

# Experiment 2: Supplementary Analyses

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3/29/2022

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## Setup

Load data and select columns used in model. See data/exp2\_data\_about.txt for more details.

```
d <- read.csv("../data/exp2_data.csv", stringsAsFactors=TRUE) %>%
  rename("Participant"="SubjID", "Item"="NameShown") %>%
  select(Participant, SubjGender, Condition, GenderRating, Item,
         Male, Female, Other)
str(d)
```

```
## 'data.frame':   9457 obs. of  8 variables:
## $ Participant : Factor w/ 1351 levels "R_06Tps0XX28Fe09j",...: 694 694 694 694 694 694 694 301 301 301 ...
## $ SubjGender  : Factor w/ 5 levels "female","genderqueer",...: 3 3 3 3 3 3 3 1 1 1 ...
## $ Condition   : Factor w/ 3 levels "first","full",...: 1 1 1 1 1 1 1 1 1 1 ...
## $ GenderRating: num  5.59 4.22 2.12 6.73 3.61 4.73 1.21 6.24 4.39 2.61 ...
## $ Item        : Factor w/ 105 levels "Ashley","Ashley Cook",...: 51 91 18 60 87 55 63 1 47 29 ...
## $ Male        : int   1 1 0 1 1 0 1 0 0 1 ...
## $ Female      : int   0 0 1 0 0 1 0 1 1 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 (4.15% of total responses) affects the pattern of results.

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

```
## [1] 392
```

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

```
## [1] 0.04145078
```

Exclude OTHER responses.

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

## Model 1: Condition w/o OTHER

Effect of Name Condition (first name, last name, full name) 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.

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

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##   Family: binomial   ( logit )
## Formula: Female ~ Condition + (1 | Participant) + (1 | Item)
##   Data: d.noOther
##
##           AIC          BIC    logLik deviance df.resid
##    8899.0     8934.6  -4444.5   8889.0     9060
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.8742 -0.4709 -0.3084  0.5478  4.7464
##
## Random effects:
##   Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.100    0.3163
## Item          (Intercept) 1.789    1.3376
## Number of obs: 9065, groups: Participant, 1321; Item, 105
##
## Fixed effects:
##
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -0.7936    0.1509  -5.261 1.43e-07 ***
## Conditionlast vs first/full    1.9098    0.3430   5.567 2.59e-08 ***
## Conditionfirst vs full      -0.2023    0.3451  -0.586  0.558
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) Cvfrs/
## Cndtnvfirst/ -0.170
## Cndtnfrstvf -0.362 -0.241
```

No differences.

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

Effects of Name Condition (first name, full name) and the first name's Gender Rating (centered, positive=more feminine) on the likelihood of a FEMALE response as opposed to a MALE response, with OTHER responses excluded. In Experiment 2, 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(Female ~ Condition * GenderRatingCentered +
                             (1|Participant) + (1|Item),
                             data=d.FF.noOther, family=binomial)
summary(m.namegender_other)

## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##   Family: binomial ( logit )
##   Formula: Female ~ Condition * GenderRatingCentered + (1 | Participant) +
##             (1 | Item)
##   Data: d.FF.noOther
##
##            AIC          BIC    logLik deviance df.resid
##    6559.7    6600.1   -3273.9   6547.7     6166
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.8717 -0.5959 -0.2364  0.6050  4.2845
##
## Random effects:
##   Groups      Name      Variance Std.Dev.
##   Participant (Intercept) 0.0268   0.1637
##   Item         (Intercept) 0.1459   0.3819
## Number of obs: 6172, groups: Participant, 897; Item, 83
##
## Fixed effects:
##
##                                     Estimate Std. Error z value
## (Intercept)                        -0.13756    0.05860  -2.348
## Conditionfirst vs full              -0.19127    0.11704  -1.634
## GenderRatingCentered                0.78486    0.03552  22.098
## Conditionfirst vs full:GenderRatingCentered -0.06500    0.06969  -0.933
##                                     Pr(>|z|)
## (Intercept)                        0.0189 *
## Conditionfirst vs full              0.1022
## GenderRatingCentered                <2e-16 ***
## Conditionfirst vs full:GenderRatingCentered 0.3509
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) Cndtvf GndrRC
## Cndtnfrstvf -0.348
## GndrRtngCnt -0.059 -0.012
## Cvfl1:GndRC -0.010 -0.053 -0.299

```

Compared to the main analysis including OTHER responses, the intercept has a larger p-value, the difference between the First and Full Name conditions is no longer trending, and the Name Gender Rating is the same.

## 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(Female ~ 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:
##   Female ~ Condition * GenderRatingCentered + Condition * GenderRatingSquared +
##   (1 | Participant) + (1 | Item)
##   Data: d.FF
##
##           AIC          BIC    logLik deviance df.resid
##    6784.5     6838.5   -3384.2   6768.5     6313
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.9223 -0.6307 -0.2334  0.6387  4.5272
##
## Random effects:
##   Groups       Name             Variance Std.Dev.
##   Participant (Intercept) 0.1278     0.3575
##   Item          (Intercept) 0.1503     0.3877
## Number of obs: 6321, groups: Participant, 903; Item, 83
##
## Fixed effects:
##
##              Estimate Std. Error z value
## (Intercept)    -0.16962    0.08275  -2.050
## Conditionfirst vs full    -0.25725    0.16551  -1.554
## GenderRatingCentered      0.77974    0.03630  21.481
## GenderRatingSquared     -0.01045    0.02004  -0.521
## Conditionfirst vs full:GenderRatingCentered -0.06953    0.07121  -0.976
## Conditionfirst vs full:GenderRatingSquared  0.01019    0.04004   0.254
##
##              Pr(>|z|)
## (Intercept)      0.0404 *
## Conditionfirst vs full    0.1201
## GenderRatingCentered    <2e-16 ***
## GenderRatingSquared      0.6020
## Conditionfirst vs full:GenderRatingCentered  0.3289
## Conditionfirst vs full:GenderRatingSquared  0.7992
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Correlation of Fixed Effects:
##          (Intr) Cndtvf GndrRC GndrRS Cvf:GRC
## Cndtnfrstvf -0.380
## GndrRtngCnt -0.166  0.054
## GndrRtngSqr -0.688  0.262  0.170
## Cvf11:GndRC  0.059 -0.166 -0.314 -0.088
## Cvf11:GndRS  0.262 -0.689 -0.084 -0.339  0.177
```

## 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.

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

SubjGender	total
female	566
genderqueer	1
male	694
N/A	88
non-binary	2

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	569
1	694

Summary of responses by condition and participant gender.

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

```

    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(Female_MaleOther = Female / (Male+Other),
         Female_Male = Female / Male) %>%
  rename("ParticipantGender"="SubjGenderMale")
d.gender.count_responses$ParticipantGender %<>% recode("0"="Non-male", "1"="Male")

kable(d.gender.count_responses)

```

Condition	ParticipantGender	Female	Male	Other	Female_MaleOther	Female_Male
first	Non-male	684	609	30	1.0704225	1.1231527
first	Male	780	847	18	0.9017341	0.9208973
full	Non-male	595	609	49	0.9042553	0.9770115
full	Male	724	893	42	0.7743316	0.8107503
last	Non-male	170	1145	92	0.1374293	0.1484716
last	Male	210	1223	121	0.1562500	0.1717089

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

```
m.cond_subjgender <- glmer(Female ~ 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: Female ~ Condition * SubjGenderMale + (1 | Participant) + (1 |
## Item)
## Data: d.gender
##
##      AIC      BIC    logLik deviance df.resid
##  8545.3   8602.0  -4264.7   8529.3     8833
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.6710 -0.4651 -0.2896  0.5581  4.7148
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.195    0.4416
## Item          (Intercept) 1.832    1.3535
## Number of obs: 8841, groups: Participant, 1263; Item, 105
##
## Fixed effects:
##                                     Estimate Std. Error z value
## (Intercept)                       -0.87078    0.15305  -5.689
## Conditionlast vs first/full         2.00537    0.34799   5.763
## Conditionfirst vs full              -0.20540    0.35009  -0.587
## SubjGenderMaleNM_M                 -0.12519    0.06240  -2.006
## Conditionlast vs first/full:SubjGenderMaleNM_M -0.39906    0.14326  -2.786
## Conditionfirst vs full:SubjGenderMaleNM_M    0.06204    0.14105   0.440
##                                     Pr(>|z|)
## (Intercept)                       1.28e-08 ***
## Conditionlast vs first/full         8.28e-09 ***
## Conditionfirst vs full              0.55741
## SubjGenderMaleNM_M                 0.04482 *
## Conditionlast vs first/full:SubjGenderMaleNM_M 0.00534 **
## Conditionfirst vs full:SubjGenderMaleNM_M    0.66002
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) Cvfrs/ Cndtvf SGMNM_ Cvf/:S
## Cndtnvfrst/ -0.169
## Cndtnfrstvf -0.359 -0.240
## SbjGndMNM_M -0.021  0.001 -0.001
## Cvf/:SGMNM_  0.003 -0.022 -0.001 -0.194
## Cvf:SGMNM_M -0.002 -0.001 -0.024 -0.002 -0.001
```

- Male participants are less likely to recall the character as female overall, but this is not significant after correction for multiple comparisons.



- The interaction between Condition (Last vs. First + Full) and Participant Gender is significant.

## Interaction

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

```
d.gender$FFdummy = as.numeric(d.gender$Condition)
d.gender$FFdummy[d.gender$FFdummy == 1] <- 0
d.gender$FFdummy[d.gender$FFdummy == 2] <- 0
d.gender$FFdummy[d.gender$FFdummy == 3] <- 1
with(d.gender, tapply(FFdummy, list(Condition), mean))

## first  full  last
##      0      0      1

m.cond_subjgender_FF <- glmer(Female ~
  FFdummy*SubjGenderMale + (1|Participant) + (1|Item),
  data=d.gender, family=binomial)
summary(m.cond_subjgender_FF)

## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: Female ~ FFdummy * SubjGenderMale + (1 | Participant) + (1 |
## Item)
## Data: d.gender
##
##      AIC      BIC   logLik deviance df.resid
##  8541.9   8584.4  -4264.9   8529.9     8835
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.7121 -0.4647 -0.2896  0.5561  4.7190
##
## Random effects:
## Groups      Name                Variance Std.Dev.
## Participant (Intercept) 0.1953    0.4419
## Item          (Intercept) 1.8379    1.3557
## Number of obs: 8841, groups: Participant, 1263; Item, 105
##
## Fixed effects:
##                                Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -0.25645    0.15463  -1.658 0.097228 .
## FFdummy                       -1.93803    0.33481  -5.788 7.11e-09 ***
## SubjGenderMaleNM_M             -0.25700    0.07058  -3.641 0.000271 ***
## FFdummy:SubjGenderMaleNM_M     0.39519    0.14182   2.787 0.005326 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) FFdmmy SGMNM_
## FFdummy      -0.461
```

```
## SbjGndMNM_M -0.028 0.015
## FFd:SGMNM_M 0.014 -0.023 -0.498
```

Then dummy code to get the participant gender effect just for Last Name condition.

```
d.gender$Ldummy = as.numeric(d.gender$Condition)
d.gender$Ldummy[d.gender$Ldummy == 1] <- 1
d.gender$Ldummy[d.gender$Ldummy == 2] <- 1
d.gender$Ldummy[d.gender$Ldummy == 3] <- 0
with(d.gender, tapply(Ldummy, list(Condition), mean))
```

```
## first full last
##      1      1      0
```

```
m.cond_subjgender_L <- glmer(Female ~
  Ldummy*SubjGenderMale + (1|Participant) + (1|Item),
  data=d.gender, family=binomial)
summary(m.cond_subjgender_L)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial (logit)
## Formula: Female ~ Ldummy * SubjGenderMale + (1 | Participant) + (1 | Item)
## Data: d.gender
##
##      AIC      BIC    logLik deviance df.resid
## 8541.9   8584.4 -4264.9   8529.9     8835
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.7121 -0.4647 -0.2896  0.5561  4.7190
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.1953   0.4419
## Item          (Intercept) 1.8379   1.3557
## Number of obs: 8841, groups: Participant, 1263; Item, 105
##
## Fixed effects:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -2.1944    0.2970  -7.388 1.49e-13 ***
## Ldummy             1.9380    0.3347   5.791 7.02e-09 ***
## SubjGenderMaleNM_M  0.1382    0.1230   1.124 0.26120
## Ldummy:SubjGenderMaleNM_M -0.3952    0.1418  -2.787 0.00532 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) Ldummy SGMNM_
## Ldummy      -0.887
## SbjGndMNM_M -0.020 0.018
## Ldm:SGMNM_M  0.019 -0.023 -0.867
```

- Beta for subj gender in First + Full: -0.25700
- Beta for subj gender in Last: 0.1382 NS

→ Male participants were less likely to recall the referent as female than non-male participants in the First and Full Name conditions. No participant gender difference in the Last Name condition.

## Model 5: 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. In Experiment 2, the Last Name condition does not include any instances of the gendered first name, so it is not included here.

```
m.cond_name_subjgender <- glmer(Female ~
  Condition * GenderRatingCentered * SubjGenderMale +
  (1|Participant) + (1|Item),
  data=d.FF.gender, family=binomial)
summary(m.cond_name_subjgender)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial (logit)
## Formula: Female ~ Condition * GenderRatingCentered * SubjGenderMale +
## (1 | Participant) + (1 | Item)
## Data: d.FF.gender
##
##      AIC      BIC    logLik deviance df.resid
##  6261.5   6328.3  -3120.7   6241.5     5870
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.3535 -0.6348 -0.2316  0.6346  4.4956
##
## Random effects:
##  Groups      Name      Variance Std.Dev.
## Participant (Intercept) 0.1147   0.3387
## Item          (Intercept) 0.1590   0.3987
## Number of obs: 5880, groups: Participant, 840; Item, 83
##
## Fixed effects:
##                                     Estimate
## (Intercept)                        -0.18617
## Conditionfirst vs full              -0.20509
## GenderRatingCentered                0.80851
## SubjGenderMaleNM_M                 -0.21835
## Conditionfirst vs full:GenderRatingCentered -0.06485
## Conditionfirst vs full:SubjGenderMaleNM_M  0.10276
## GenderRatingCentered:SubjGenderMaleNM_M -0.15373
## Conditionfirst vs full:GenderRatingCentered:SubjGenderMaleNM_M -0.12900
##                                     Std. Error
## (Intercept)                        0.06211
## Conditionfirst vs full              0.12411
```

```

## GenderRatingCentered 0.03749
## SubjGenderMaleNM_M 0.06894
## Conditionfirst vs full:GenderRatingCentered 0.07337
## Conditionfirst vs full:SubjGenderMaleNM_M 0.13780
## GenderRatingCentered:SubjGenderMaleNM_M 0.04501
## Conditionfirst vs full:GenderRatingCentered:SubjGenderMaleNM_M 0.08998
## z value Pr(>|z|)
## (Intercept) -2.997 0.002724
## Conditionfirst vs full -1.652 0.098450
## GenderRatingCentered 21.566 < 2e-16
## SubjGenderMaleNM_M -3.167 0.001539
## Conditionfirst vs full:GenderRatingCentered -0.884 0.376742
## Conditionfirst vs full:SubjGenderMaleNM_M 0.746 0.455840
## GenderRatingCentered:SubjGenderMaleNM_M -3.415 0.000637
## Conditionfirst vs full:GenderRatingCentered:SubjGenderMaleNM_M -1.434 0.151669
##
## (Intercept) **
## Conditionfirst vs full .
## GenderRatingCentered ***
## SubjGenderMaleNM_M **
## Conditionfirst vs full:GenderRatingCentered
## Conditionfirst vs full:SubjGenderMaleNM_M
## GenderRatingCentered:SubjGenderMaleNM_M ***
## Conditionfirst vs full:GenderRatingCentered:SubjGenderMaleNM_M
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) Cndtvf GndrRC SGMNM_ Cvf1:GRC Cvf:SG GRC:SG
## Cndtnfrstvf -0.334
## GndrRtngCnt -0.064 -0.013
## SbjGndMNM_M -0.090 -0.018 -0.006
## Cvf11:GndRC -0.010 -0.057 -0.283 0.020
## Cvf:SGMNM_M -0.019 -0.092 0.021 0.010 0.001
## GRC:SGMNM_M -0.007 0.023 -0.145 -0.133 -0.035 -0.034
## Cvf:GRC:SGM 0.023 -0.008 -0.036 -0.034 -0.142 -0.134 -0.004

```

- Male participants are less likely to recall the character as female overall. This matches the results of the interaction in the condition-only model.
- The interaction between participant gender and first name gender rating is significant. Smaller effect of name gender rating in male participants.
- Interaction with Condition, three-way interaction with Name Gender and Condition n.s.