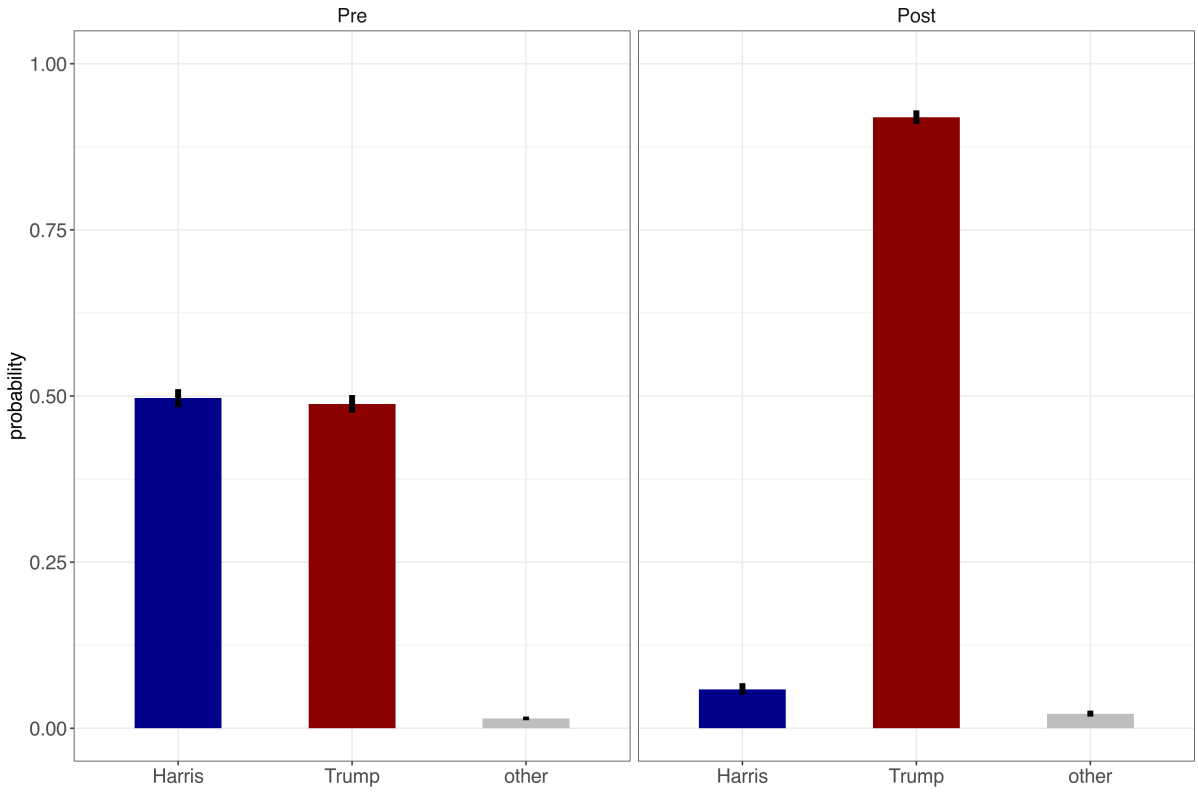
# Pre- and post-election EDA

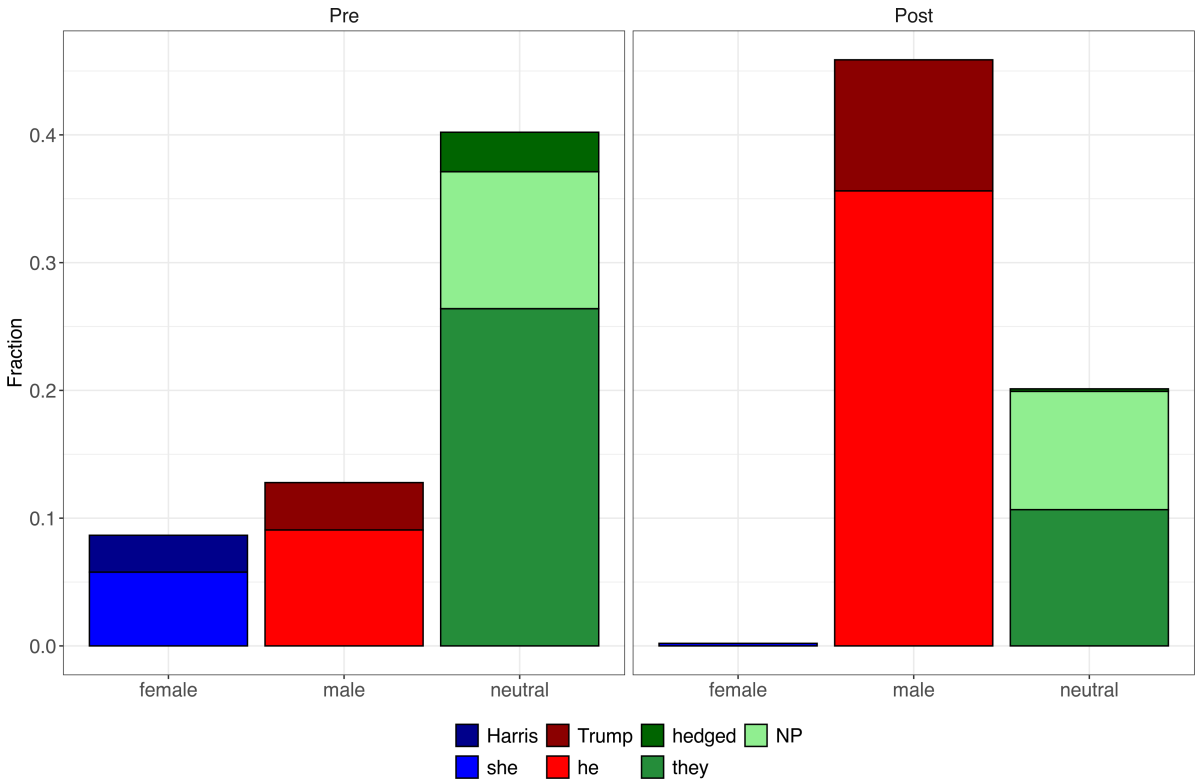
## Setup and read in data

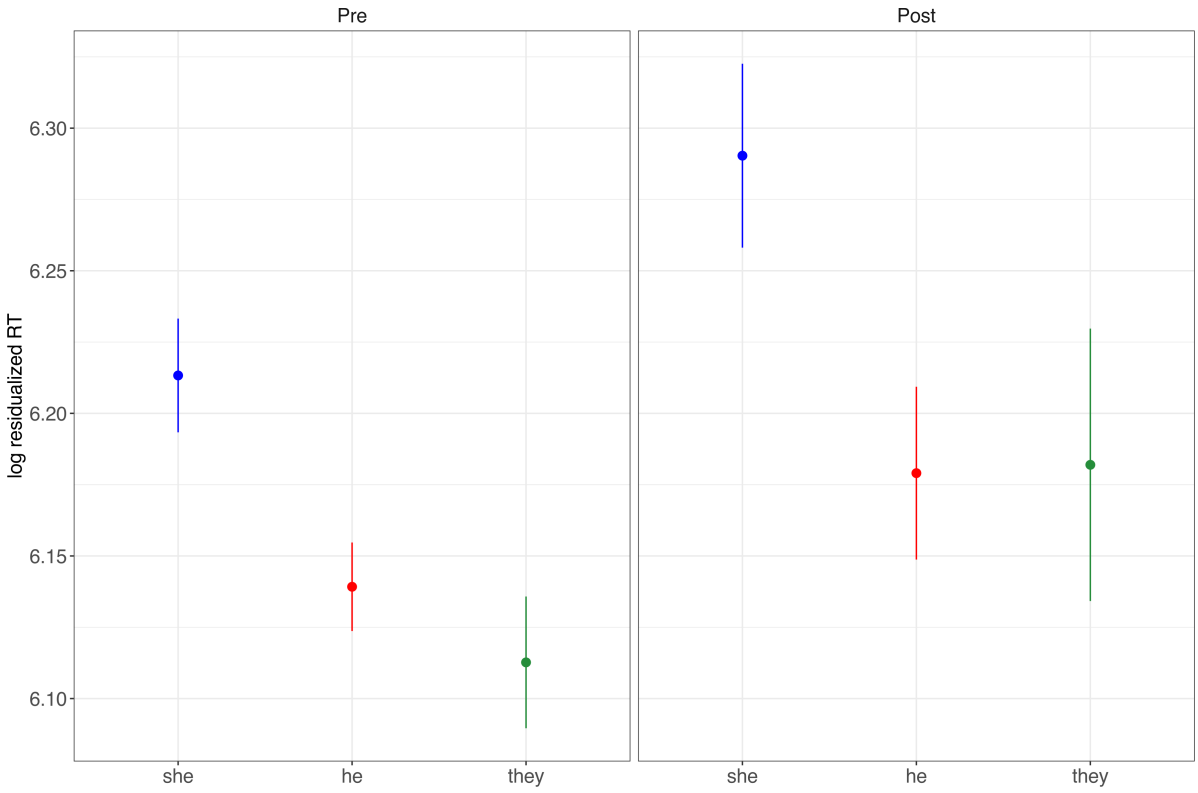
## HSP abstract

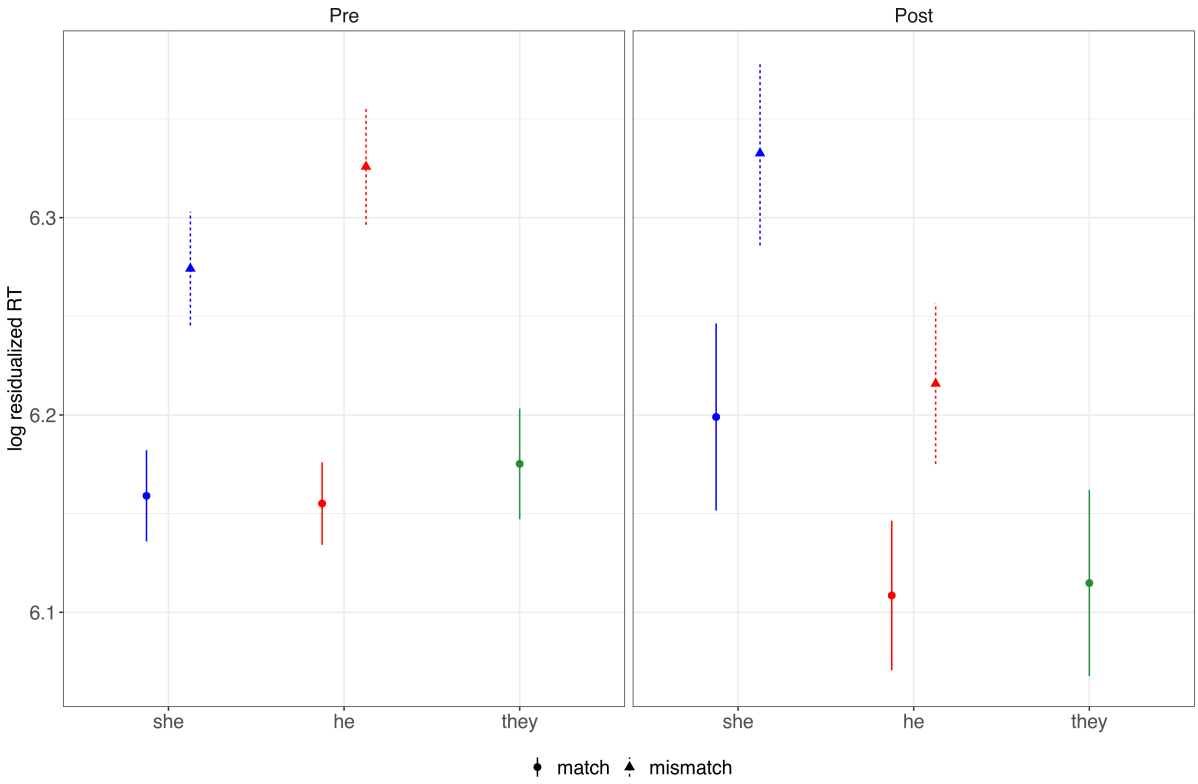
```
# A tibble: 12 x 3
# Groups:   condition [6]
   condition   batch     n
   <chr>       <fct> <int>
 1 cloze-event pre     333
 2 cloze-event post    354
 3 event-cloze pre     161
 4 event-cloze post    155
 5 event-maze  pre     102
 6 event-maze  post     99
 7 event-spr   pre     163
 8 event-spr   post    151
 9 maze-event  pre     189
10 maze-event  post    181
11 spr-event   pre     331
12 spr-event   post    333
```

```
# A tibble: 2 x 2
  batch     n
  <fct> <int>
1 pre     494
2 post    484
```


Pre
Post
probability
1.00
0.75
0.50
0.25
0.00
Harris
Trump
other
Harris
Trump
other


Pre
Post
Fraction
0.0
0.1
0.2
0.3
0.4
female
male
neutral
female
male
neutral
Harris
Trump
hedged
NP
she
he
they


Pre
Post
log residualized RT
6.30
6.25
6.20
6.15
6.10
she
he
they
she
he
they

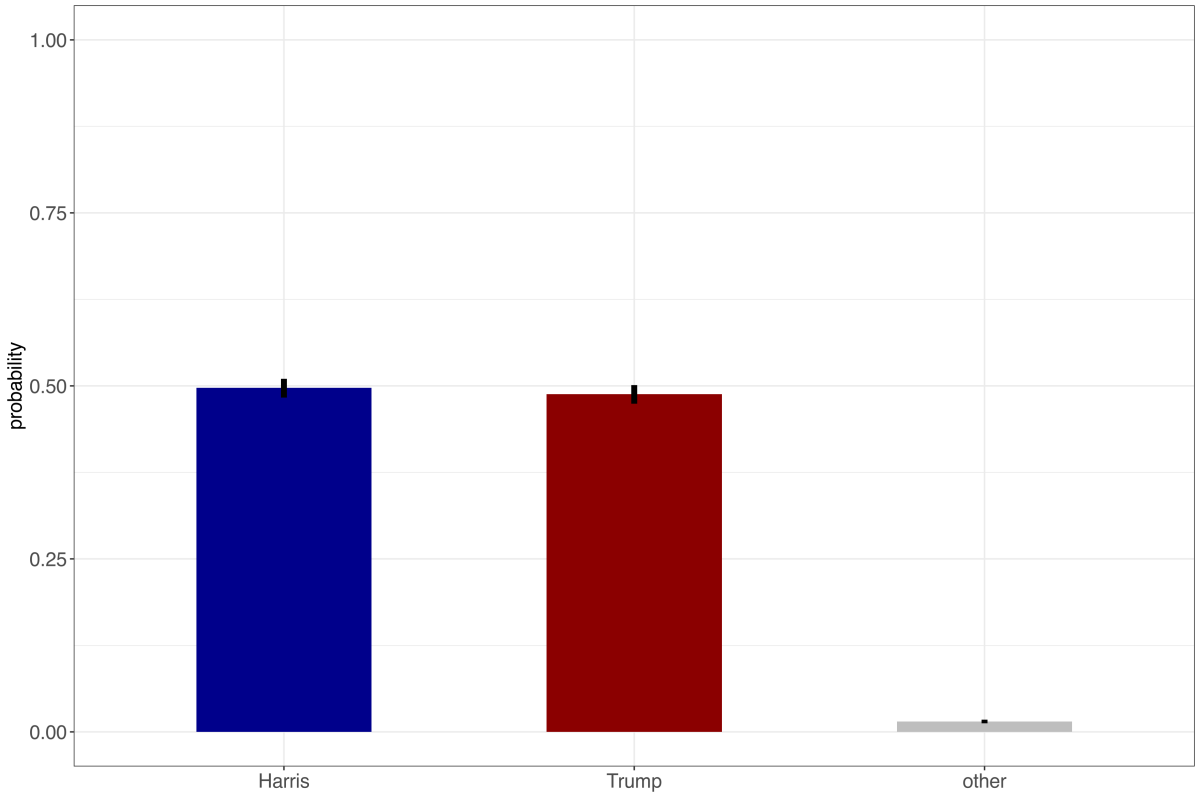


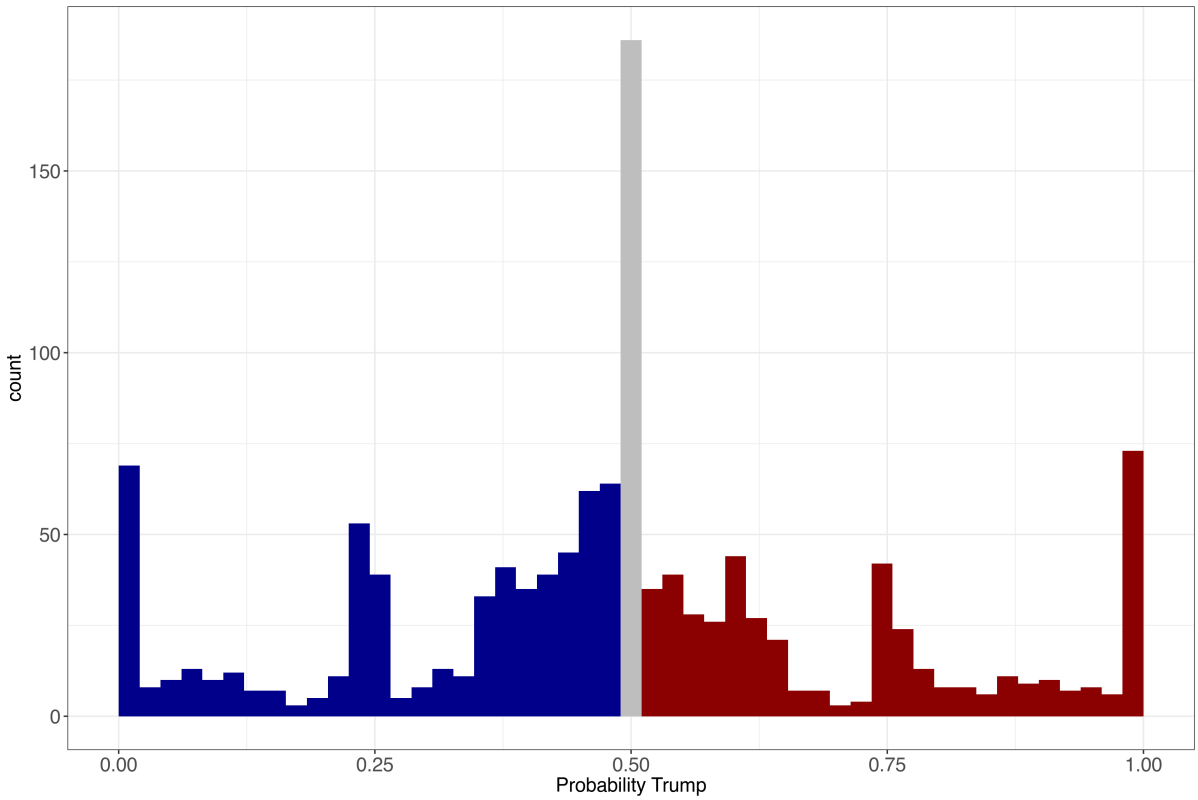

## HSP poster

Need only run the `setup` and `read` chunks before below.

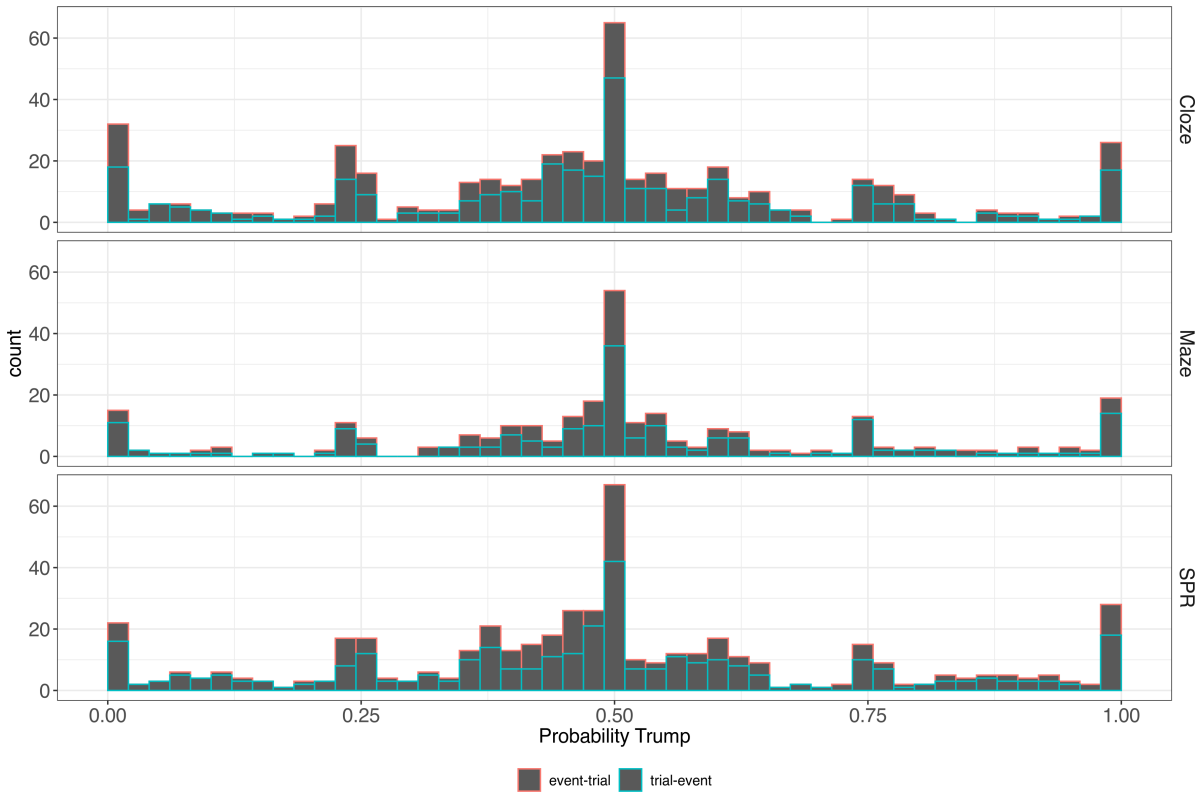
```
# A tibble: 12 x 4
   batch task  condition       n
   <fct> <fct> <chr>       <int>
 1 pre   Cloze cloze-event   333
 2 pre   Cloze event-cloze   161
 3 pre   Maze  event-maze    102
 4 pre   Maze  maze-event    189
 5 pre   SPR   event-spr     163
 6 pre   SPR   spr-event     331
 7 post  Cloze cloze-event   354
 8 post  Cloze event-cloze   155
 9 post  Maze  event-maze     99
10 post  Maze  maze-event    181
11 post  SPR   event-spr     151
12 post  SPR   spr-event     333
```

```
------------- Batch: pre-election

Event expectations
```



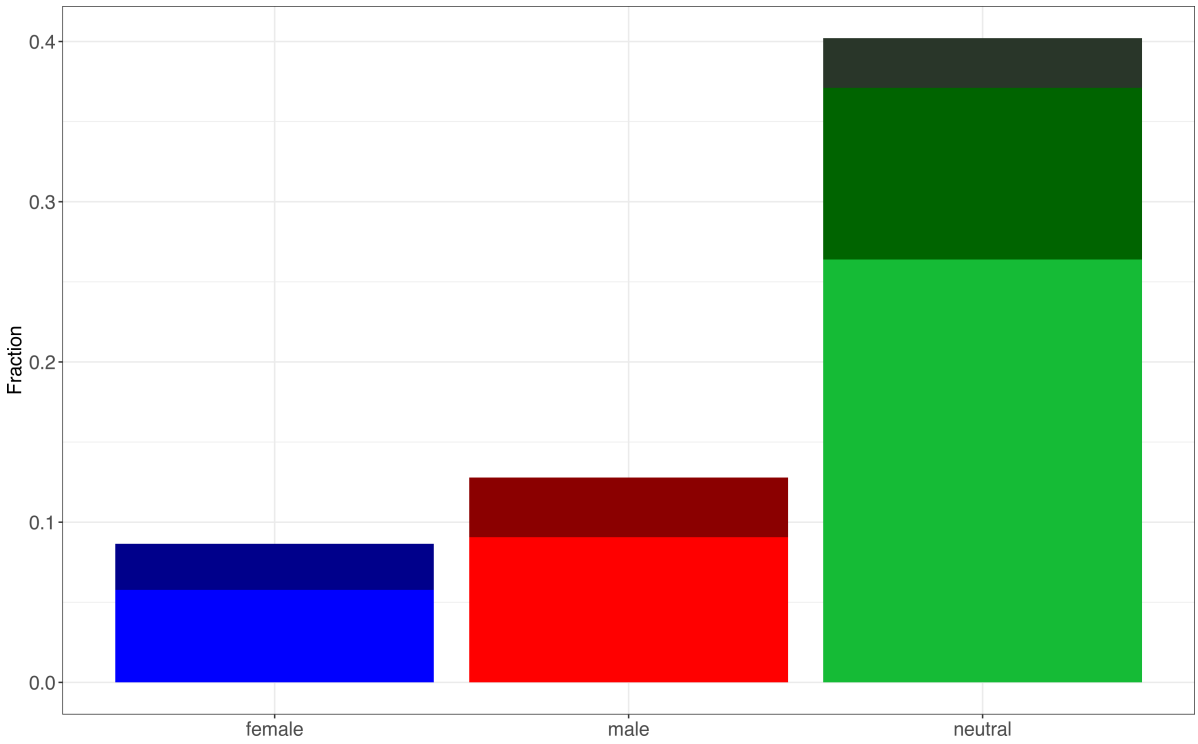



Event expectations histogram

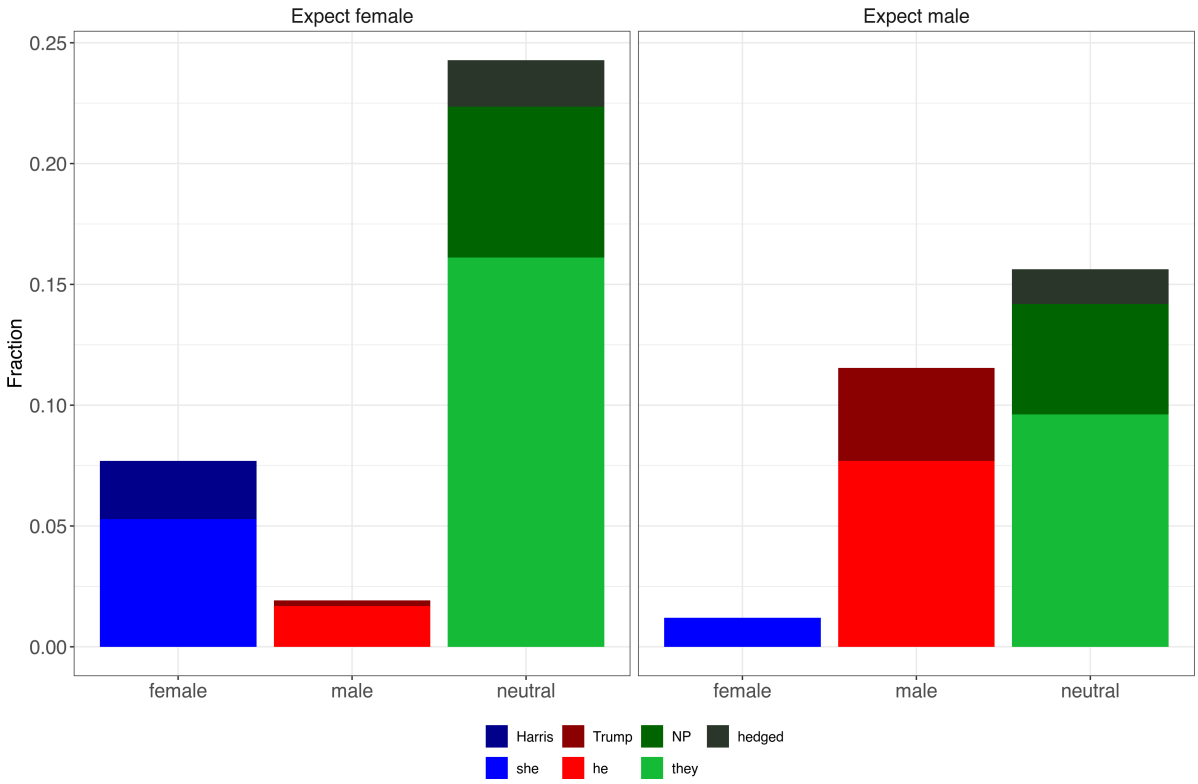



Event expectations histogram by task

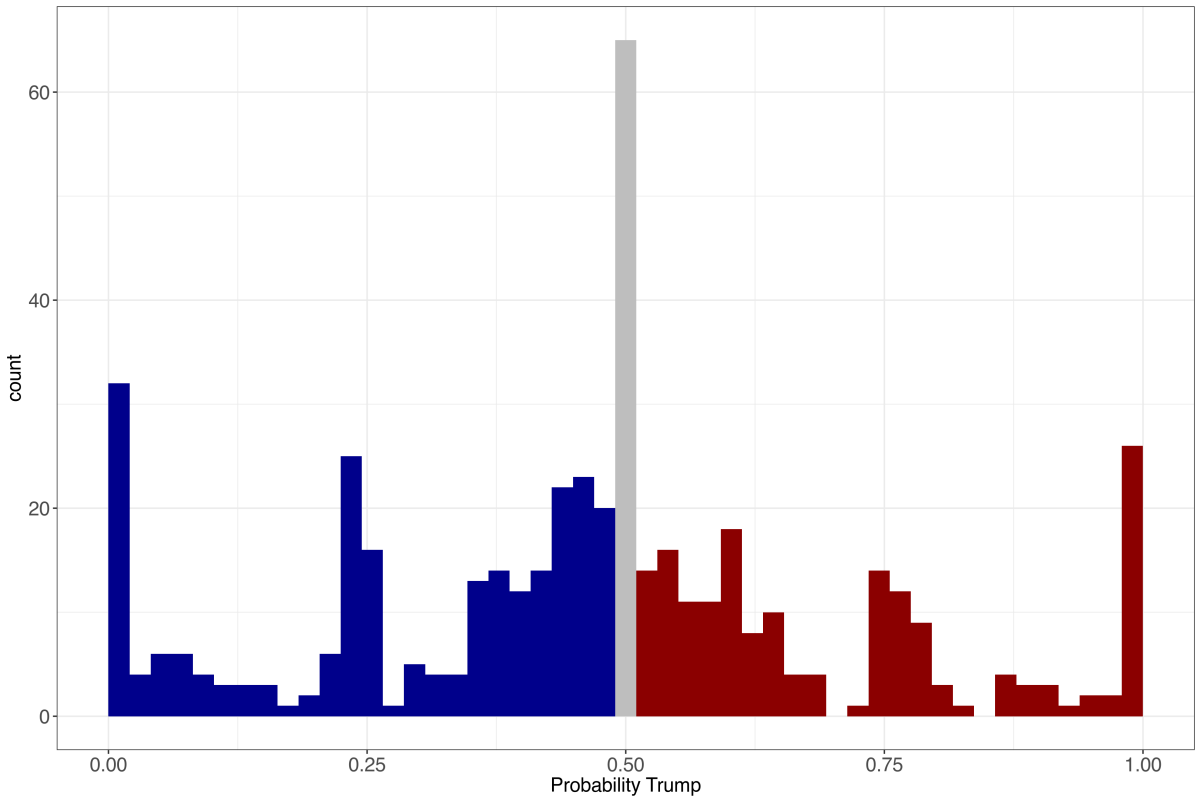
Cloze



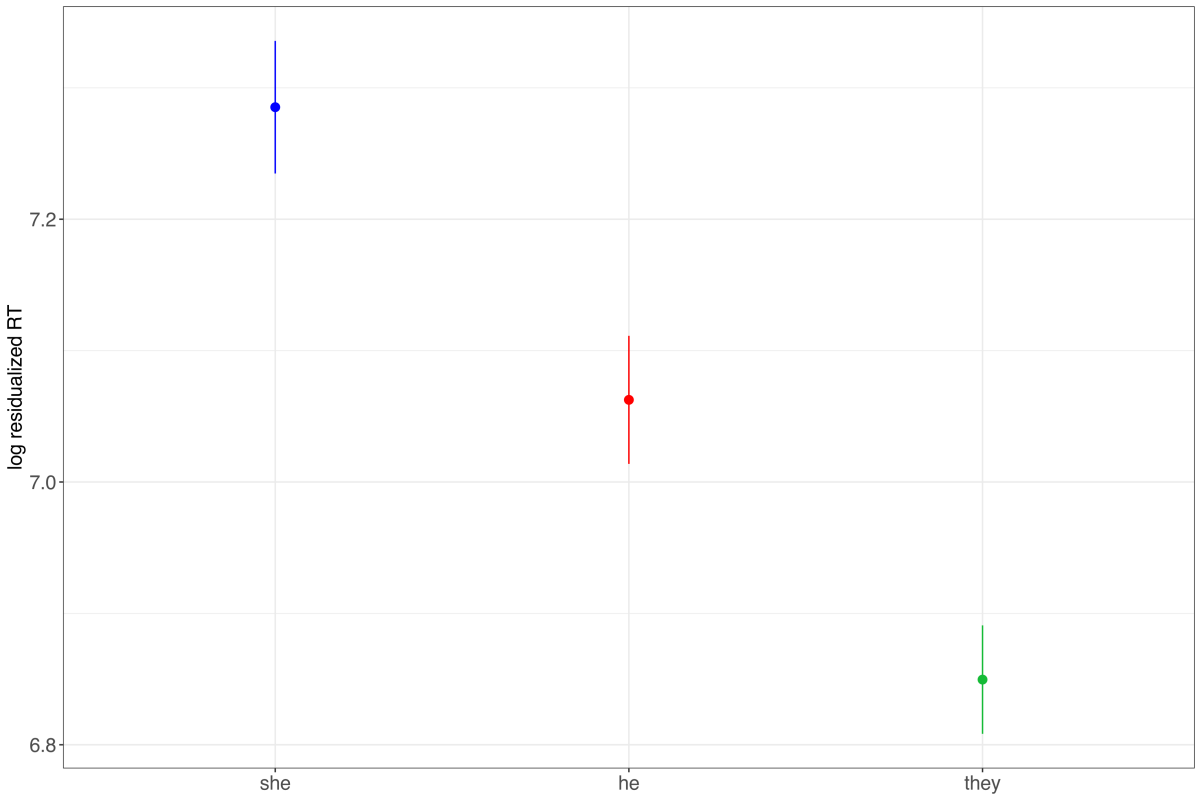

Cloze by expectations



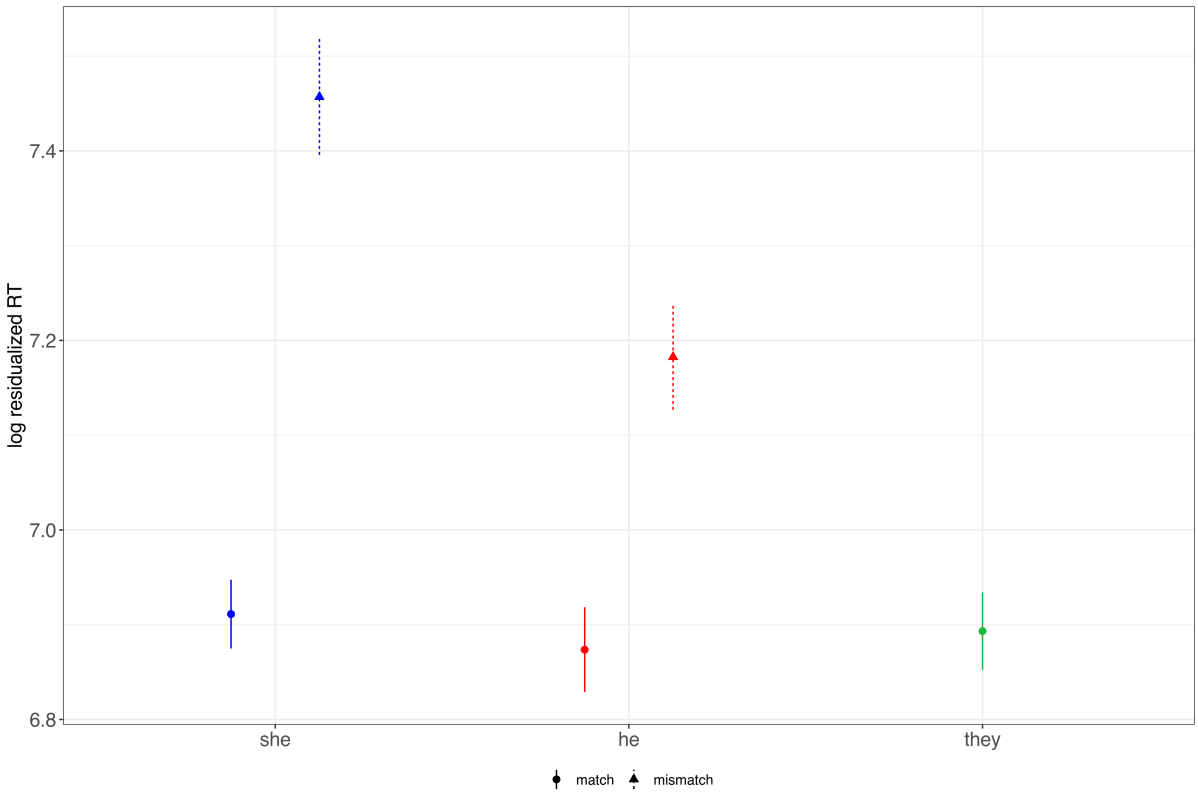

Cloze task expectations histogram



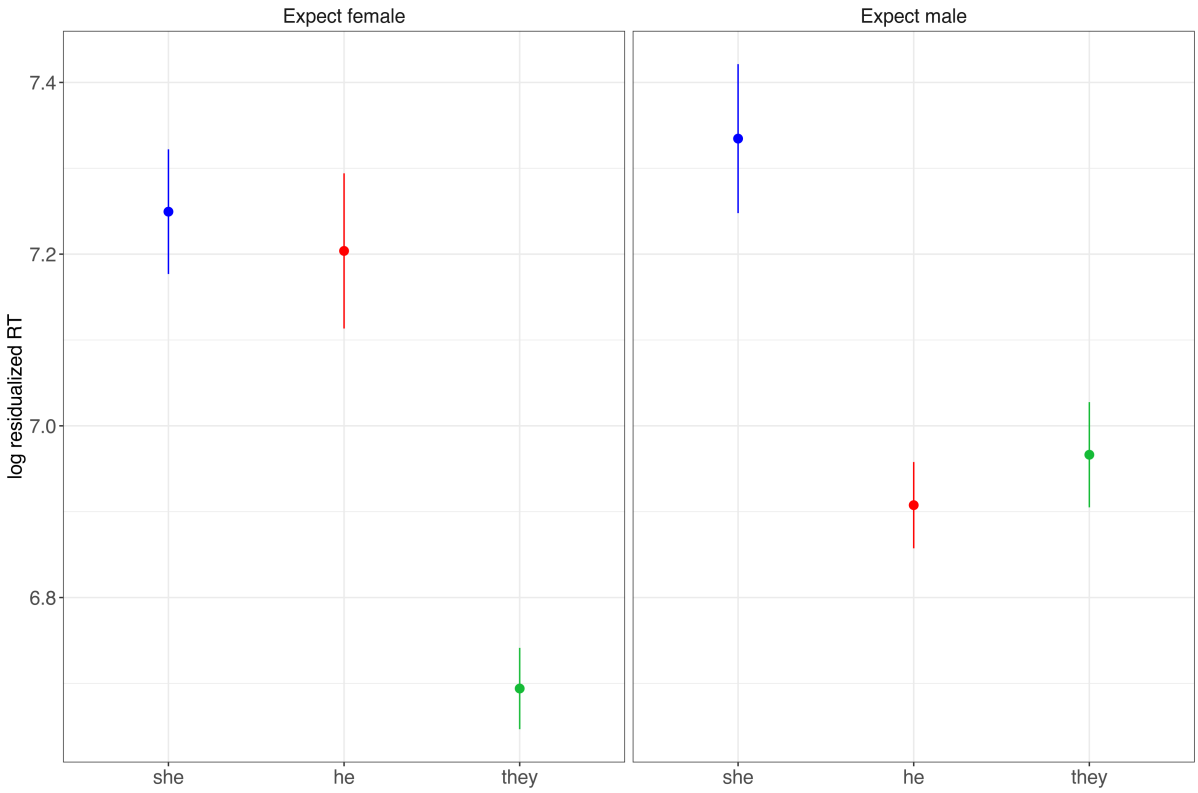

Maze



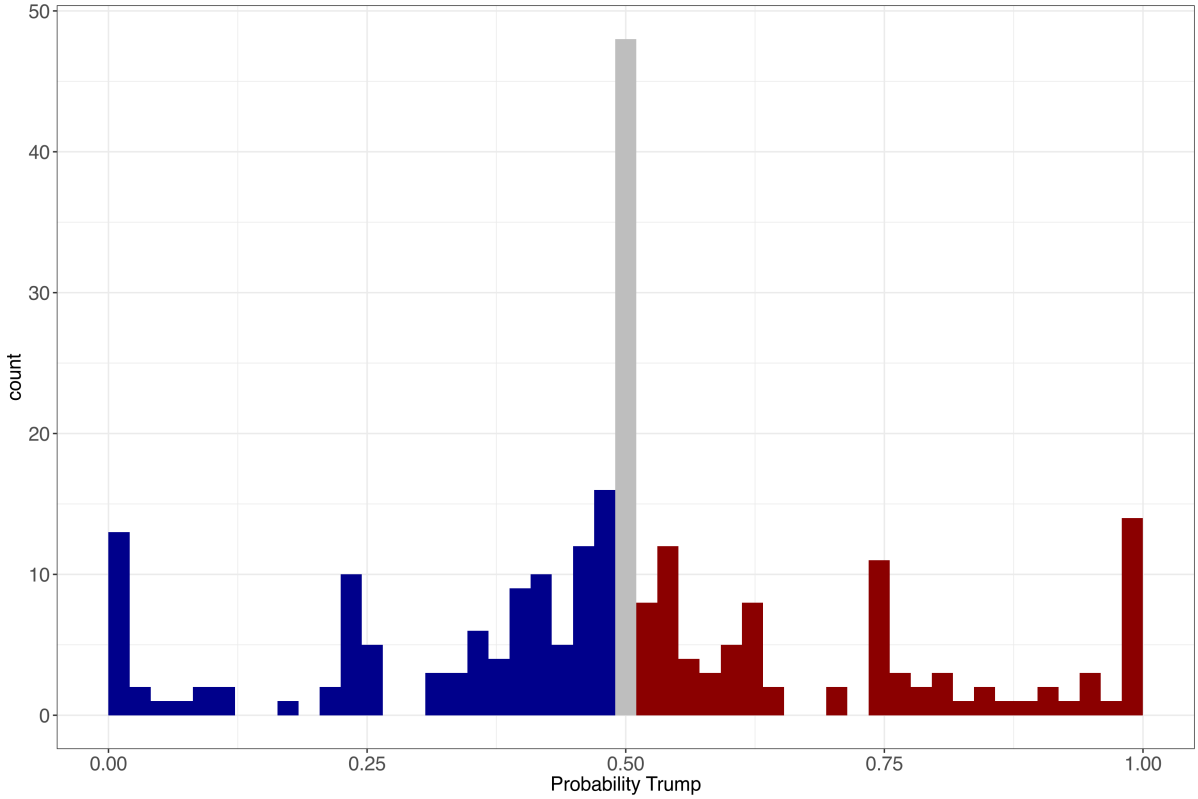

Maze second pronoun



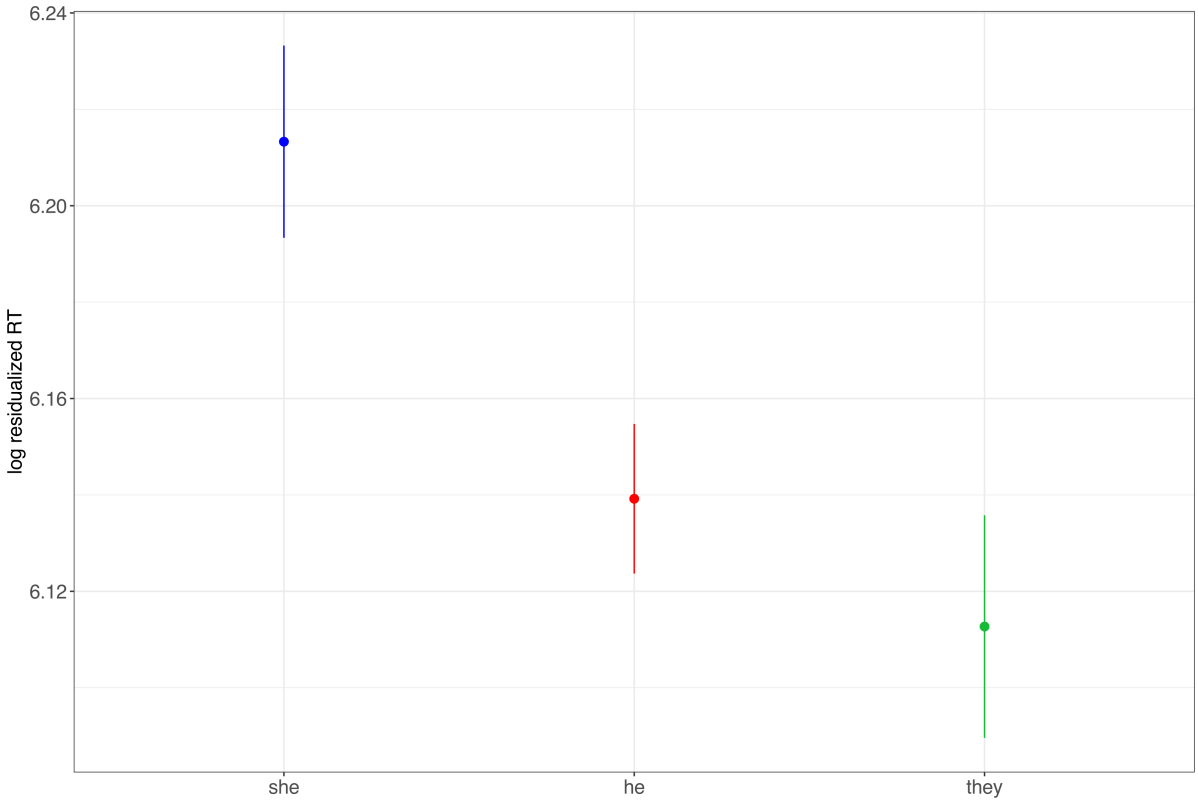

Maze by expectation



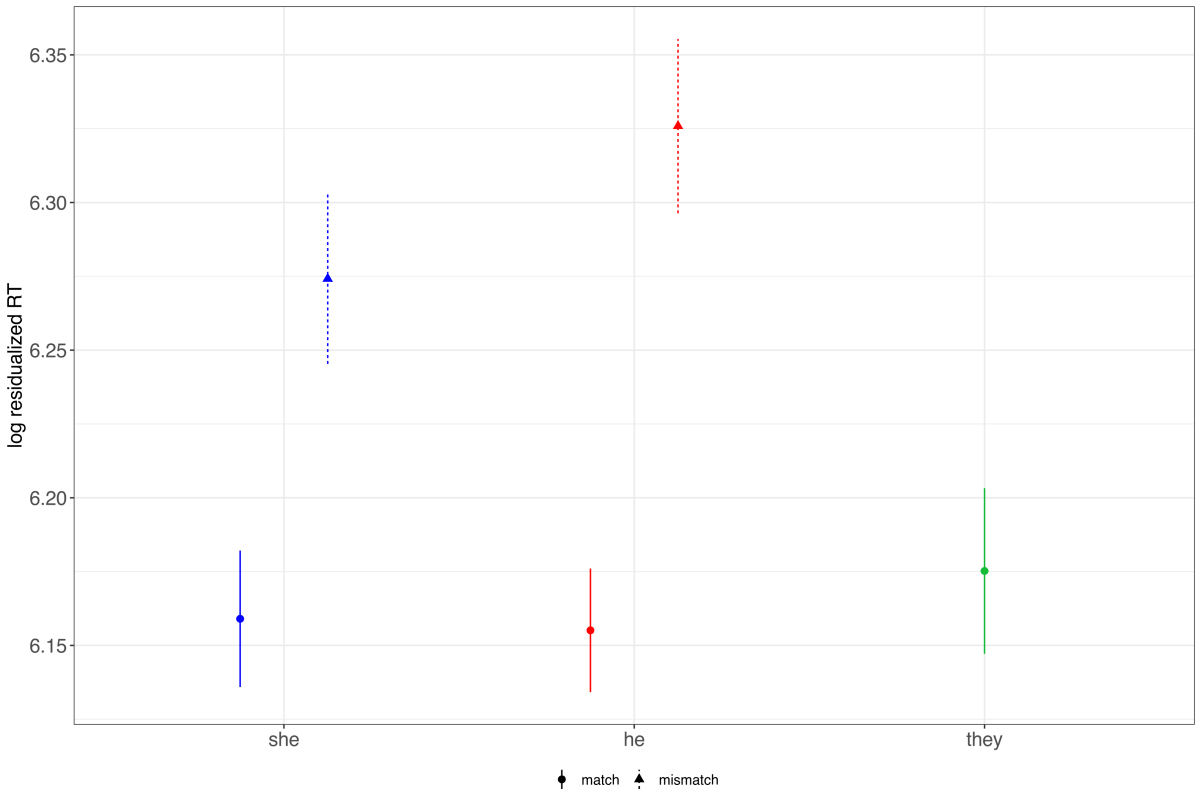

Maze task expectations histogram



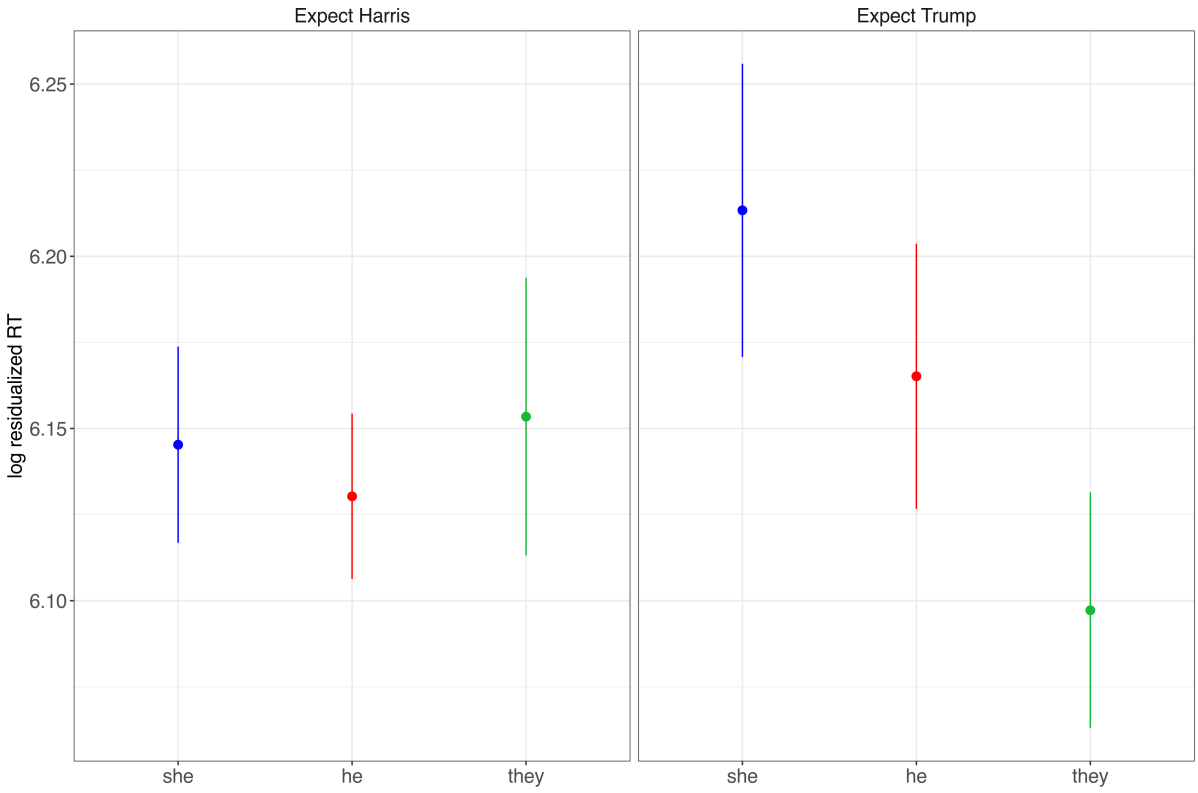

SPR



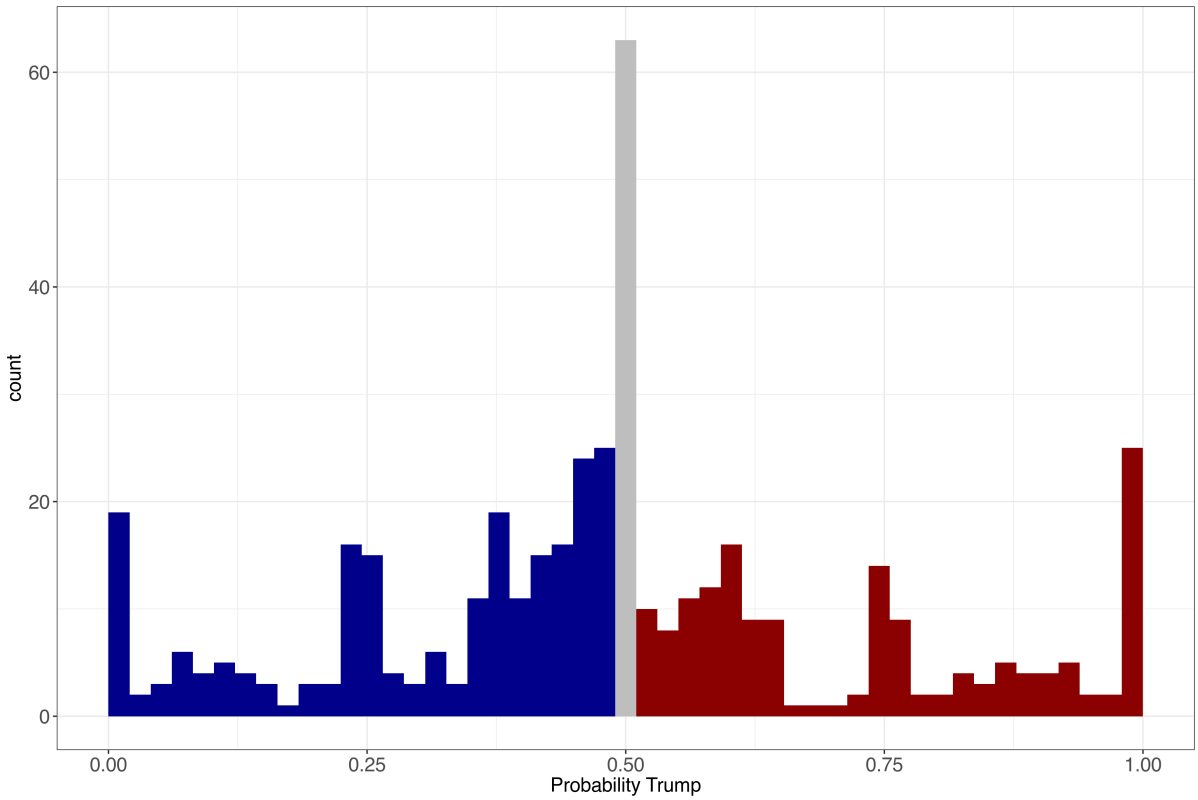

SPR second pronoun



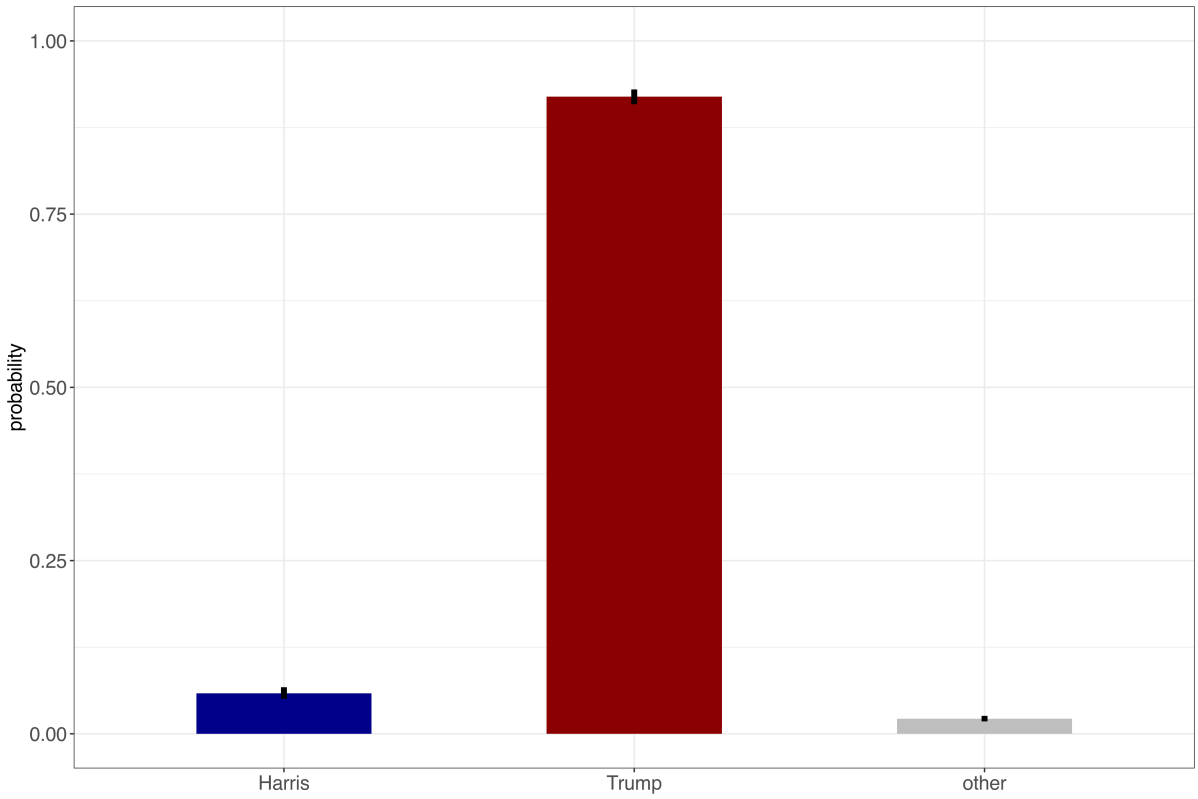

SPR by expectations

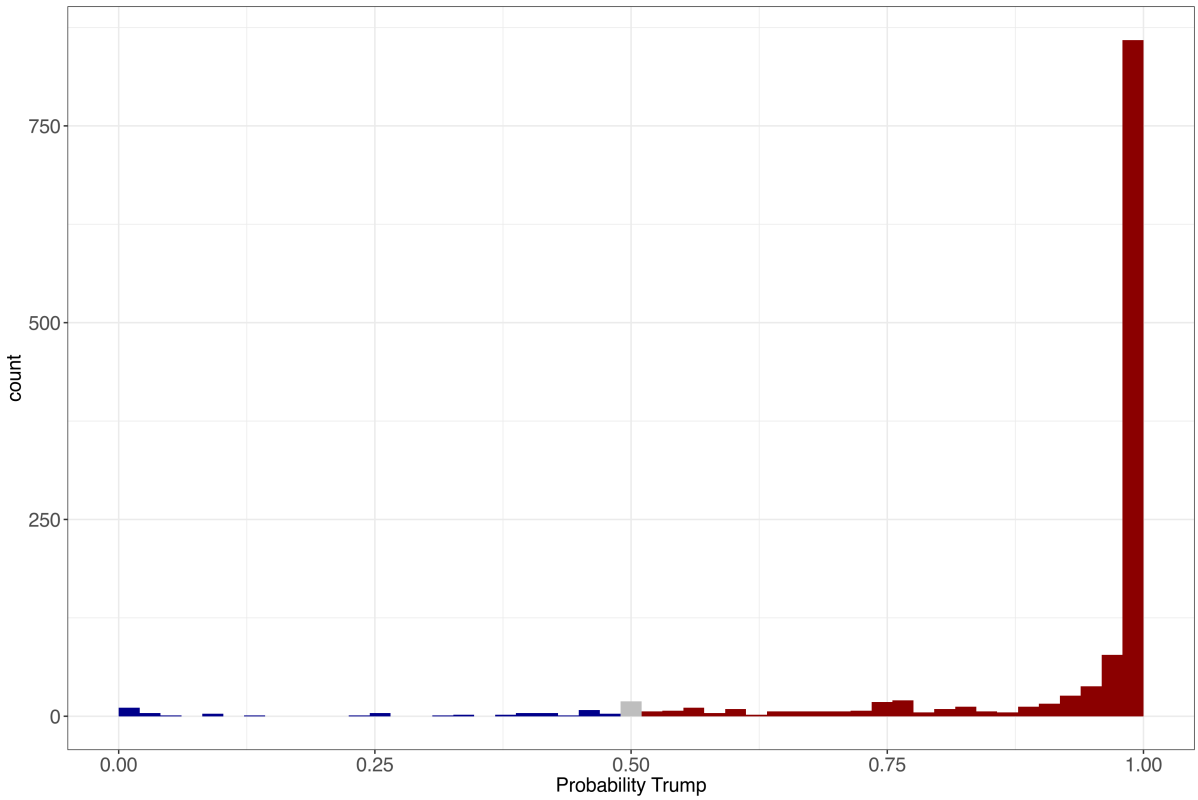



SPR expectations histogram
---------- Batch: post-election



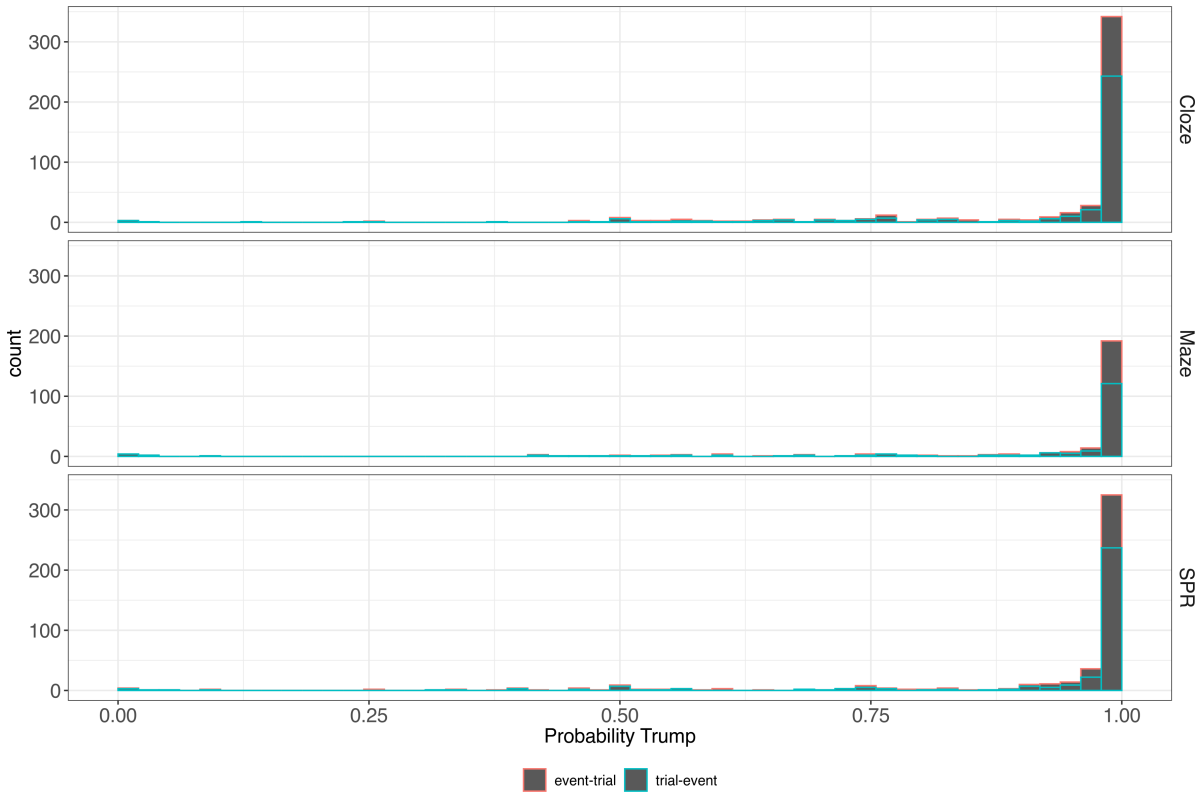

Event expectations


1.00
0.75
0.50
0.25
0.00
probability
Harris
Trump
other

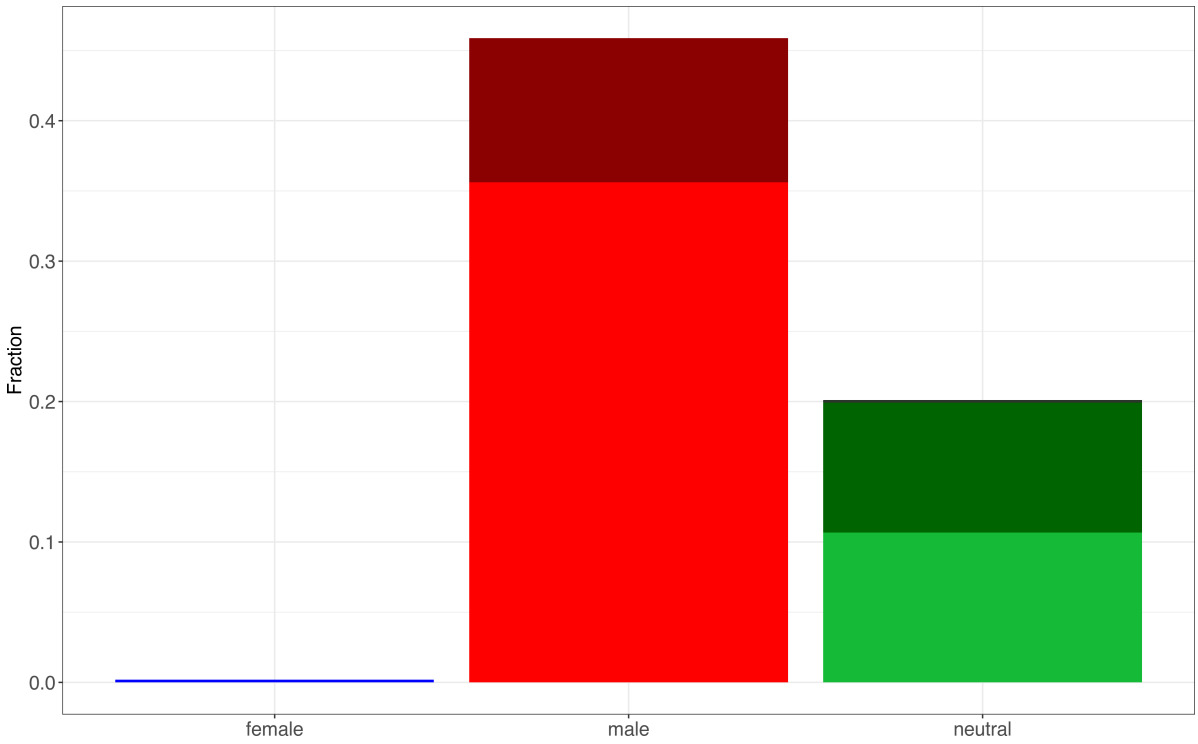



Event expectations histogram

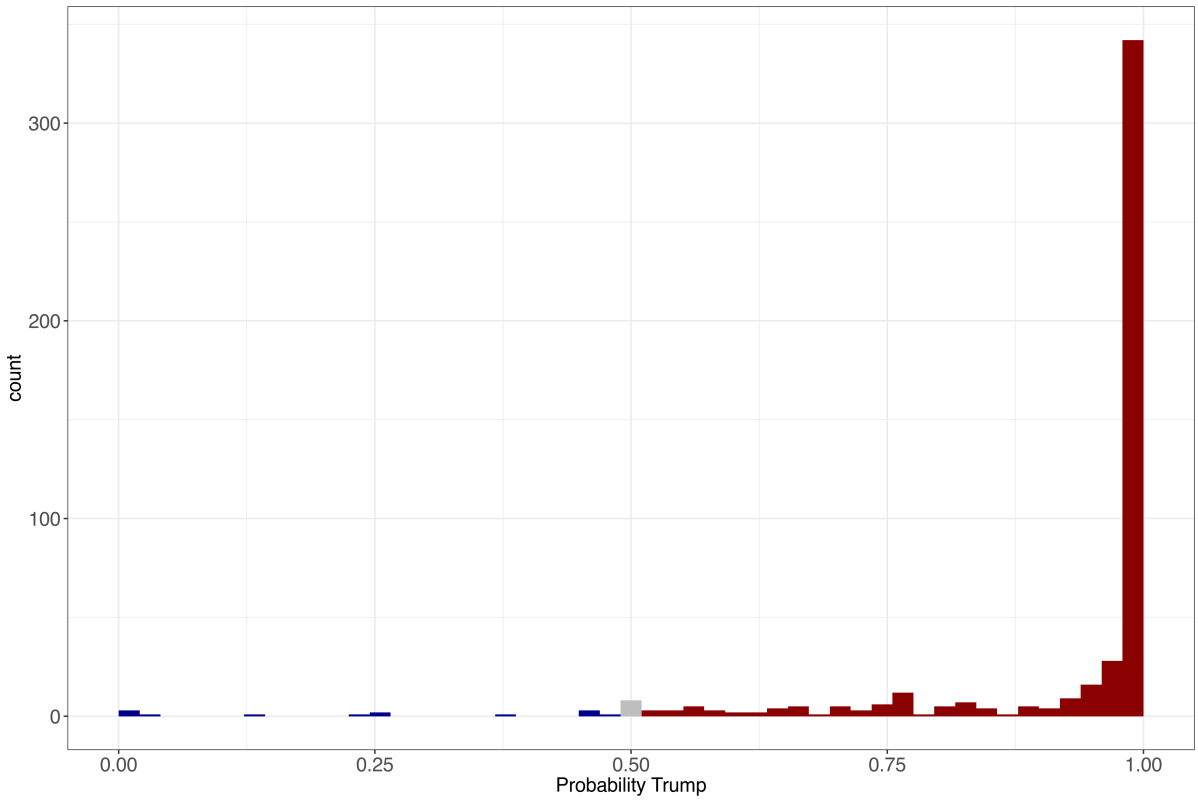
Event expectations histogram by task


300
200
100
0
Cloze
Maze
SPR
count
0.00
0.25
0.50
0.75
1.00
Probability Trump
event-trial
trial-event

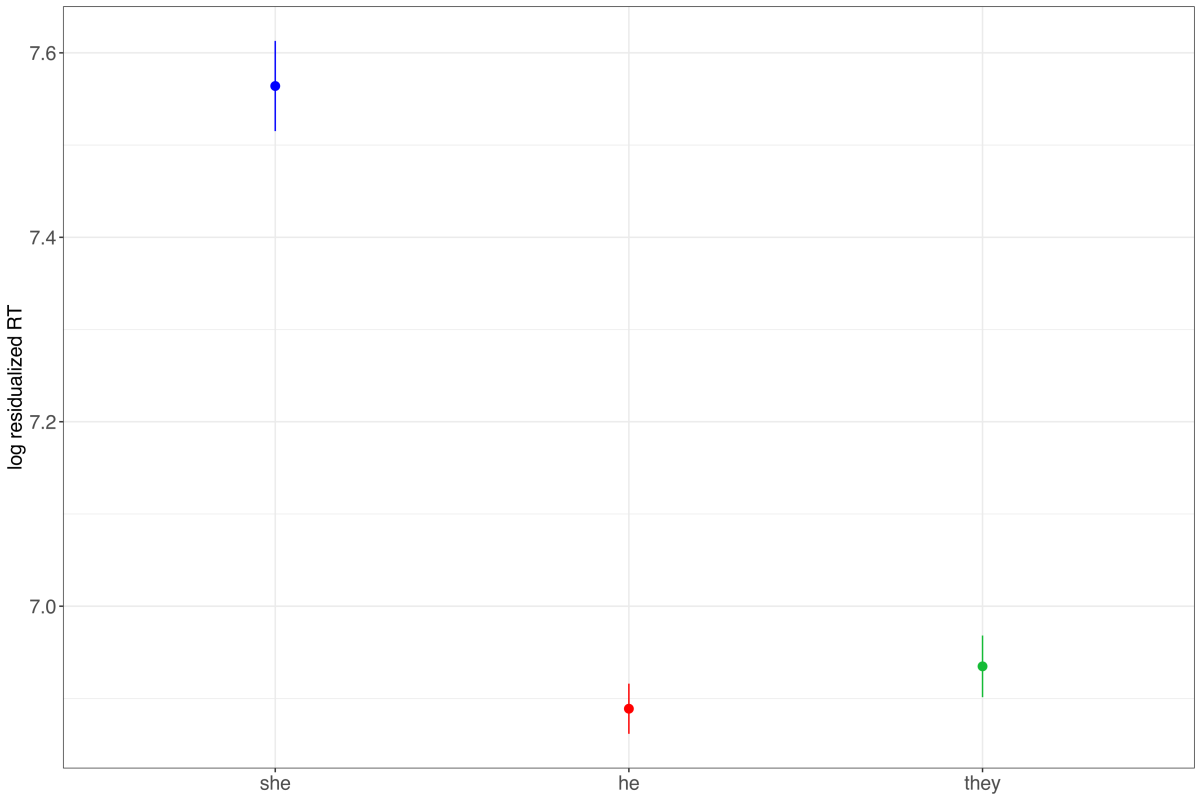
```
Cloze
```



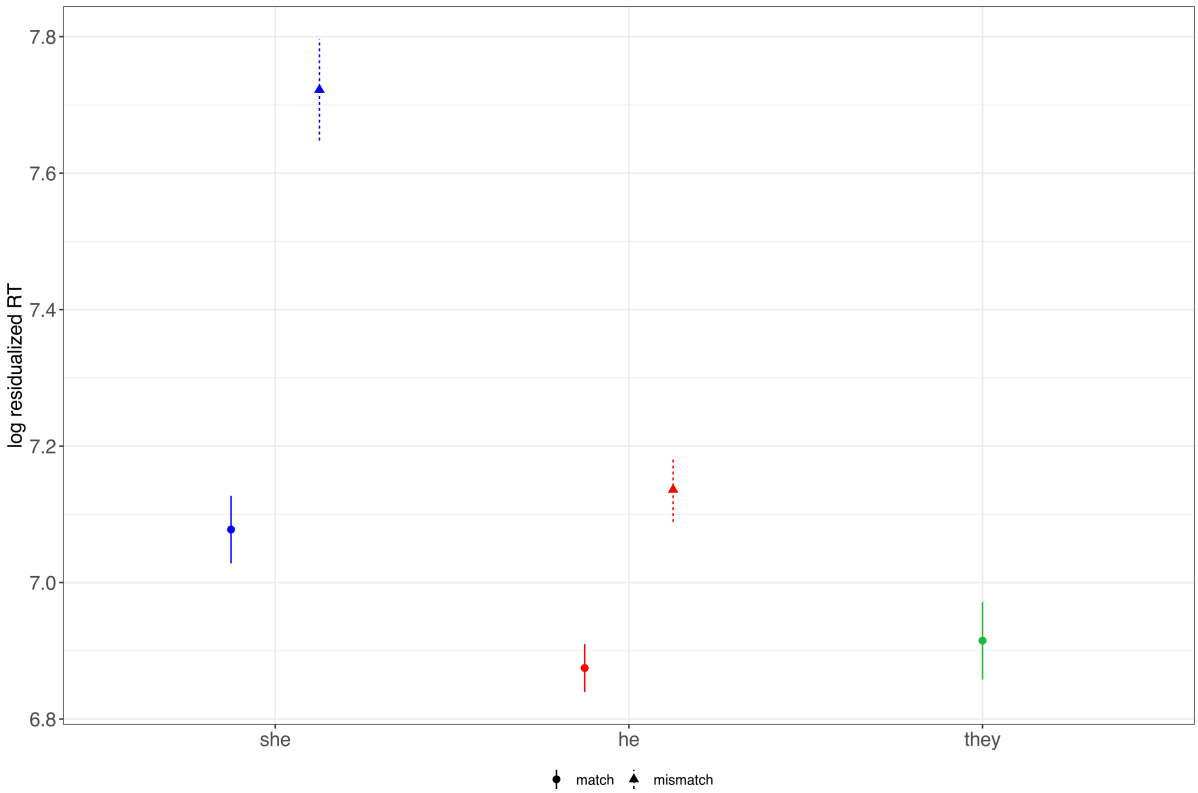

Cloze task expectations histogram



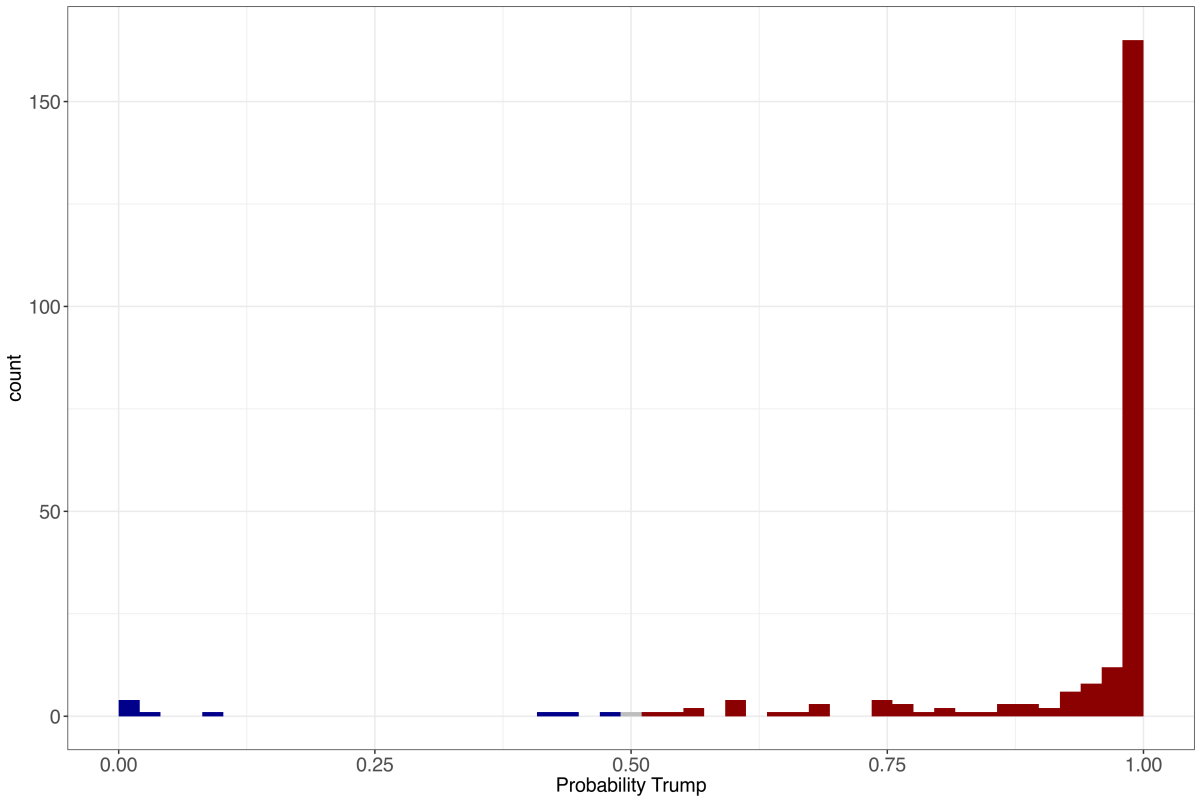

Maze



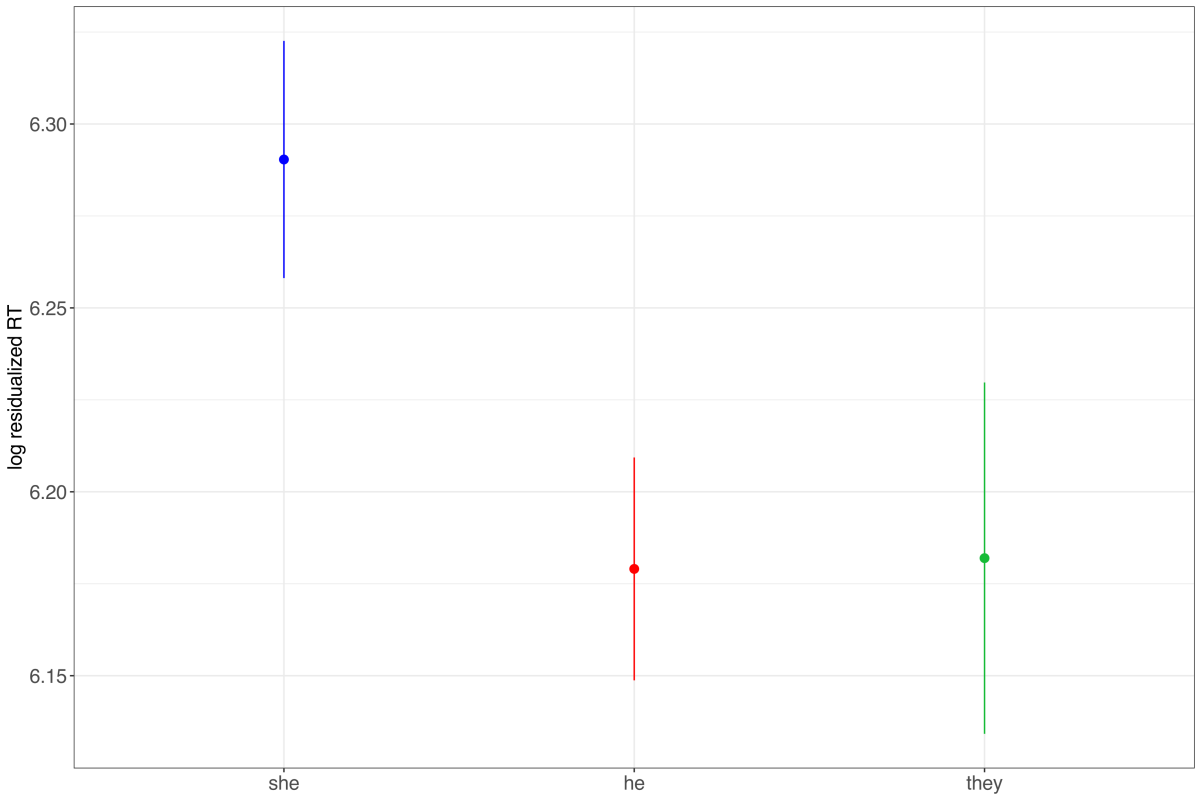

Maze second pronoun



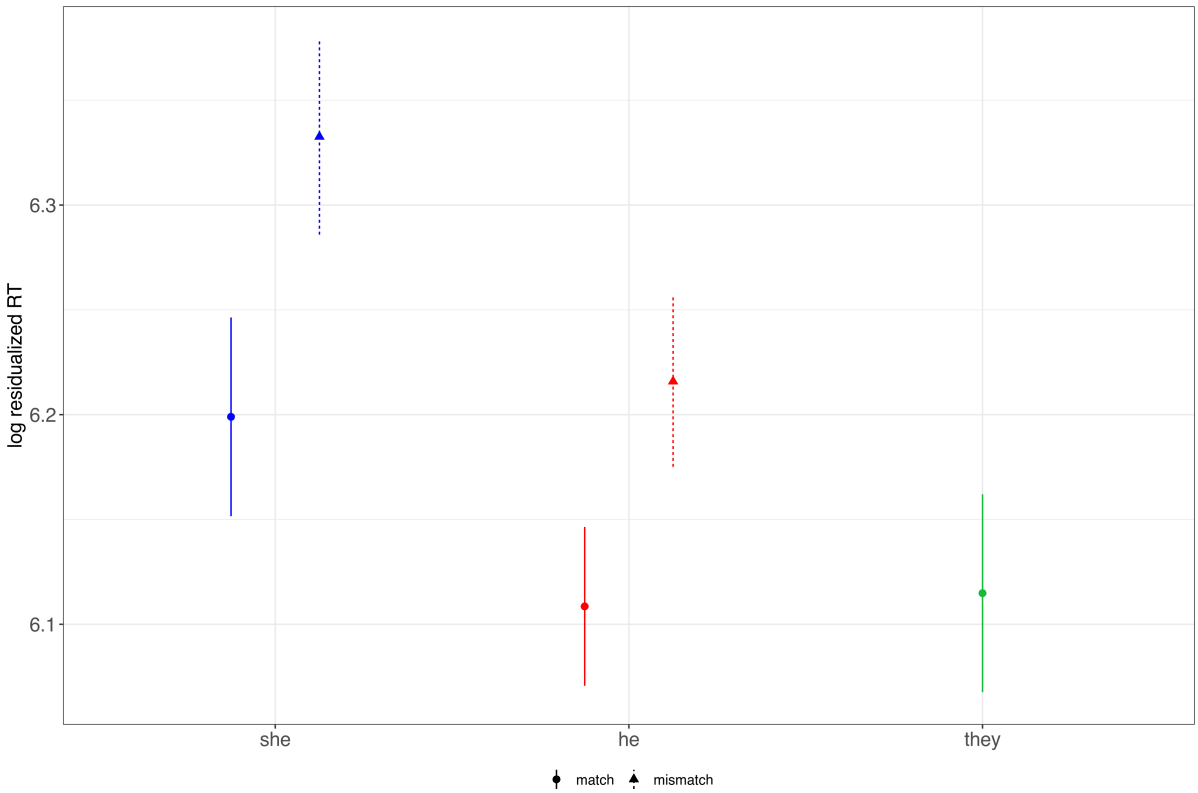

Maze task expectations histogram

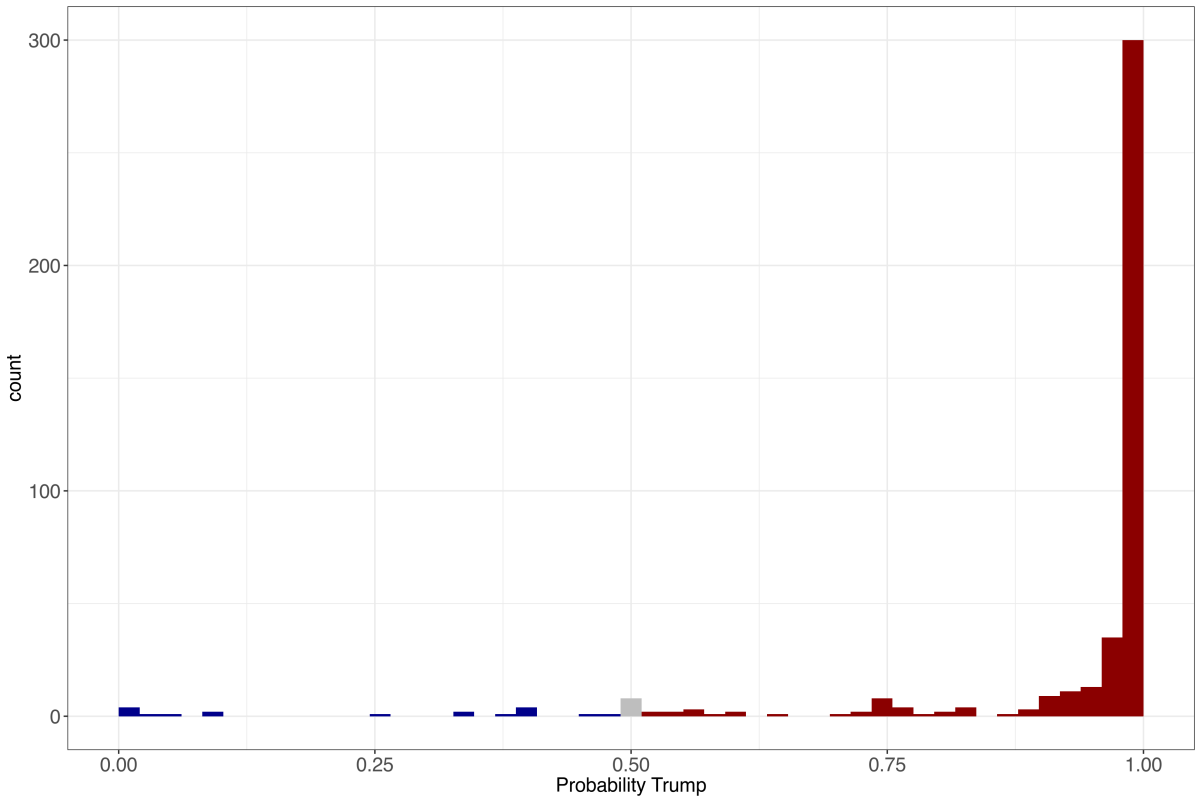



SPR




SPR second pronoun


log residualized RT
6.3
6.2
6.1
she
he
they
match
mismatch




`SPR expectations histogram`

## Exploratory Data analysis

Other exploratory analysis below.

## Event expectation

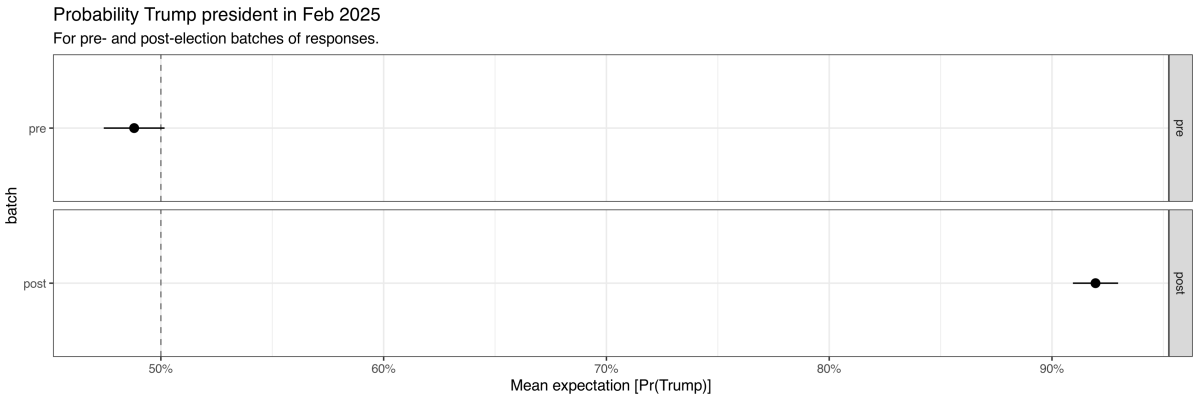



Table 1: One-sample t-tests comparing Trump probability to 50%

| batch | n | mean_prob | t_stat | p_value | ci_lower | ci_upper |
|---|---|---|---|---|---|---|
| pre | 1255 | 0.488 | -1.724 | 0.085 | 0.474 | 0.502 |
| post | 1243 | 0.920 | 81.142 | 0.000 | 0.909 | 0.930 |

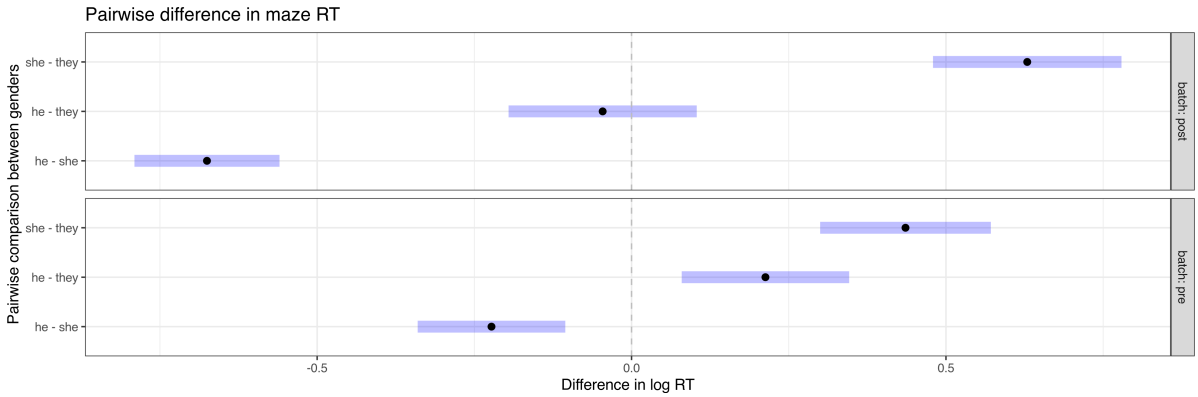
^ In the pre-election batch, mean expectations were 48.801%, and this was not significantly different from 50%. In the post-election batch, mean expectations were 91.954%, and this was significantly different from 50%.

## Maze

Pairwise comparisons between genders (first pronoun only): Within each batch {pre-election, post-election}, is there a significant difference in reading times for each pairwise comparison among {male,female,neutral} pronouns?

```
batch = post:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                  -0.675 0.0587 452 -11.506  <.0001
 he - they                 -0.046 0.0761 452  -0.604  0.5464
 she - they                 0.629 0.0763 452   8.252  <.0001

batch = pre:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                  -0.223 0.0597 452  -3.729  0.0002
 he - they                  0.213 0.0677 452   3.143  0.0018
 she - they                 0.436 0.0691 452   6.308  <.0001
```

```
Results are given on the log (not the response) scale.
```

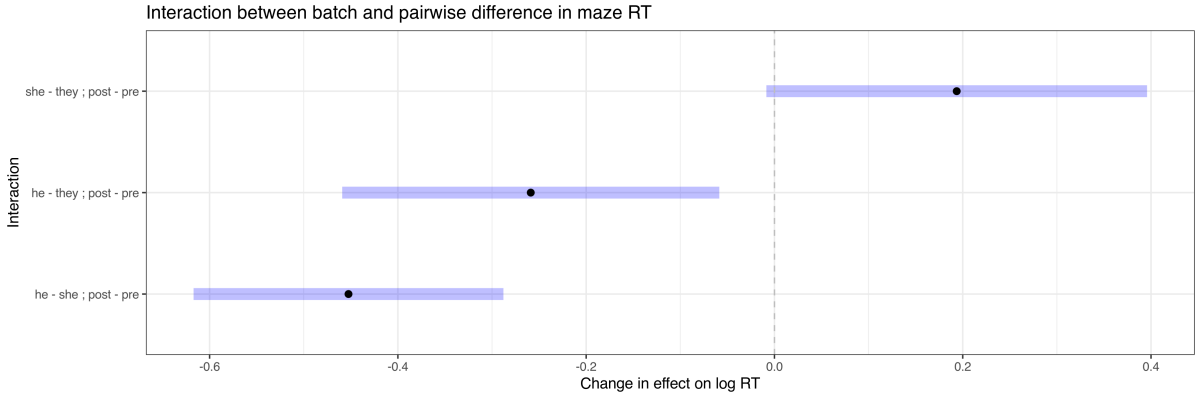



^ Pairwise comparisons between genders show, for Maze RTs:

- in pre-election data, RT of female pronouns is larger than that of male pronouns, which in turn are slower than gender-neutral pronouns. All differences are significant at 0.05 level.
- in post-election data, RT of female pronouns is significantly larger than that of either male or neutral pronouns respectively, and difference between male and neutral pronouns is not significant.

Now, looking at interaction between each pairwise contrast, pre-vs-post election:

```
pronoun_gender_pairwise batch_pairwise estimate     SE  df t.ratio p.value
he - she                post - pre       -0.452 0.0837 452  -5.404  <.0001
he - they               post - pre       -0.259 0.1020 452  -2.540  0.0114
she - they              post - pre        0.194 0.1030 452   1.882  0.0605

Results are given on the log (not the response) scale.
```

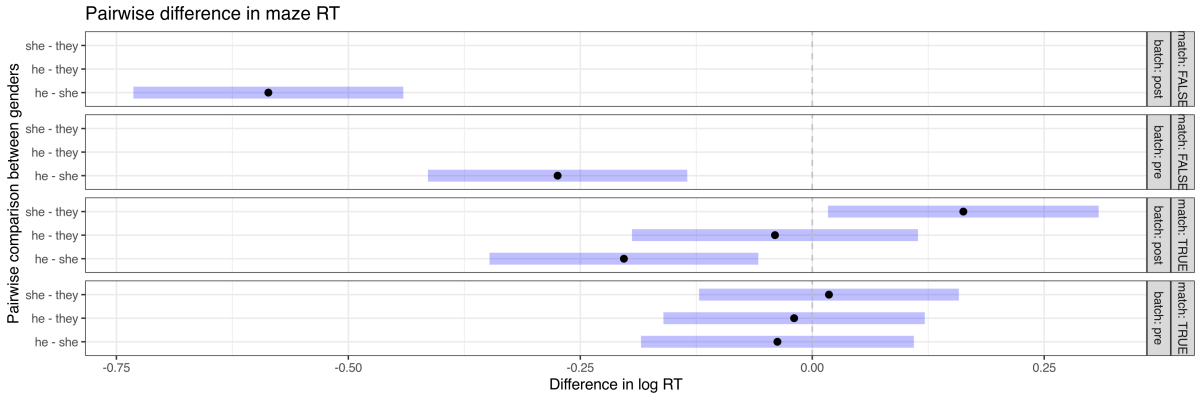


^ interaction between each pairwise contrast among pronouns and experiment batch (pre- vs post-election).

- Comparing post-election minus pre-election
  - log RT difference he-she is negative — that is, the bias for reading male faster than female pronouns increased.
  - log RT difference he-they is negative but smaller, and
  - log RT difference she-they is positive but not significant.

And looking at the second pronoun:

```
match = FALSE, batch = post:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.5862 0.0740 456  -7.919  <.0001
 he - they                nonEst     NA  NA      NA      NA
 she - they               nonEst     NA  NA      NA      NA

match =  TRUE, batch = post:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.2030 0.0737 456  -2.754  0.0061
 he - they               -0.0402 0.0784 456  -0.512  0.6088
 she - they               0.1628 0.0742 456   2.194  0.0287

match = FALSE, batch = pre:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.2745 0.0711 456  -3.859  0.0001
 he - they                nonEst     NA  NA      NA      NA
 she - they               nonEst     NA  NA      NA      NA

match =  TRUE, batch = pre:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.0375 0.0748 456  -0.502  0.6161
 he - they               -0.0195 0.0717 456  -0.273  0.7852
 she - they               0.0180 0.0712 456   0.253  0.8007

Results are given on the log (not the response) scale.
```



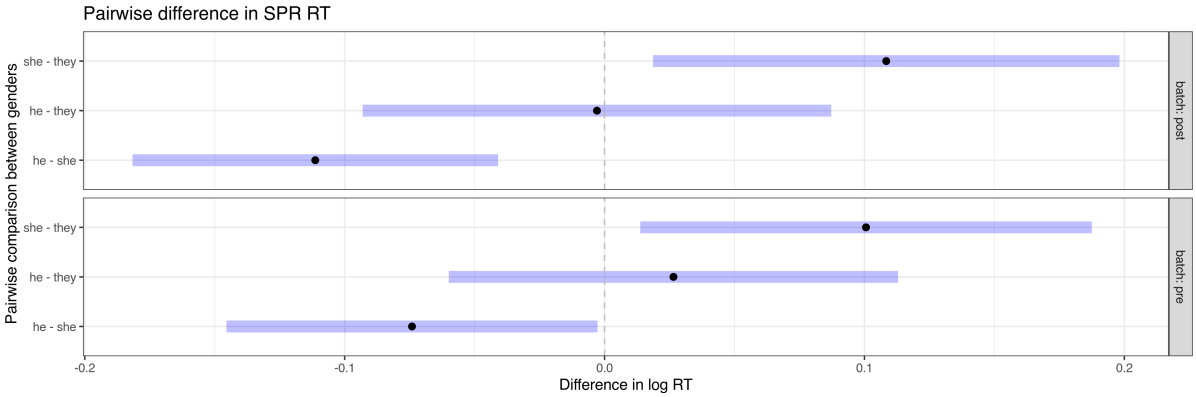

```
batch = post:
 pronoun_gender_pairwise match_pairwise estimate    SE  df t.ratio p.value
 he - she                FALSE - TRUE     -0.383 0.104 456  -3.668  0.0003
 he - they               FALSE - TRUE     nonEst    NA  NA      NA      NA
 she - they              FALSE - TRUE     nonEst    NA  NA      NA      NA

batch = pre:
 pronoun_gender_pairwise match_pairwise estimate    SE  df t.ratio p.value
 he - she                FALSE - TRUE     -0.237 0.103 456  -2.295  0.0222
 he - they               FALSE - TRUE     nonEst    NA  NA      NA      NA
 she - they              FALSE - TRUE     nonEst    NA  NA      NA      NA

Results are given on the log (not the response) scale.
```

## SPR

Pairwise comparisons between genders (first pronoun only): Within each batch {pre-election, post-election}, is there a significant difference in reading times for each pairwise comparison among {male,female,neutral} pronouns?

```
batch = post:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.11131 0.0358 836  -3.106  0.0020
 he - they               -0.00292 0.0459 836  -0.064  0.9492
 she - they               0.10839 0.0457 836   2.371  0.0180

batch = pre:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.07409 0.0364 836  -2.037  0.0420
```

```
he - they                0.02651 0.0440 836   0.602  0.5474
she - they               0.10060 0.0443 836   2.273  0.0233

Results are given on the log (not the response) scale.
```

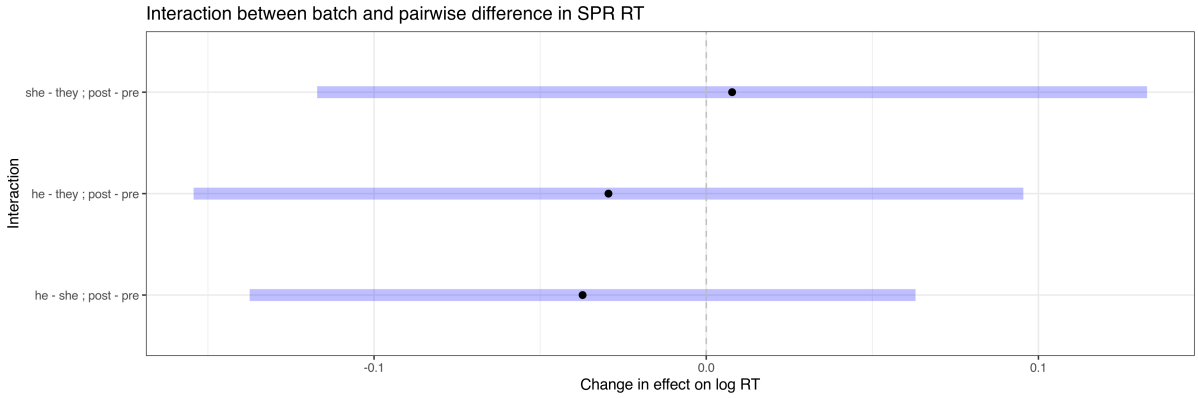



^ Pairwise comparisons between genders show, for SPR RTs:

- in pre-election data,
  - RT of female pronouns is slower than that of neutral pronouns (p=0.0233) and
  - RT of female pronouns is slower than that of male pronouns (p=0.0420).
  - Male-neutral comparison is not significant (p=0.5474).
- in post-election data,
  - RT of female pronouns is slower than that of neutral pronouns (p=0.0180) and
  - RT of female pronouns is slower than that of male pronouns (p=0.0020).
  - Male-neutral comparison is not significant (p=0.5474).

Next, looking at interaction between each pairwise contrast, pre-vs-post election:

```
pronoun_gender_pairwise batch_pairwise estimate     SE  df t.ratio p.value
he - she                post - pre     -0.03722 0.0511 836  -0.729  0.4663
he - they               post - pre     -0.02944 0.0636 836  -0.463  0.6438
she - they              post - pre      0.00779 0.0636 836   0.122  0.9027

Results are given on the log (not the response) scale.
```



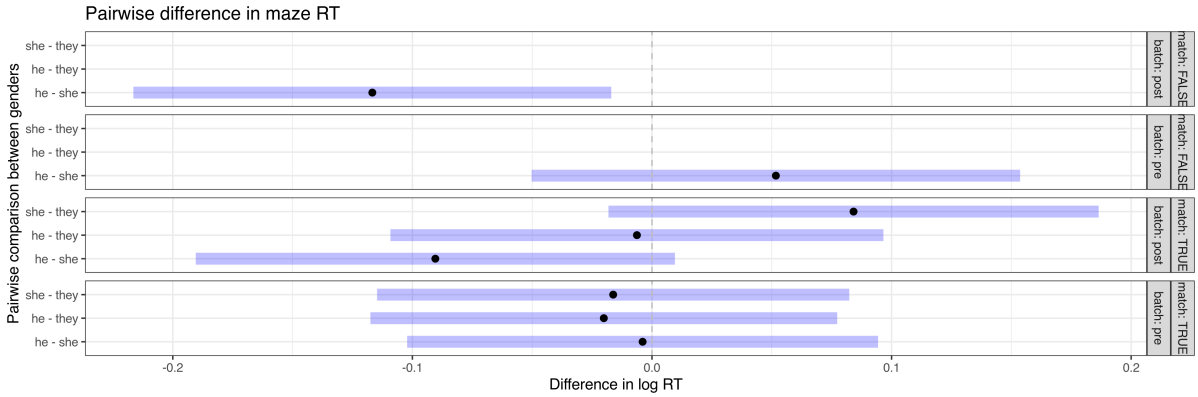

^ interaction between each pairwise contrast among pronouns and experiment batch (pre- vs post-election).

- Comparing post-election minus pre-election
  - numerical speedup for he versus they and he versus she, and slowdown for she versus they, but no contrasts are significant.

And looking at the second pronoun:

```
match = FALSE, batch = post:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.11672 0.0508 827  -2.297  0.0219
 he - they                 nonEst     NA  NA      NA      NA
 she - they                nonEst     NA  NA      NA      NA

match =  TRUE, batch = post:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.09042 0.0509 827  -1.775  0.0763
 he - they               -0.00628 0.0524 827  -0.120  0.9046
 she - they               0.08414 0.0521 827   1.614  0.1068

match = FALSE, batch = pre:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                 0.05171 0.0519 827   0.996  0.3197
 he - they                 nonEst     NA  NA      NA      NA
 she - they                nonEst     NA  NA      NA      NA

match =  TRUE, batch = pre:
 pronoun_gender_pairwise estimate     SE  df t.ratio p.value
 he - she                -0.00391 0.0501 827  -0.078  0.9378
 he - they               -0.02010 0.0496 827  -0.405  0.6855
```

```
 she - they              -0.01620 0.0502 827  -0.323  0.7471

Results are given on the log (not the response) scale.
```




```
batch = post:
 pronoun_gender_pairwise match_pairwise estimate     SE  df t.ratio p.value
 he - she                FALSE - TRUE    -0.0263 0.0720 827  -0.366  0.7148
 he - they               FALSE - TRUE     nonEst     NA  NA      NA      NA
 she - they              FALSE - TRUE     nonEst     NA  NA      NA      NA

batch = pre:
 pronoun_gender_pairwise match_pairwise estimate     SE  df t.ratio p.value
 he - she                FALSE - TRUE     0.0556 0.0721 827   0.771  0.4409
 he - they               FALSE - TRUE     nonEst     NA  NA      NA      NA
 she - they              FALSE - TRUE     nonEst     NA  NA      NA      NA

Results are given on the log (not the response) scale.
```

---

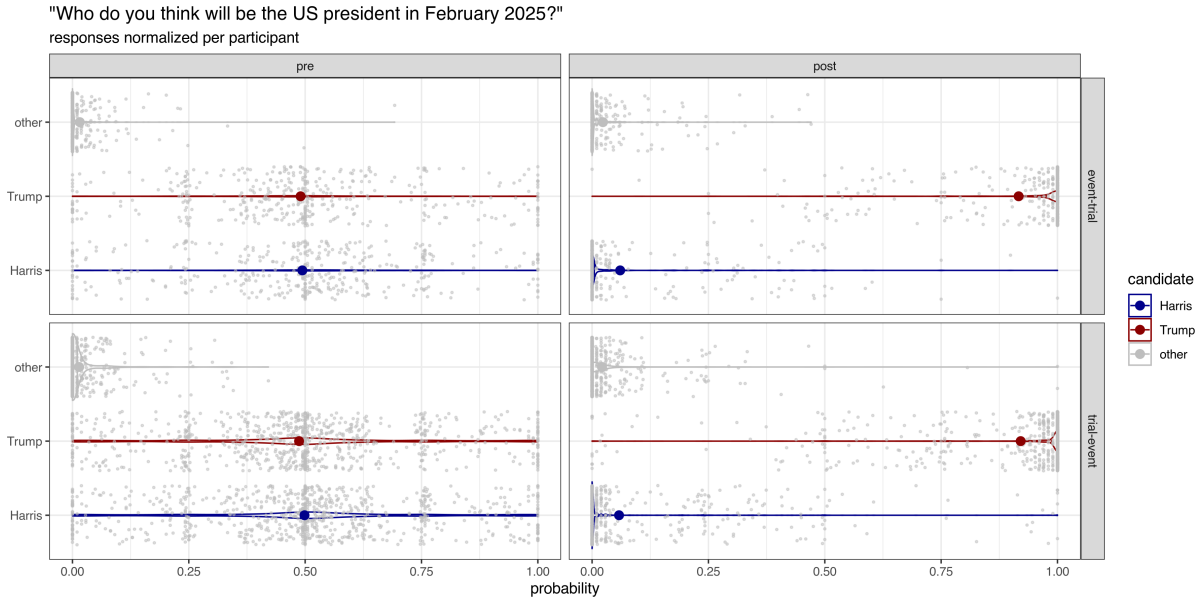
## Other exploratory plotting

Number of participants per task pre- and post- election.

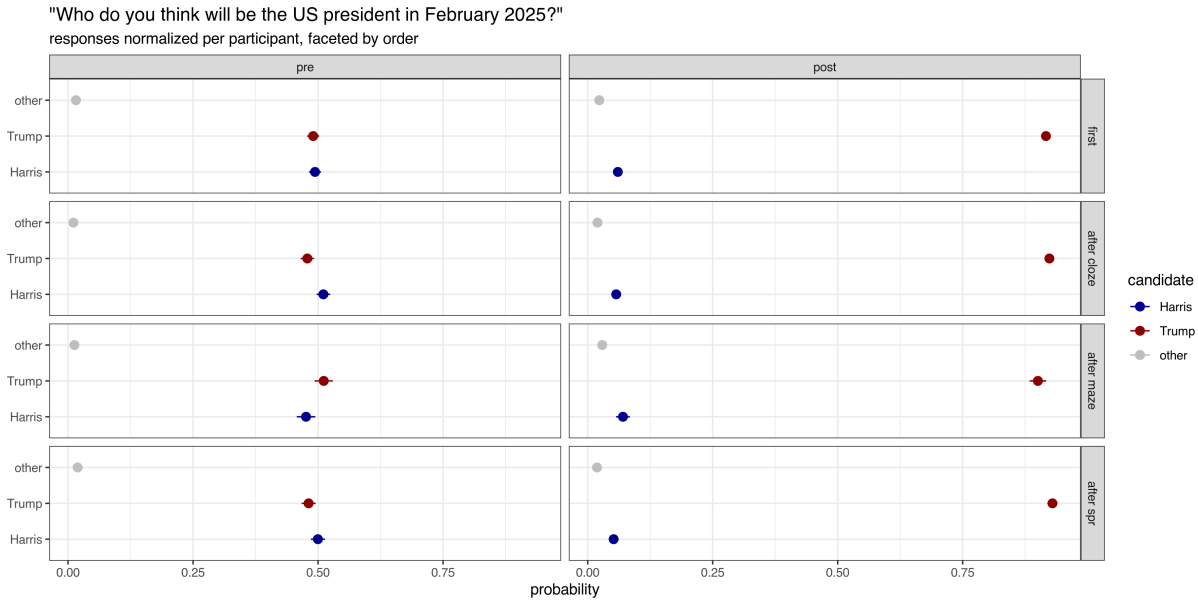
| batch | cloze | maze | spr | total |
|---|---|---|---|---|
| pre | 485 | 244 | 445 | 1174 |
| post | 497 | 235 | 432 | 1164 |

## Expectations

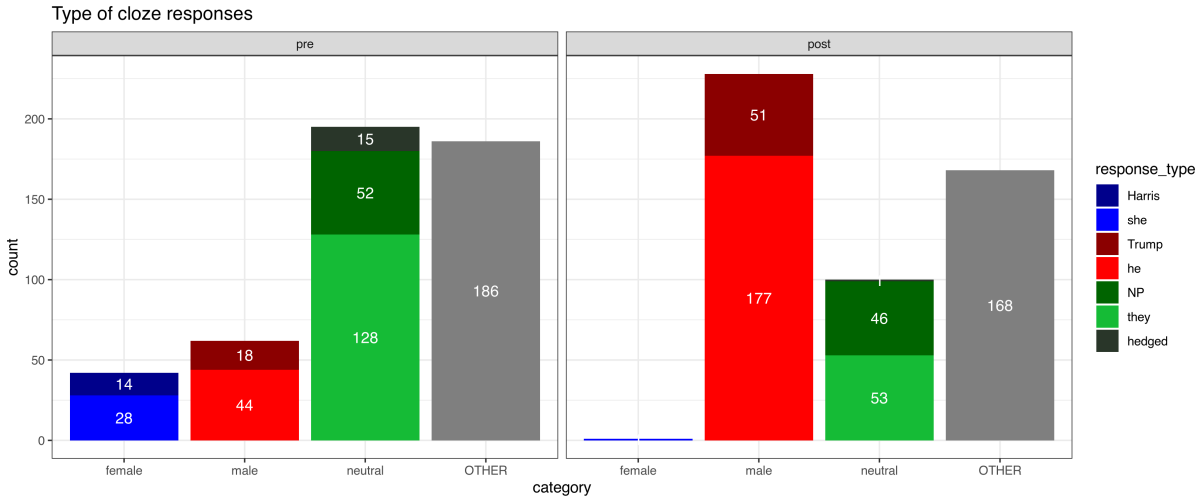
Check for order effect on belief estimation results, in pre- and post- election data.




Looking for order effects, (combining all orders that start with "event" to one, for this plot, since all are identical wrt this data)

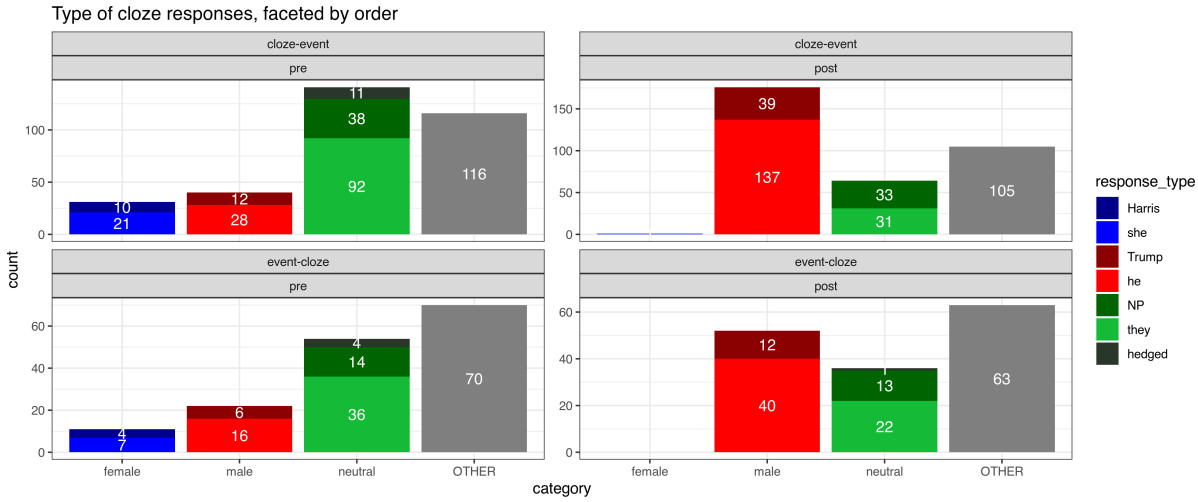


## Cloze



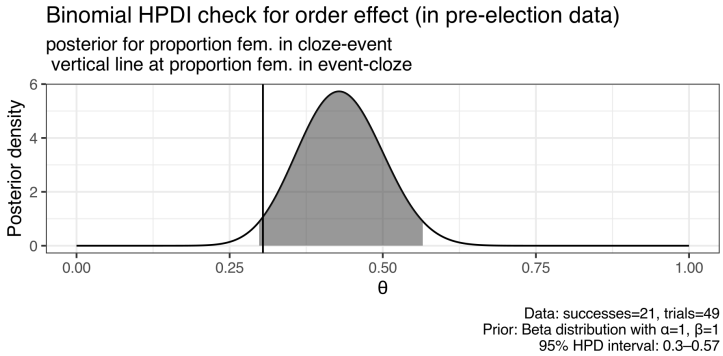

```
prop.test(F, M+F) p-value
                0.07709987
```

Faceting by order:




In the event-cloze order there seems to be a somewhat larger bias toward producing male pronouns or male referents/Trump.

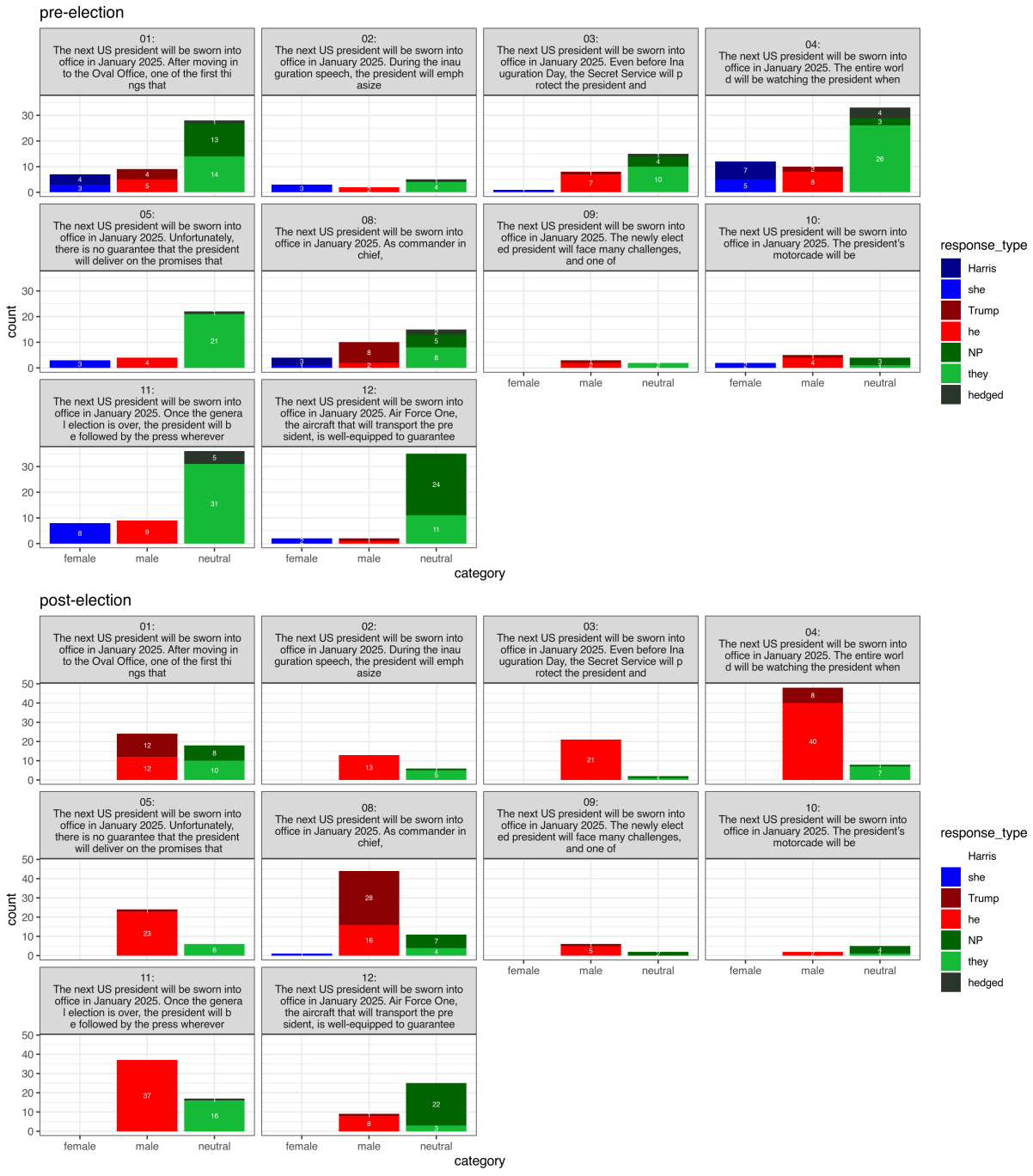
*But it seems the difference between orders here is actually not significant, per Titus' binomial 95%-HPDI test:*




## By item cloze breakdown

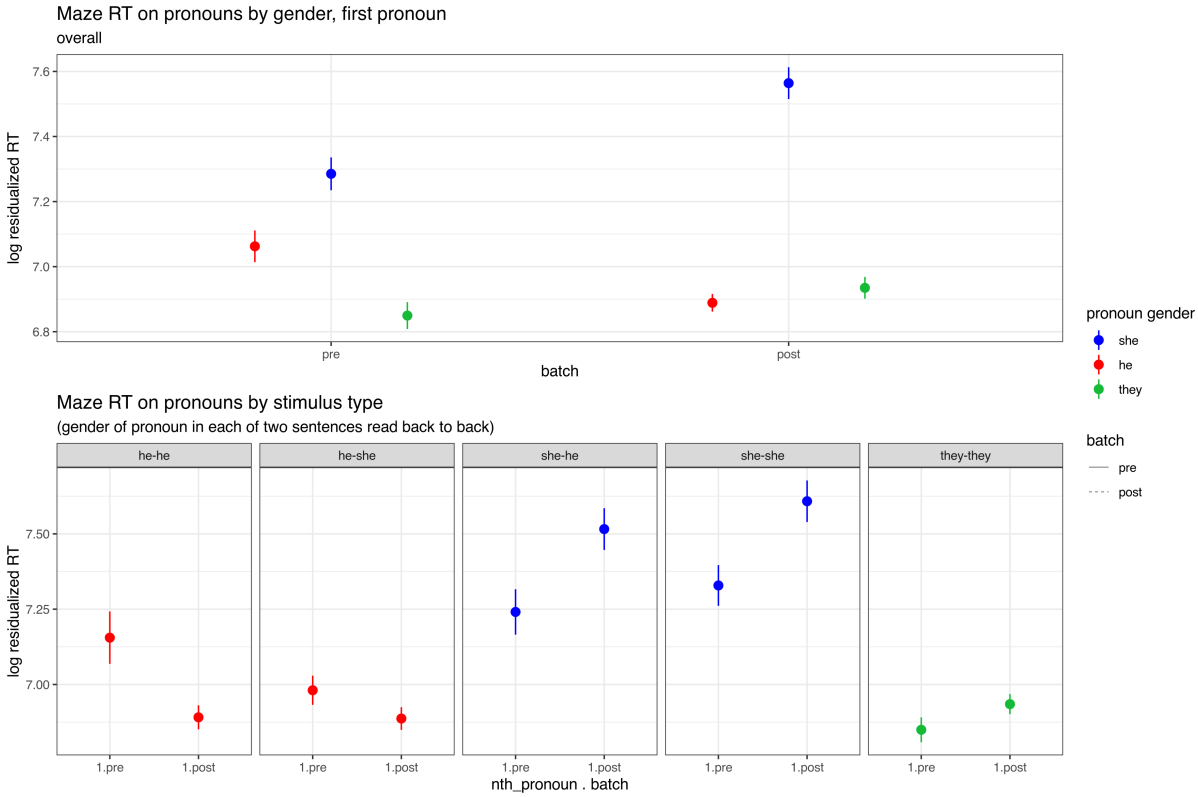
Type of cloze responses, by item

(OTHER responses not shown)

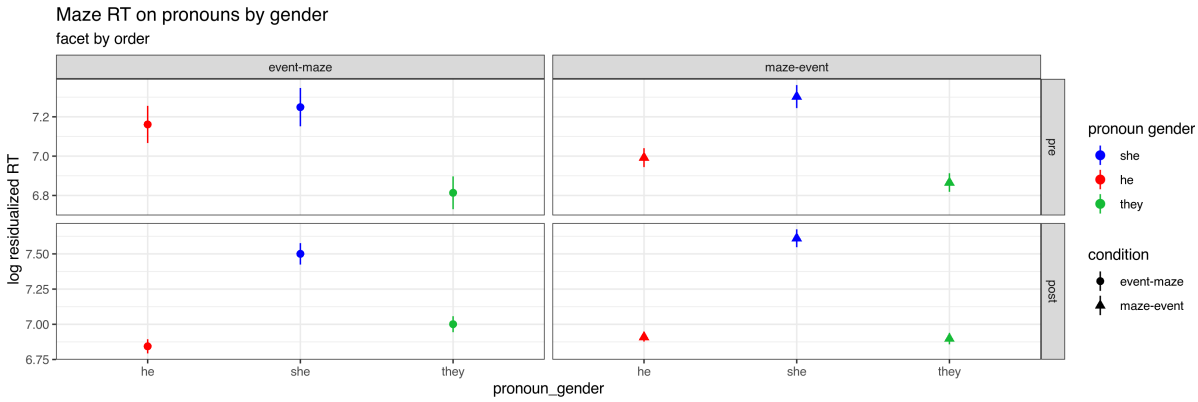


## Maze

Look at average Maze RT by gender of pronoun, and for each condition of two sentences presented. Shows an effect of gender (male pronoun is read faster than female, neutral is perhaps even faster than male). These Maze RTs are residualized as with the SPR (control for participant mean reading speed and eg word length, punctuation, and by item effects).

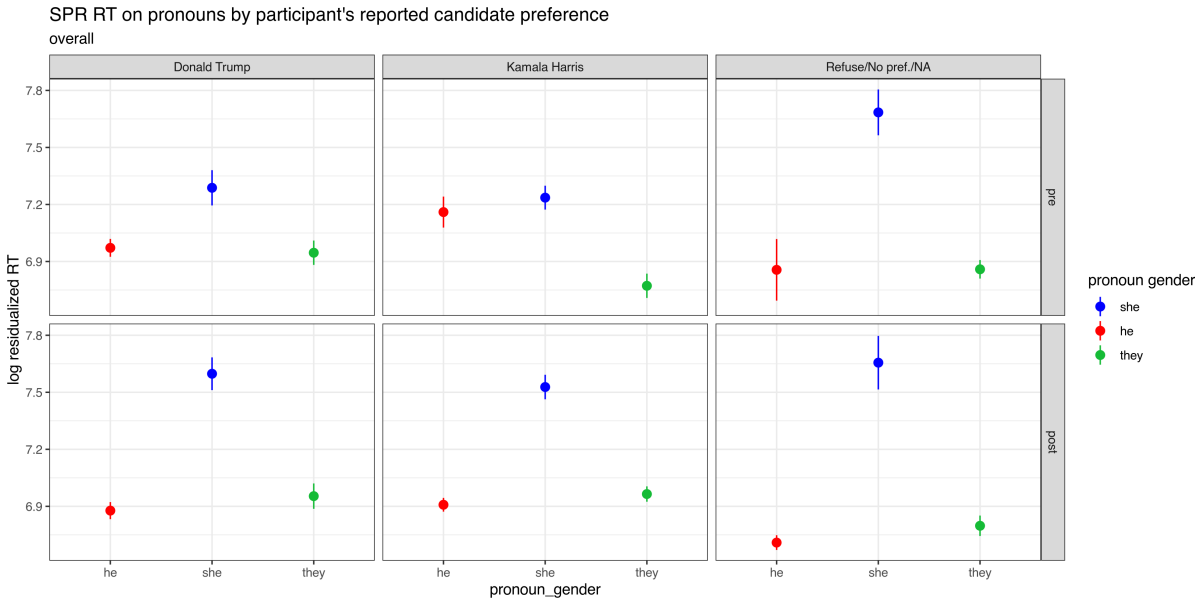



Faceting by order



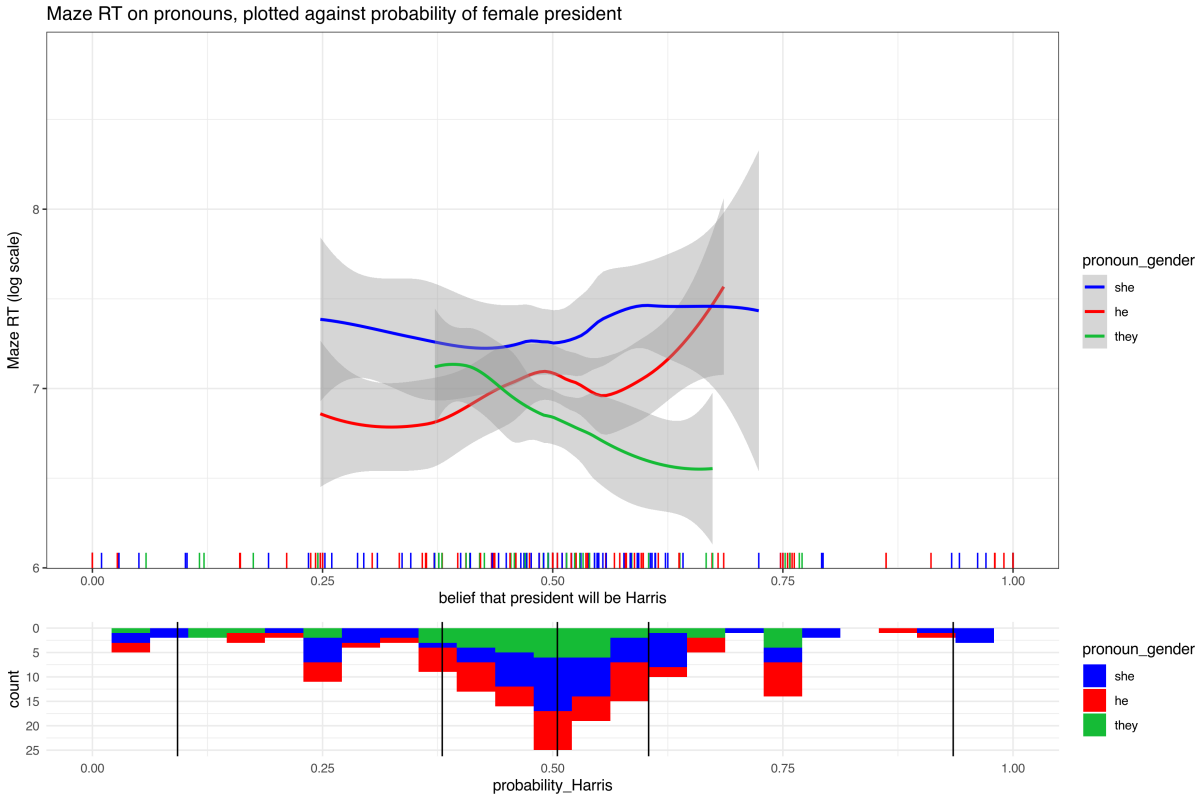
^ In the pre-election data (top facets above), there may be a slightly less clear male pronoun bias for participants who did the maze task following the event estimation (event-maze) versus before (maze-event). In the post-election data, the bias was strong in either order.

And broken down by participant reported preference

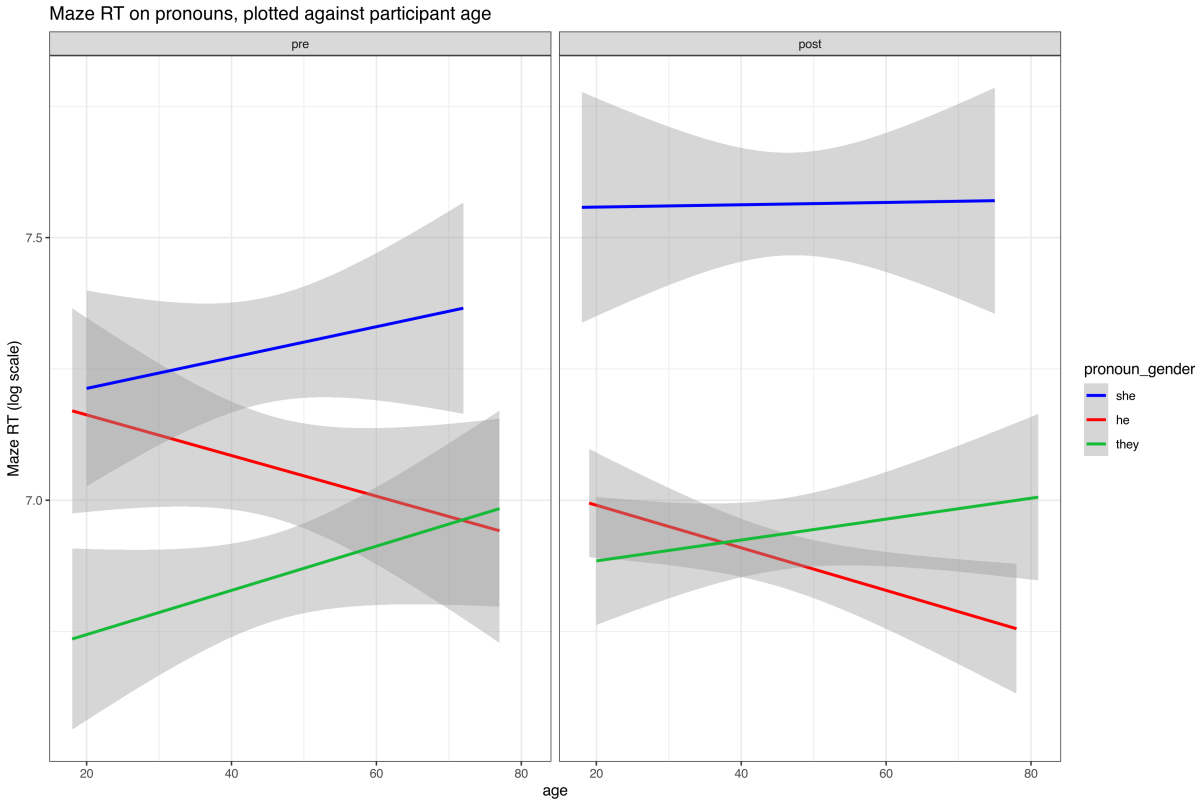



^ The pre-election bias is least strong among participants whose preferred candidate was Harris.

We could look at a related effect as a continuous interaction plotting event-probability (who the participant thinks will be president) on the x-axis versus RT on the y-axis:

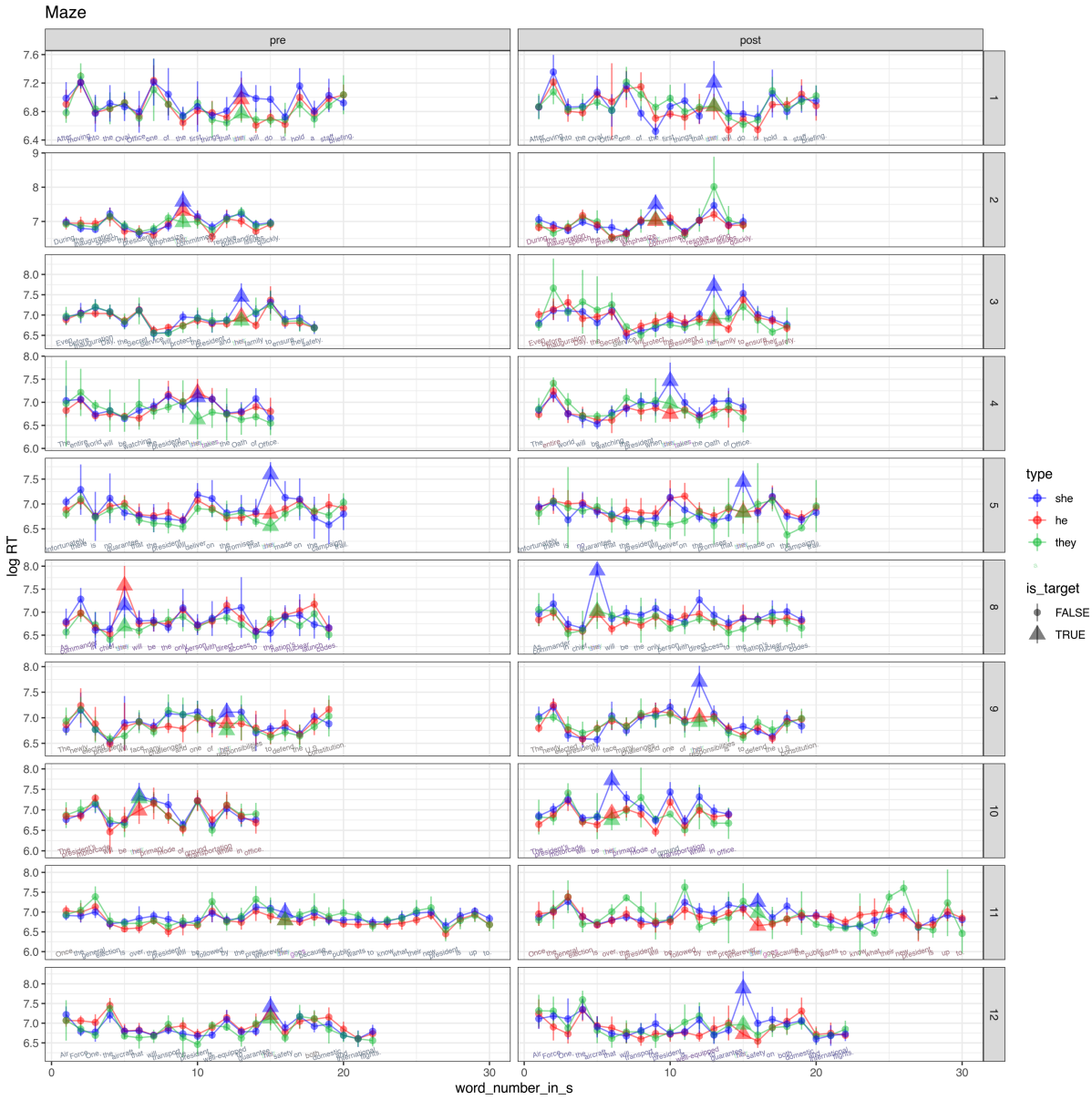



^ It looks like the male-pronoun processing bias (/ female-pronoun processing penalty) gets smaller as belief that the president would be female is higher. But note the majority of participants are in the middle of the distribution.



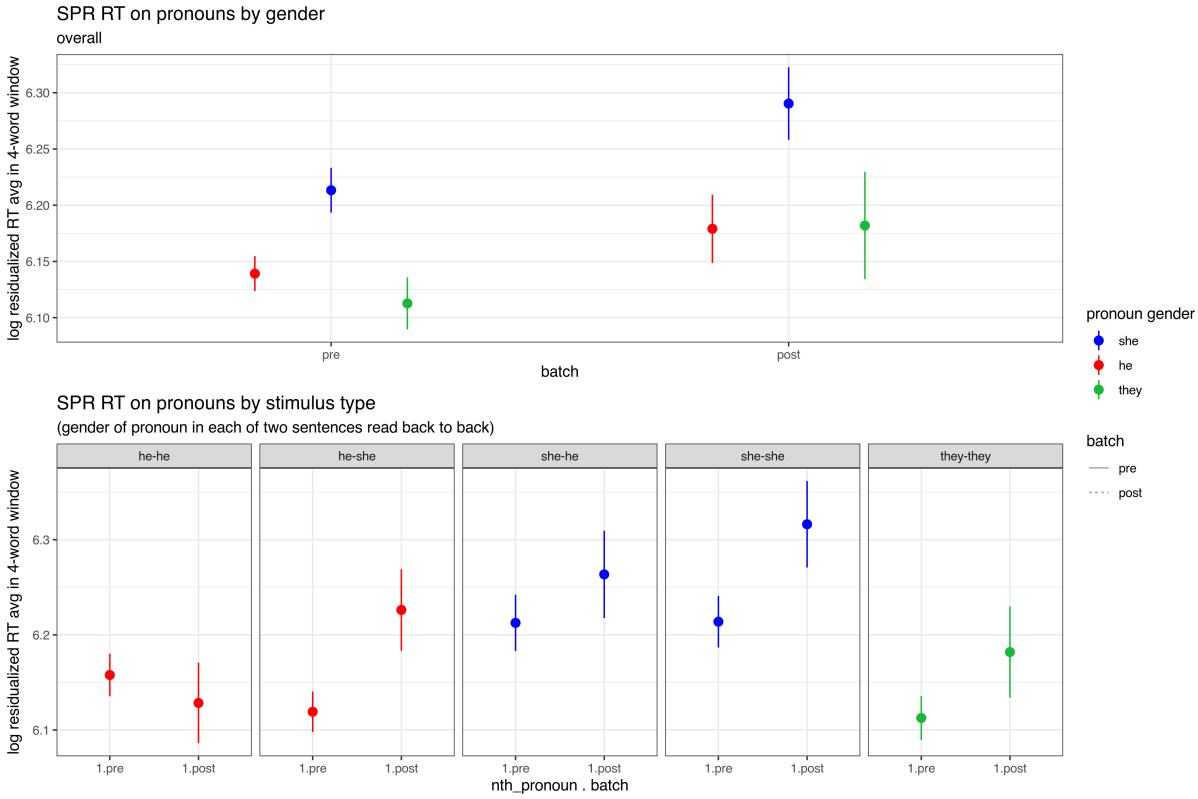

^Looking at participant age, there also could be something interesting going on, at least with the decreasing processing cost of the neutral pronoun for younger readers.

**Maze reading time tracks on each of the target sentences:**

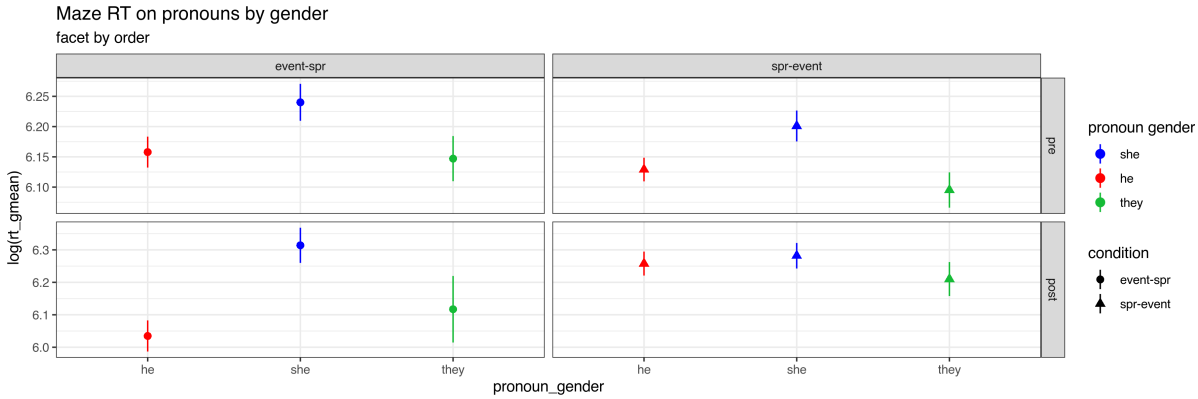



## SPR

Likewise look at average SPR RT by gender of pronoun, and for each condition of two sentences presented. These RTs are residualized.




Faceting by order

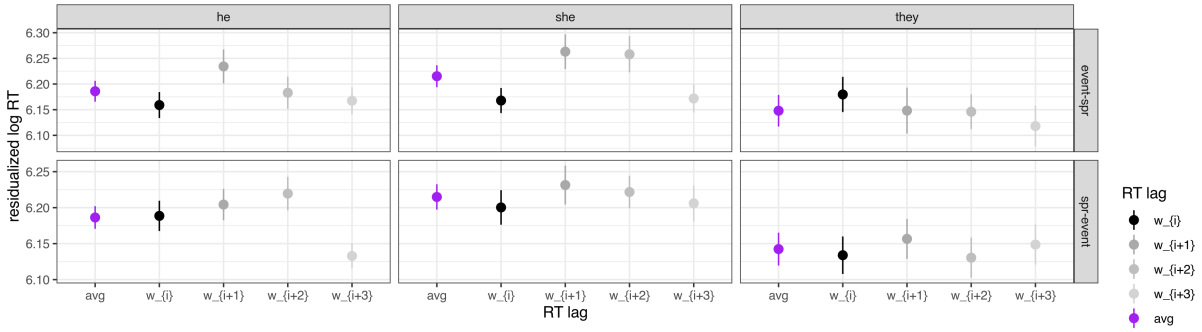



^ Probably not enough power to detect, but it may be true that the bias is stronger in the spr-event order, as with Maze data.

Pre-election data

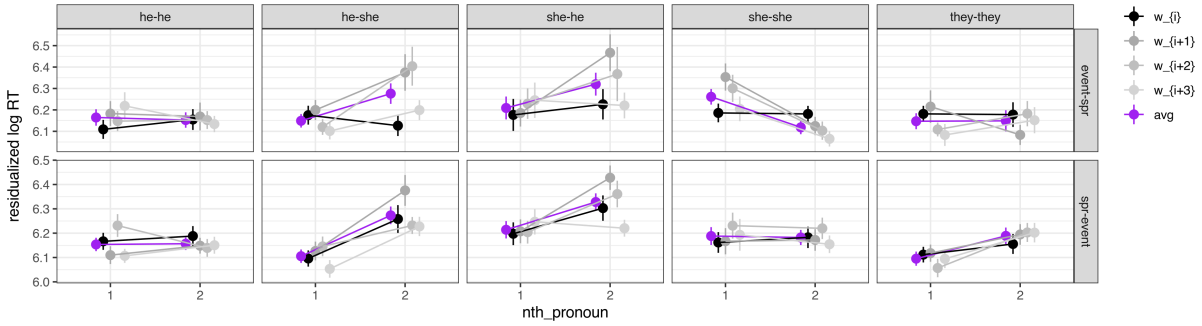
SPR by gender

Looking at RT with different lags w_{i+n}, where w_i = target pronoun.
Also showing geometric_mean(w_{i+n}) for n = {0,...,3}

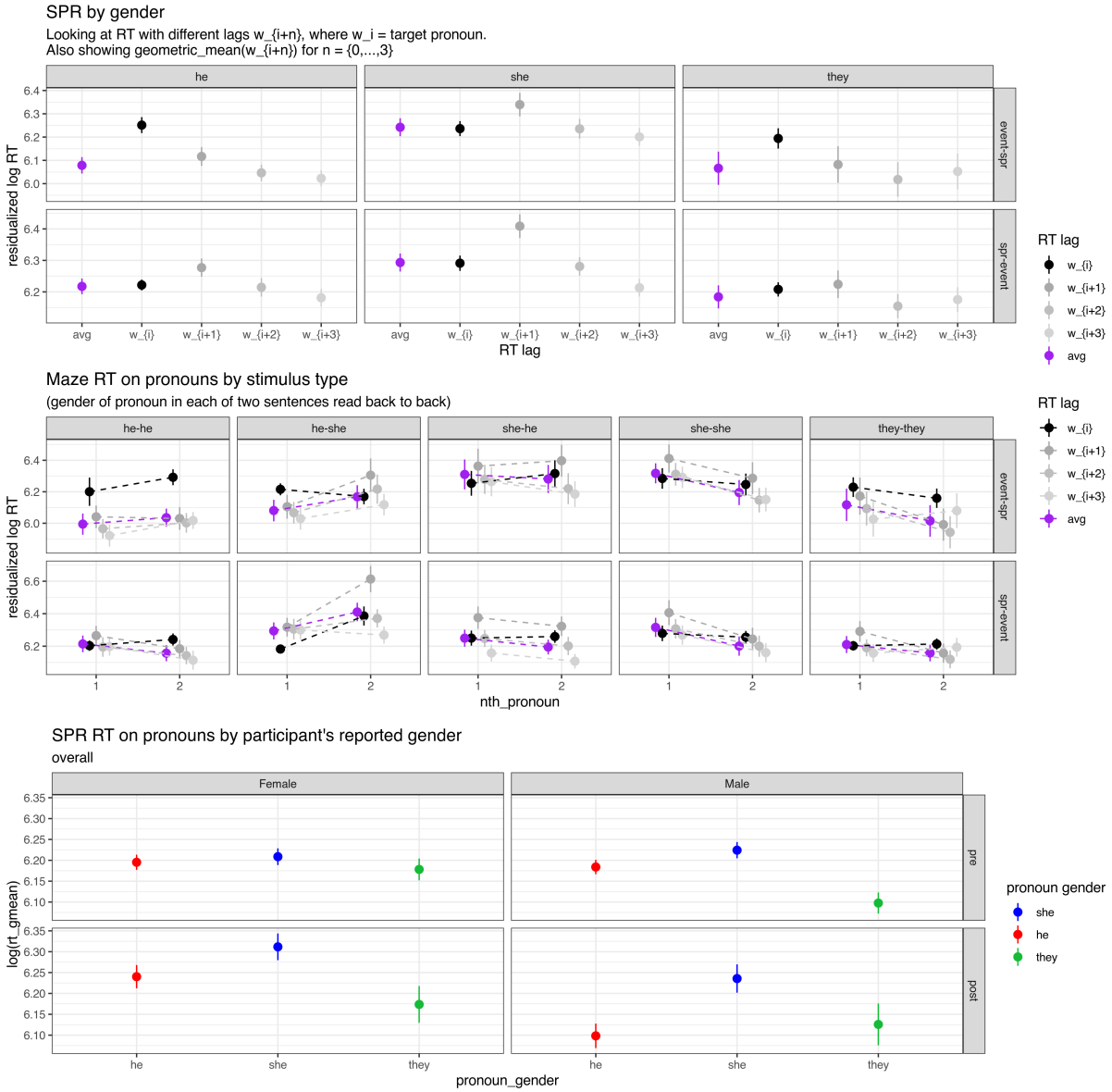



Maze RT on pronouns by stimulus type

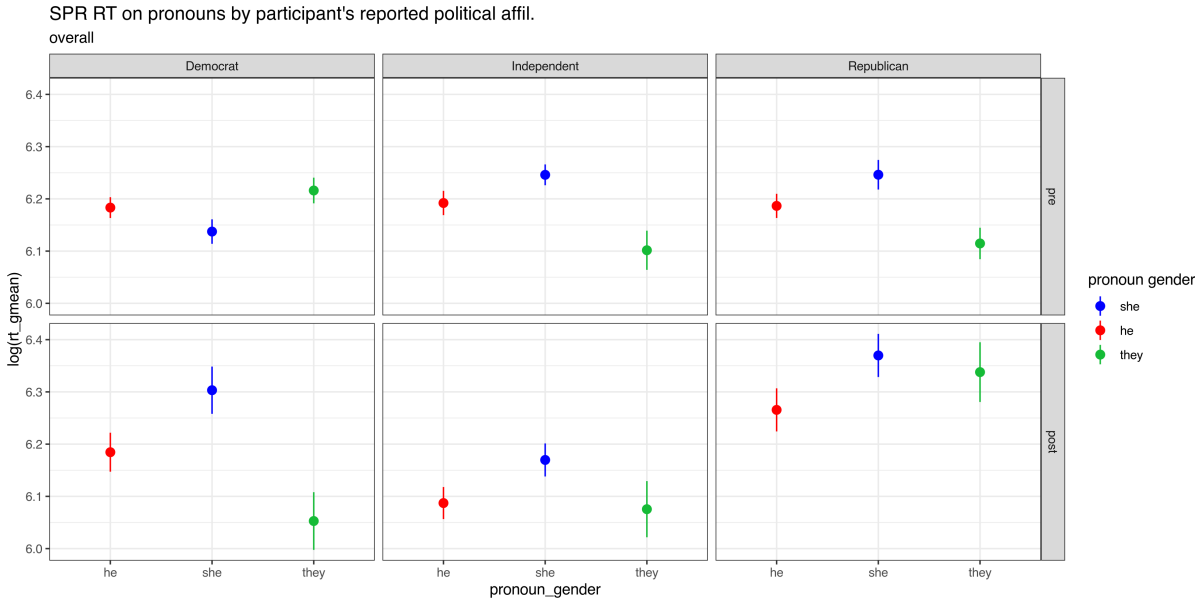
(gender of pronoun in each of two sentences read back to back)



Post-election data

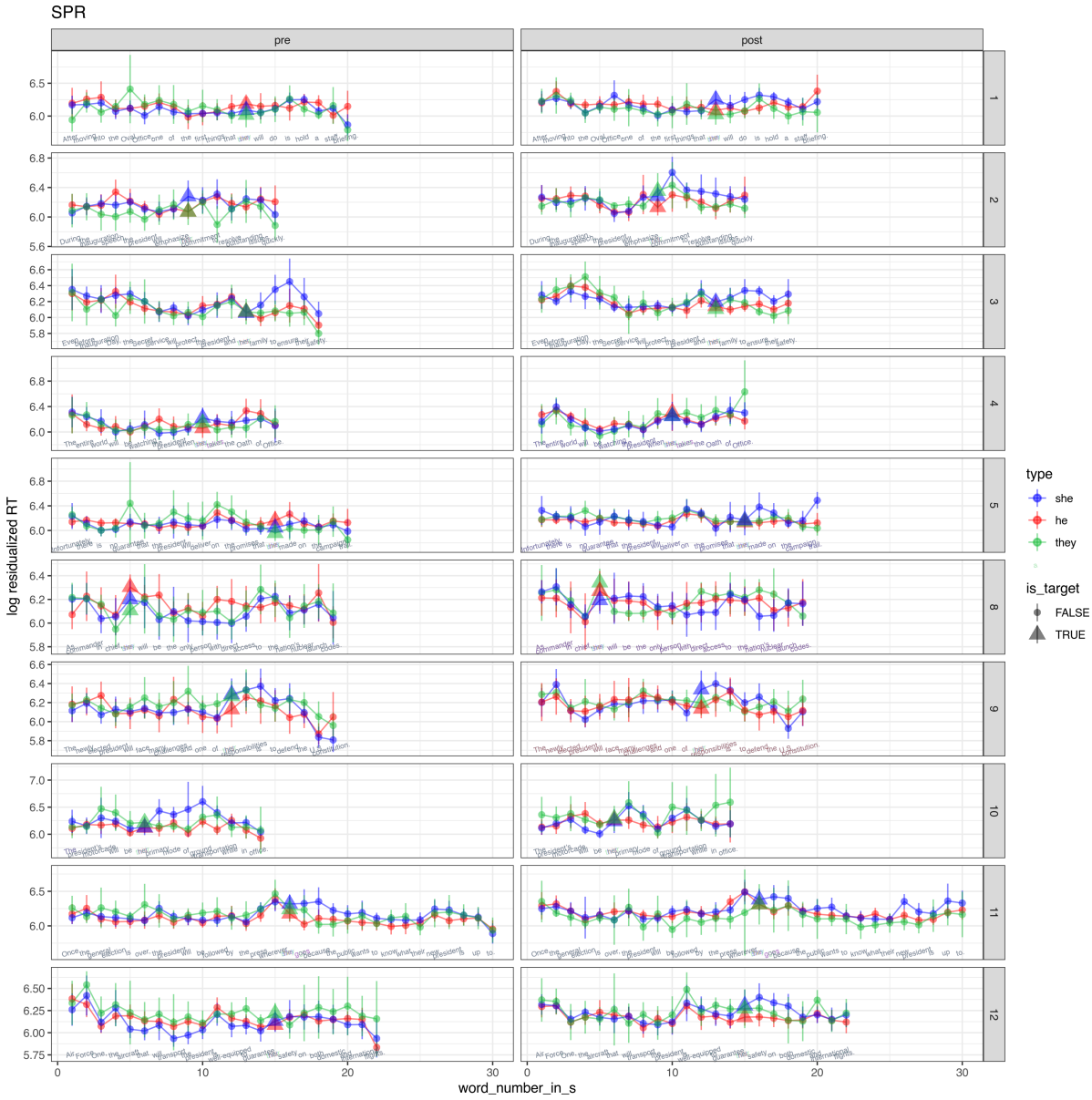



^ SPR averages broken down by participant gender may be useful if we're interesed in the difference that shows up in Maze as well: bias seems larger in males.




^ SPR averages broken down by participant political affiliation, as with Maze above.

**SPR tracks on each of the target sentences:**


SPR
pre
post
log residualized RT
word_number_in_s
type
she
he
they
is_target
FALSE
TRUE