0.01425    0.01933  -0.737 0.461103
## Condition2:GenderRatingSquared 0.05970    0.02351   2.539 0.011108 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) Cndtn1 Cndtn2 GndrRC GndrRS C1:GRC C2:GRC C1:GRS
## Condition1    0.002
## Condition2  -0.003 -0.002
## GndrRtngCnt -0.173  0.003 -0.005
## GndrRtngSqr -0.717 -0.005  0.005  0.212
## Cndtn1:GnRC  0.001 -0.165 -0.009  0.038 -0.003
## Cndtn2:GnRC -0.004 -0.008 -0.154 -0.027  0.029 -0.043
## Cndtn1:GnRS -0.005 -0.636  0.007 -0.003  0.029  0.117  0.056
## Cndtn2:GnRS  0.005  0.006 -0.620  0.034 -0.027  0.058  0.095 -0.045
```

- Condition (F v F) \* Quadratic Gender Rating interaction, but n.s. after correction for multiple comparisons, so not making a big deal of it

## Participant Gender

### Setup/Data Summary

The third supplementary analysis looks at participant gender: if male participants show a larger bias to recall the character as male than non-male participants.

Participants entered their gender in a free-response box.

```
exp4_d %>% group_by(SubjGender) %>%
  summarise(total=n_distinct(Participant)) %>% kable()
```



SubjGender	total
female	555
male	602
non-binary	3
transgender female	1
transgender male	1
NA	91

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

```
exp4_d_gender <- exp4_d %>%
  filter(SubjGender != "N/A") %>%
  mutate(SubjGenderMale=(ifelse(
    SubjGender=="male" | SubjGender=="transgender male", 1, 0)))

exp4_d_gender %>% group_by(SubjGenderMale) %>%
  summarise(total=n_distinct(Participant)) %>%
  kable()
```

SubjGenderMale	total
0	559
1	603

Summary of responses by condition and participant gender.

```
exp4_d_gender %<>% mutate(ResponseAll=case_when(
  Male==1 ~ "Male",
  Female==1 ~ "Female",
  Other==1 ~ "Other"))

exp4_d_gender <- exp4_d %>%
  filter(SubjGender != "N/A") %>%
  mutate(SubjGenderMale=(ifelse(SubjGender=="male", 1, 0)))

exp4_d_gender %>% group_by(SubjGenderMale) %>%
  summarise(total=n_distinct(Participant)) %>%
  kable()
```

SubjGenderMale	total
0	560
1	602

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

```
exp4_d_gender$SubjGenderMale %<>% as.factor()
contrasts(exp4_d_gender$SubjGenderMale)=cbind("NM_M"=c(-.5,.5))
contrasts(exp4_d_gender$SubjGenderMale)
```

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

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

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 *female* response as opposed to *male* or *other* responses.

```
exp4_m_gender <- glmer(Female ~
  Condition * GenderRatingCentered * SubjGenderMale +
  (1|Participant) + (1|Item),
  data=exp4_d_gender, family=binomial)
```

```
## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, :
## Model failed to converge with max|grad| = 0.00332225 (tol = 0.002, component 1)
```

```
summary(exp4_m_gender)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: Female ~ Condition * GenderRatingCentered * SubjGenderMale +
## (1 | Participant) + (1 | Item)
## Data: exp4_d_gender
##
##      AIC      BIC    logLik deviance df.resid
## 8484.2   8582.3 -4228.1   8456.2     8120
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.4046 -0.5731 -0.2629  0.5807  4.8566
##
## Random effects:
## Groups      Name                Variance Std.Dev.
## Participant (Intercept) 0.1829    0.4276
## Item          (Intercept) 0.3675    0.6062
## Number of obs: 8134, groups: Participant, 1162; Item, 63
##
## Fixed effects:
##                                     Estimate Std. Error z value
## (Intercept)                       -0.25084    0.08274  -3.032
## Condition1                         0.14966    0.06379   2.346
## Condition2                         0.07633    0.07463   1.023
## GenderRatingCentered               0.76485    0.04663  16.404
## SubjGenderMaleNM_M                -0.19530    0.06079  -3.213
```

```

## Condition1:GenderRatingCentered          0.09614    0.03620    2.656
## Condition2:GenderRatingCentered          -0.09911    0.04344   -2.281
## Condition1:SubjGenderMaleNM_M           -0.01862    0.12793   -0.146
## Condition2:SubjGenderMaleNM_M           -0.13395    0.14939   -0.897
## GenderRatingCentered:SubjGenderMaleNM_M -0.01808    0.03493   -0.517
## Condition1:GenderRatingCentered:SubjGenderMaleNM_M 0.04372    0.07259    0.602
## Condition2:GenderRatingCentered:SubjGenderMaleNM_M -0.04707    0.08692   -0.542
##                                          Pr(>|z|)
## (Intercept)                             0.00243 **
## Condition1                             0.01897 *
## Condition2                             0.30643
## GenderRatingCentered                   < 2e-16 ***
## SubjGenderMaleNM_M                     0.00131 **
## Condition1:GenderRatingCentered         0.00791 **
## Condition2:GenderRatingCentered         0.02252 *
## Condition1:SubjGenderMaleNM_M          0.88427
## Condition2:SubjGenderMaleNM_M          0.36991
## GenderRatingCentered:SubjGenderMaleNM_M 0.60483
## Condition1:GenderRatingCentered:SubjGenderMaleNM_M 0.54698
## Condition2:GenderRatingCentered:SubjGenderMaleNM_M 0.58813
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) Cndtn1 Cndtn2 GndrRC SGMNM_ Cn1:GRC Cn2:GRC C1:SGM C2:SGM
## Condition1    0.009
## Condition2  -0.008 -0.008
## GndrRtngCnt -0.029  0.007  0.012
## SbjGndMNM_M -0.010  0.040 -0.039 -0.017
## Cndtn1:GnRC  0.005 -0.122  0.017  0.025 -0.017
## Cndtn2:GnRC  0.011  0.017 -0.104 -0.024  0.001 -0.035
## Cn1:SGMNM_M  0.013 -0.061 -0.026 -0.003  0.019 -0.018  0.000
## Cn2:SGMNM_M -0.013 -0.029 -0.002 -0.002 -0.012  0.000 -0.040 -0.007
## GRC:SGMNM_M -0.015 -0.017  0.002 -0.011 -0.112  0.059 -0.049  0.009  0.024
## C1:GRC:SGMN -0.004 -0.019  0.000  0.016  0.010 -0.080 -0.033 -0.123  0.018
## C2:GRC:SGMN -0.001  0.001 -0.040 -0.016  0.023 -0.036  0.006  0.017 -0.104
##      GRC:SG C1:GRC:
## Condition1
## Condition2
## GndrRtngCnt
## SbjGndMNM_M
## Cndtn1:GnRC
## Cndtn2:GnRC
## Cn1:SGMNM_M
## Cn2:SGMNM_M
## GRC:SGMNM_M
## C1:GRC:SGMN  0.056
## C2:GRC:SGMN -0.050 -0.034
## optimizer (Nelder_Mead) convergence code: 0 (OK)
## Model failed to converge with max|grad| = 0.00332225 (tol = 0.002, component 1)

```

- Male participants less likely to recall character as female than non-male participants overall.
- No other interactions with participant gender significant.