The P600 effect when singular gendered antecedents are co-indexed with (a) *himself* or *herself* (b) *themselves*

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This script conducts an ANOVA examining the P600 PROST data with Referentiality and Gender as within variables and Identity Status as a between factor. Analysis 1 examines the data for antecedents are co-indexed with *himself* or *herself*, while Analysis 2 examines the P600 effect when antecedents are co-indexed with *themselves*

Define functions, set parameters and load

Define standard error of mean function

```
sem <- function(x) sd(x)/sqrt(length(x))
```

Before we begin, let's set some general parameters for `ggplot2`. We will set a general theme using the `theme_set()` function. We will use the 'classic' theme which gives us clean white background rather than the default grey with white grid lines. And we will position the legend at the top of the graph rather than at the right side which is the default.

Then we re-order factor levels for *Referentiality*

```
## [1] "Referential"    "NonReferential"
```

```
## [1] "Referential"    "NonReferential"
```

Analysis 1: The P600 effect when antecedents are co-indexed with *himself* or *herself*

```
ezANOVA(data = prost_2022_singular
              , dv = diff_score
              , wid = SubjID
              , within = .(Referentiality, Gender_Status)
              , between = Group
              , type = 3
              , return_aov = F
              )
```

```
## $ANOVA
##                              Effect DFn DFd          F            p p<.05
## 2                             Group   1  36  2.6476957 1.124226e-01
## 3                    Referentiality   1  36 24.2580517 1.887572e-05     *
## 5                     Gender_Status   1  36  2.1030534 1.556627e-01
## 4              Group:Referentiality   1  36  0.2741019 6.038016e-01
## 6               Group:Gender_Status   1  36  0.2164015 6.445974e-01
## 7     Referentiality:Gender_Status   1  36  5.1551114 2.926166e-02     *
```

```
## 8 Group:Referentiality:Gender_Status   1  36  2.0276871 1.630661e-01
##           ges
## 2 0.016408837
## 3 0.165071951
## 5 0.016550569
## 4 0.002229006
## 6 0.001728699
## 7 0.026715413
## 8 0.010681228
```

Condition Means for Analysis 1

The P600 effect when antecedents are co-indexed with *himself* or *herself.*

Significant Effects: **Referentiality; Group x Referentiality x Gender Status**

Referentiality	Mean	SE	SD	Max	Min
Referential	-0.34	0.16	1.42	4.15	-4.41
NonReferential	1.03	0.20	1.78	6.52	-3.33

Gender_Status	Mean	SE	SD	Max	Min
Gendered	0.54	0.23	1.97	6.52	-4.41
NonGendered	0.15	0.17	1.47	4.02	-3.33

Group	Mean	SE	SD	Max	Min
Binary	0.16	0.2	1.75	5.10	-4.41
NonBinary	0.56	0.2	1.73	6.52	-2.63

Referentiality	Gender_Status	Group	Mean	SE	SD	Max	Min
Referential	Gendered	Binary	-0.74	0.41	1.85	4.15	-4.41
Referential	Gendered	NonBinary	-0.04	0.31	1.31	2.48	-2.04
Referential	NonGendered	Binary	-0.18	0.27	1.19	2.54	-2.15
Referential	NonGendered	NonBinary	-0.37	0.28	1.21	1.73	-2.50
NonReferential	Gendered	Binary	1.32	0.40	1.77	5.10	-1.66
NonReferential	Gendered	NonBinary	1.67	0.46	1.94	6.52	-0.59
NonReferential	NonGendered	Binary	0.22	0.34	1.54	4.02	-3.33
NonReferential	NonGendered	NonBinary	0.95	0.39	1.66	3.40	-2.63

Post-hoc tests for Analysis 1: Gender Status x Referentiality

The following chunk runs post-hoc tests for the 3-way ***"Group x Gender Status x Referentiality"*** Interaction

"Some woman. . . himself" vs. "Mary. . . himself"

Table 5: Paired t-test: `diff_score` by `Referentiality`

Test statistic	df	P value	Alternative hypothesis	mean difference
-4.833	37	2.36e-05 * * *	two.sided	-1.893

"Someone. . . himself" vs. "The participant. . . himself"

Table 6: Paired t-test: `diff_score` by `Referentiality`

Test statistic	df	P value	Alternative hypothesis	mean difference
-2.614	37	0.01286 *	two.sided	-0.8365

"The participant. . . himself" vs. "Mary. . . himself"

Table 7: Paired t-test: `diff_score` by `Gender_Status`

Test statistic	df	P value	Alternative hypothesis	mean difference
-0.3661	37	0.7164	two.sided	-0.1346

"Someone. . . himself" vs. "Some woman. . . himself"

Table 8: Paired t-test: `diff_score` by `Gender_Status`

Test statistic	df	P value	Alternative hypothesis	mean difference
2.688	37	0.01071 *	two.sided	0.9219

Interaction Plots: Gender Status x Referentiality *himself*
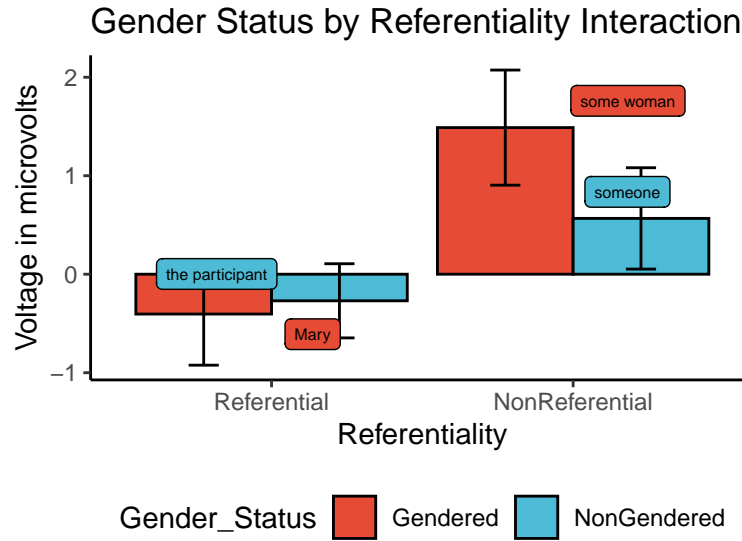
Interaction broken down by Group *Binary* vs *Non-Binary*
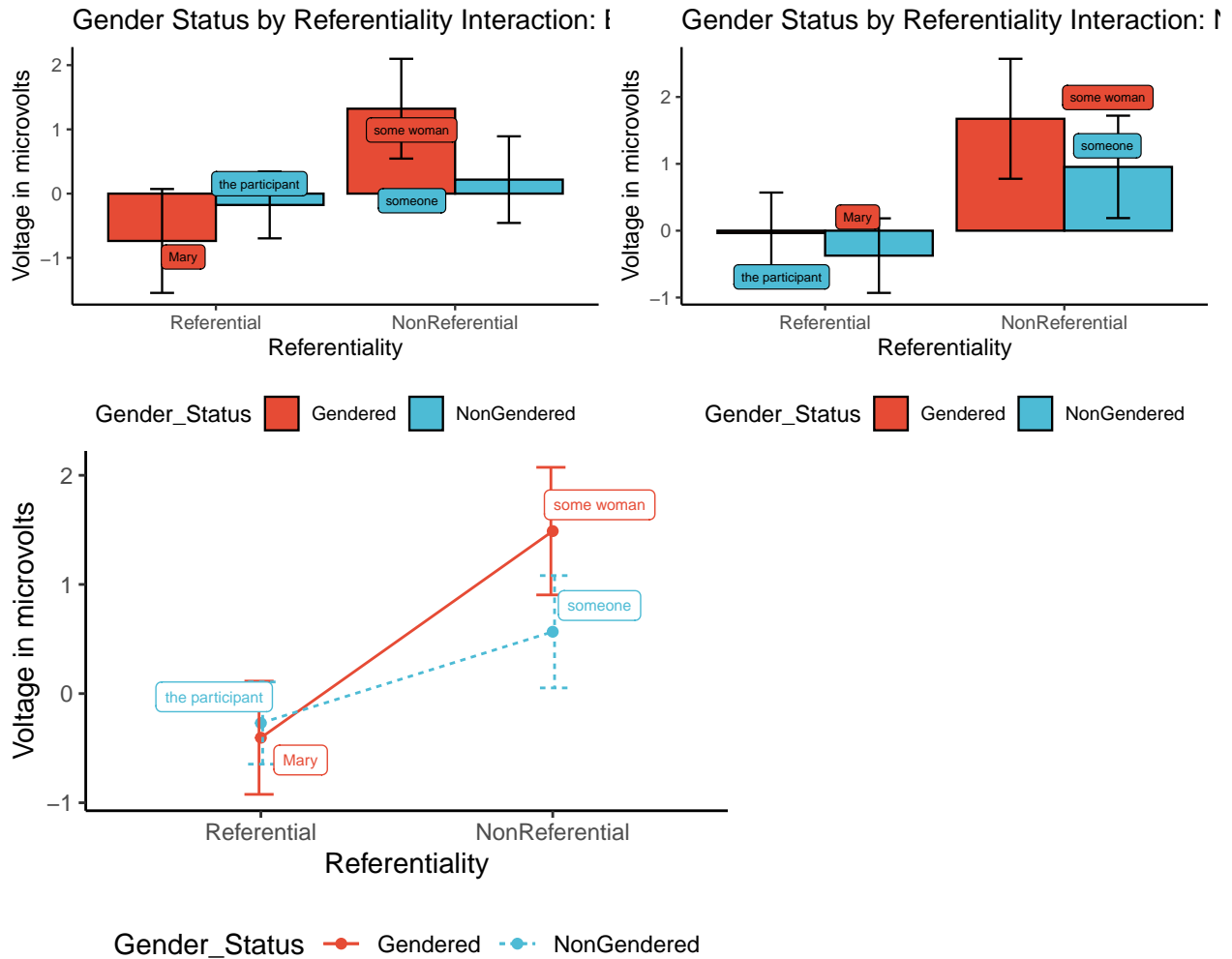
Gender Status by Referentiality Interaction: [

Gender Status by Referentiality Interaction: [

Analysis 2: The P600 effect when antecedents are co-indexed with *themselves*

```r
ezANOVA(data = prost_2022_plural
        , dv = diff_score
        , wid = SubjID
        , within = .(Referentiality, Gender_Status)
        , between = Group
        , type = 3
        , return_aov = F
        )
```

```
## $ANOVA
##                                Effect DFn DFd            F          p p<.05
## 2                               Group   1  36 0.0053411590 0.94214444
## 3                      Referentiality   1  36 5.2198710296 0.02832801     *
## 5                       Gender_Status   1  36 0.5605028582 0.45892150
## 4                Group:Referentiality   1  36 0.0000511147 0.99433508
## 6                Group:Gender_Status   1  36 0.0456034989 0.83210302
## 7         Referentiality:Gender_Status   1  36 5.0012917068 0.03161659     *
## 8 Group:Referentiality:Gender_Status   1  36 1.1780250752 0.28497330
##            ges
## 2 3.760513e-05
```

```
## 3 2.392545e-02
## 5 3.402687e-03
## 4 2.400287e-07
## 6 2.777167e-04
## 7 4.740160e-02
## 8 1.158497e-02
```

Condition Means for Analysis 2

The P600 effect when antecedents are co-indexed with *himself* or *herself.*

Significant Effects: **Referentiality; Referentiality x Gender Status**

Referentiality	Mean	SE	SD	Max	Min
Referential	0.49	0.19	1.66	4.45	-4.03
NonReferential	0.00	0.18	1.60	3.52	-4.29

Gender_Status	Mean	SE	SD	Max	Min
Gendered	0.34	0.18	1.56	4.45	-2.77
NonGendered	0.15	0.20	1.72	3.52	-4.29

Referentiality	Gender_Status	Group	Mean	SE	SD	Max	Min
Referential	Gendered	Binary	0.80	0.34	1.54	3.69	-2.35
Referential	Gendered	NonBinary	1.07	0.36	1.52	4.45	-1.26
Referential	NonGendered	Binary	0.20	0.40	1.80	3.52	-4.03
Referential	NonGendered	NonBinary	-0.10	0.38	1.60	3.51	-3.04
NonReferential	Gendered	Binary	-0.05	0.28	1.24	2.66	-1.96
NonReferential	Gendered	NonBinary	-0.46	0.37	1.56	3.52	-2.77
NonReferential	NonGendered	Binary	0.07	0.42	1.87	2.49	-4.29
NonReferential	NonGendered	NonBinary	0.44	0.39	1.65	3.18	-1.96

Post-hoc tests for Analysis 2: Gender Status x Referentiality

The following chunk runs post-hoc tests for the 3-way ***"Group x Gender Status x Referentiality"*** Interaction

"Some woman. . . themselves" vs. "Mary. . . themselves"

Table 12: Paired t-test: `diff_score` by `Referentiality`

Test statistic	df	P value	Alternative hypothesis	mean difference
3.366	37	0.001787 * *	two.sided	1.174

"Someone. . . themselves" vs. "The participant. . . themselves"

Table 13: Paired t-test: `diff_score` by `Referentiality`

Test statistic	df	P value	Alternative hypothesis	mean difference
-0.4705	37	0.6407	two.sided	-0.191

"The participant…themselves" vs. "Mary…themselves"

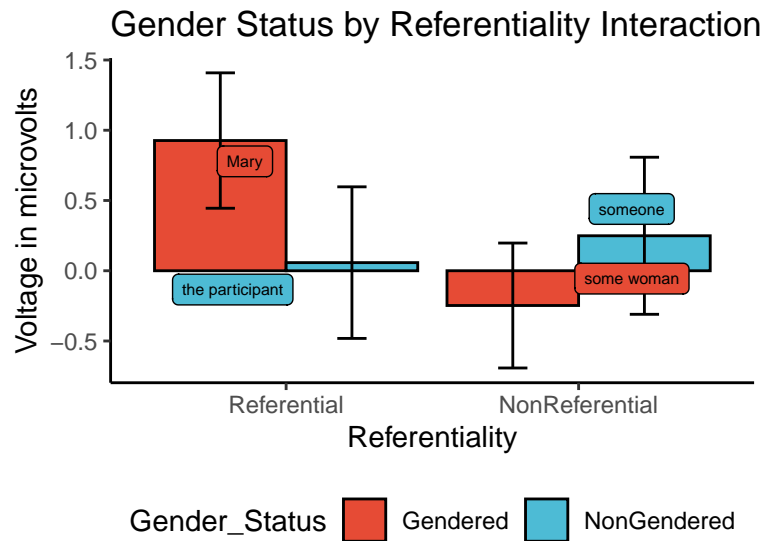Table 14: Paired t-test: `diff_score` by `Gender_Status`

Test statistic	df	P value	Alternative hypothesis	mean difference
2.157	37	0.03754 *	two.sided	0.8688

"Someone…themselves" vs. "Some woman…themselves"

Table 15: Paired t-test: `diff_score` by `Gender_Status`

Test statistic	df	P value	Alternative hypothesis	mean difference
-1.277	37	0.2097	two.sided	-0.4963

Interaction Plots: Gender Status by Referentiality *themselves*

Interaction broken down by Group *Binary* vs *Non-Binary*

Gender Status by Referentiality Interaction:

Gender Status by Referentiality Interaction: