Analyses

TODO discussion 2021-09-20

- why negative: because inverted u and a in 2 places, see chunk calc-space
- why different dfs: I wasn't doing the same analysis, now I am
- why different Fs: because the vss data was different (due to formula switch)
- explain about 2 rows that are excluded, & possible mismatch
- do we have pitch.txt & formant.txt outputted by script?
  - no, but we have output by mom! Alex to integrate
- we can also leave that be, since by now we are aligned in terms of means for point vowels?
  - no, because duration & pitch are incorrectly attributed
- not sure what to do about the fact that our vowel triangles don't look the same – how were those generated? perhaps they are not over the same tokens?
  - mystery solved! i and u based on all moms in both figures
  - what shall we do, single figure for all moms?
- "REAL" decisions:
  - removing outliers? – yes
  - removing items from f1/2 when no f0 – keeping them because they are not outliers
  - doing ANOVA first, then mixed model- agreed
  - (I don't think software matters!) - ANOVA in spss, lmer in r

interim done:

- switched input file, results are stable
- add confidence intervals to vowel space, incorporate results to paper

Replication

In this section, I'm just doing again the analyses that are already in the manuscript. Those were done with SPSS, so this is more replication than reproduction.

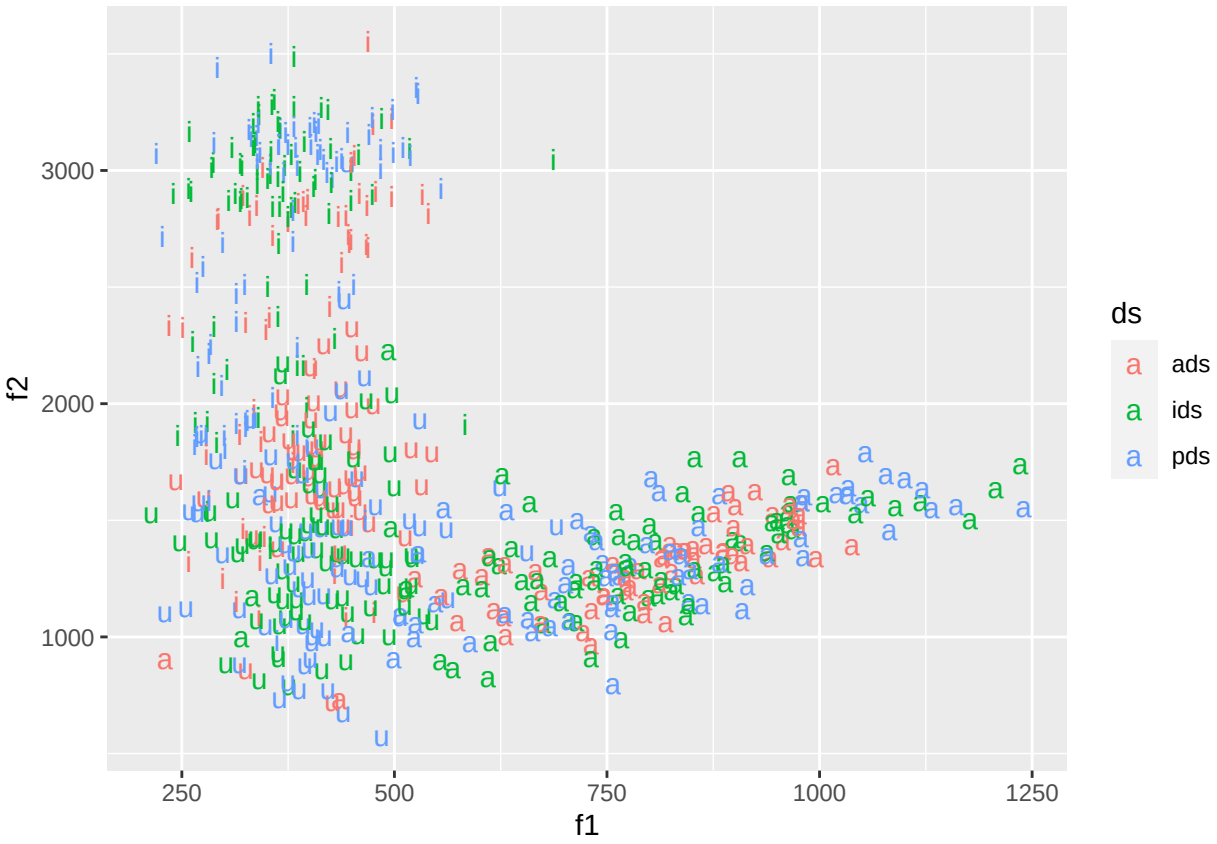
```
## [1] 614  11
```

Checking that we are getting the same means against the means in the xls file – we are.

Checking that we are getting the same means against the means in the sav file – we are.

Note there are no outliers:

```
## Warning: Removed 3 rows containing missing values (geom_text).
```




```
##
## ball bead boot  box
##  105  209  201   99
```

```
## [1] 614  16
```

```
## `summarise()` has grouped output by 'motID', 'ds', 'v', 'stim_group'. You can override using the `.g
```

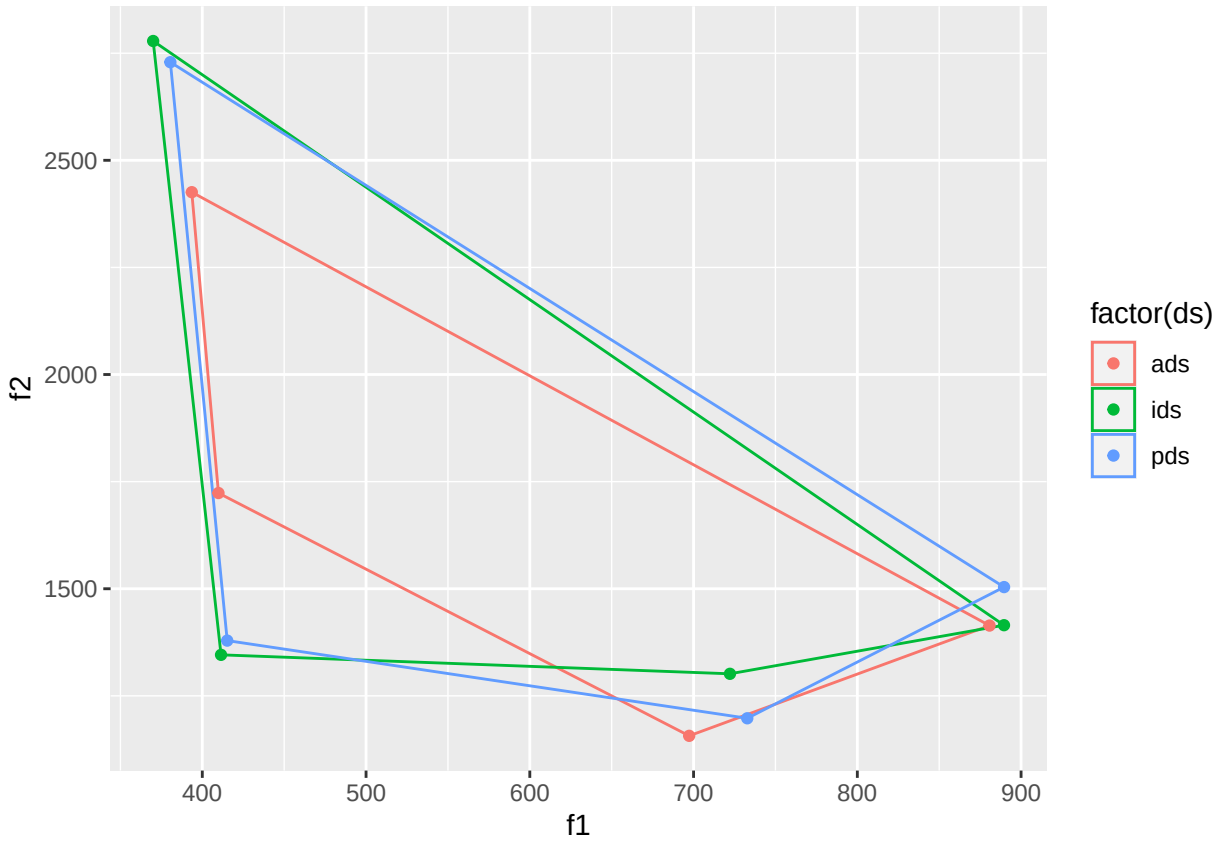
```
## `summarise()` has grouped output by 'ds', 'v'. You can override using the `.groups` argument.
```

```
## `summarise()` has grouped output by 'motID', 'ds'. You can override using the `.groups` argument.
```

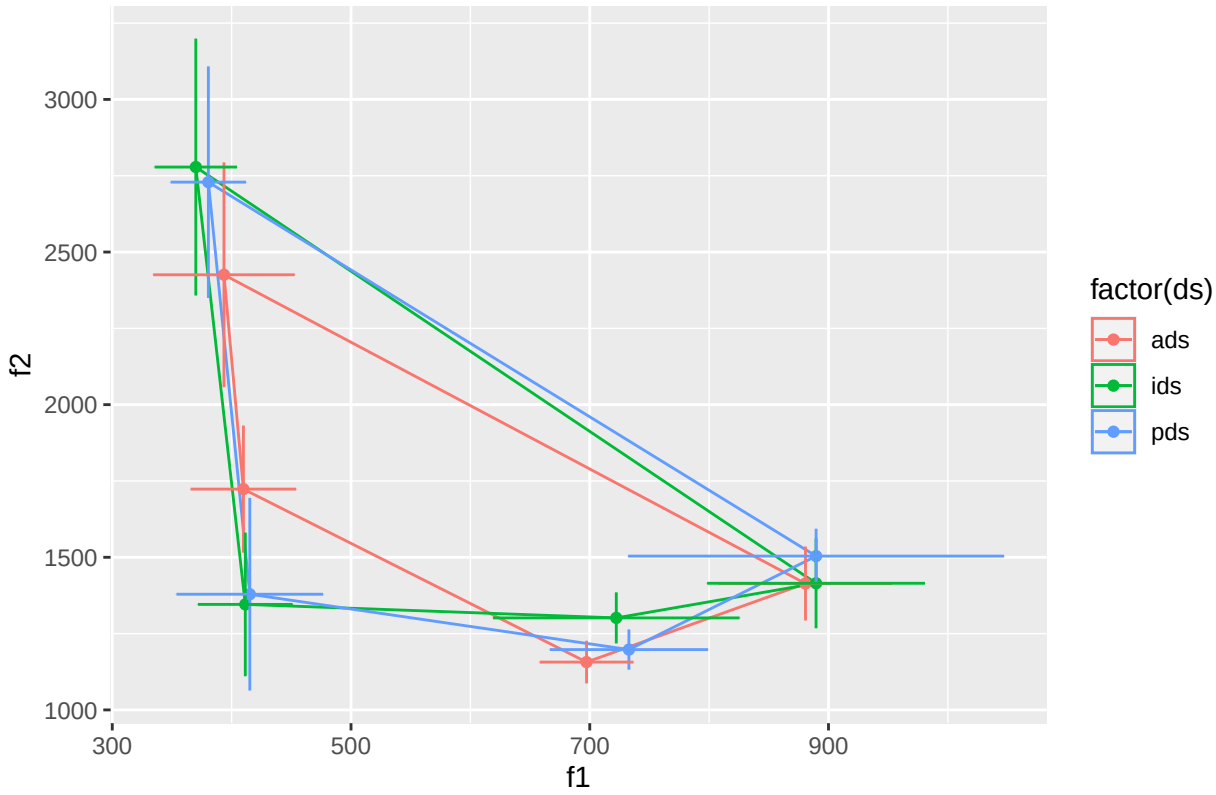
```
## `summarise()` has grouped output by 'ds'. You can override using the `.groups` argument.
## `summarise()` has grouped output by 'ds'. You can override using the `.groups` argument.
## `summarise()` has grouped output by 'ds'. You can override using the `.groups` argument.
```

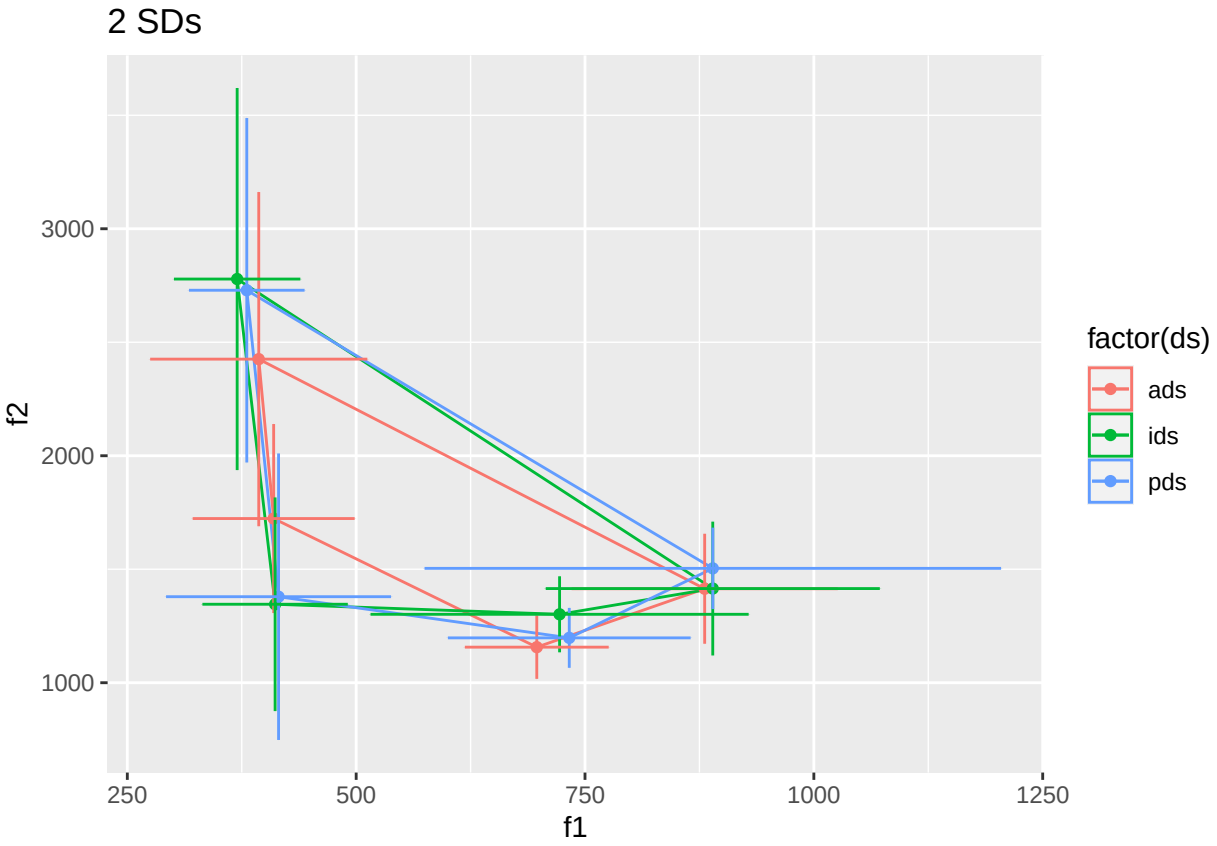
Fig vowel space

```
## pdf
##   2
```


2500
2000
1500
f2
400
500
600
700
800
900
f1
factor(ds)
ads
ids
pds

1 SDs


3000
2500
2000
1500
1000
f2
300
500
700
900
f1
factor(ds)
ads
ids
pds



Vowel space calculations

Next we calculate vowel space for each mom and register.

```
## # A tibble: 3 x 2
##   ds        vss
##   <chr>   <dbl>
## 1 ads   596848.
## 2 ids   886587.
## 3 pds   842918.
```

ANOVA

A within-subject analysis of variance (ANOVA) on average vowel space across listener conditions (3=IDS, PDS, ADS) revealed a significant main effect ($F(2,18) = 6.04$, $p < .02$), with paired contrasts indicating that the average vowel spaces for IDS and PDS were not significantly different, $t(9) = .98$, $p > .05$, but were both greater than the vowel space of ADS (IDS v. ADS, $t(9) = 3.79$, $p < .005$) and (PDS v. ADS, $t(9) = 2.24$, $p = .05$; see Figure 1a and b).

ANOVA: not the same F or dfs

explanations from Robin: "To conduct a repeated-measures ANOVA in SPSS, we do not specify the repeated-measures factor and the dependent variable in the SPSS data file. Instead, the SPSS data file contains several quantitative variables. The number of quantitative variables is equal to the number of levels of the within-subjects factor. The scores on any one of these quantitative variables are the scores on the dependent variable for a single level of the within-subjects factor. Although we do not define the within-subjects factor in

the SPSS data file, we specify it in the dialog box for the General Linear Model Repeated-Measures procedure. To define the factor, we give a name to the within-subjects factor, specify the number of levels of this factor, and indicate the quantitative variables in the data set associated with the levels of the within-subjects factor." and "the error term in the SPSS repeated measures model is (n-1) for sample (10-1=9) x (k-1) for the number of measures per sample (3-1=2); so 9 x 2 = 18 (for the denominator)."

```
## Anova Table (Type III tests)
##
## Response: vss
##                 Sum Sq Df F value    Pr(>F)
## (Intercept) 3.5623e+12  1 51.5874 1.005e-07 ***
## ds          4.8802e+11  2  3.5337   0.04334 *
## Residuals   1.8644e+12 27
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
## Warning: Converting "mom" to factor for ANOVA.
```

```
## Warning: Converting "ds" to factor for ANOVA.
```

```
##                               Length Class      Mode
## ANOVA                         9      data.frame list
## Mauchly's Test for Sphericity 4      data.frame list
## Sphericity Corrections        7      data.frame list
## aov                           3      aovlist    list
```

```
## Tables of means
## Grand mean
##
## 775451.3
##
##  ds
## ds
##    ads    ids    pds
## 596848 886587 842918
```

Paired contrasts – same pattern of results but different t values.

```
##
##  Paired t-test
##
## data:  vs$vss[vs$ds == "pds"] and vs$vss[vs$ds == "ids"]
## t = -0.4956, df = 9, p-value = 0.6321
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -242997.1  155658.9
## sample estimates:
## mean of the differences
##               -43669.08
```

```
##
## Cohen's d
##
## d estimate: 0.1559337 (negligible)
## 95 percent confidence interval:
##      lower      upper
## -0.7850539  1.0969214
```

```
##
##  Paired t-test
##
## data:  vs$vss[vs$ds == "ids"] and vs$vss[vs$ds == "ads"]
## t = 2.4351, df = 9, p-value = 0.03767
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##   20572.94 558905.61
## sample estimates:
## mean of the differences
##                289739.3
```

```
##
## Cohen's d
##
## d estimate: -1.121556 (large)
## 95 percent confidence interval:
##      lower      upper
## -2.1322879 -0.1108244
```

```
##
##  Paired t-test
##
## data:  vs$vss[vs$ds == "pds"] and vs$vss[vs$ds == "ads"]
## t = 1.9906, df = 9, p-value = 0.07773
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -33574.0 525714.4
## sample estimates:
## mean of the differences
##                246070.2
```

```
##
## Cohen's d
##
## d estimate: -0.9882865 (large)
## 95 percent confidence interval:
##        lower        upper
## -1.983551077  0.006978064
```

dur, f0, f1, f2

Duration and pitch can be done at the item level

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: Vowel.Duration ~ ds * target + (1 + ds | motID)
##    Data: dat
##
## REML criterion at convergence: -1202.6
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.5120 -0.5243 -0.0814  0.3421  5.3534
##
```

```
## Random effects:
##  Groups   Name        Variance  Std.Dev. Corr
##  motID    (Intercept) 0.0007915 0.02813
##           dsids       0.0049585 0.07042  0.71
##           dspds       0.0016792 0.04098  0.41 0.42
##  Residual             0.0067777 0.08233
## Number of obs: 614, groups:  motID, 10
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)         0.195420   0.018230  32.341259  10.720 3.54e-12 ***
## dsids               0.071922   0.031004  23.340307   2.320   0.0294 *
## dspds               0.028832   0.025617  43.263609   1.126   0.2666
## targetbead          0.014766   0.019373 253.452590   0.762   0.4467
## targetboot         -0.025244   0.019137 254.312247  -1.319   0.1883
## targetbox          -0.007169   0.022381  84.997033  -0.320   0.7495
## dsids:targetbead    0.018547   0.025530 371.954675   0.726   0.4680
## dspds:targetbead    0.008486   0.026016 382.948878   0.326   0.7445
## dsids:targetboot   -0.038286   0.025470 375.205621  -1.503   0.1336
## dspds:targetboot   -0.012732   0.026305 366.612811  -0.484   0.6287
## dsids:targetbox    -0.014377   0.031213 160.492273  -0.461   0.6457
## dspds:targetbox     0.008059   0.032281 166.800408   0.250   0.8032
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) dsids  dspds  trgtbd trgtbt trgtbx dsds:trgtbd dspds:trgtbd
## dsids        -0.183
## dspds        -0.426  0.457
## targetbead   -0.714  0.405  0.494
## targetboot   -0.723  0.410  0.500  0.677
## targetbox    -0.658  0.365  0.448  0.616  0.624
## dsds:trgtbd   0.528 -0.567 -0.370 -0.746 -0.501 -0.449
## dspds:trgtbd  0.521 -0.300 -0.711 -0.735 -0.494 -0.445  0.552
## dsds:trgtbt   0.529 -0.571 -0.371 -0.496 -0.738 -0.449  0.675       0.365
## dspds:trgtbt  0.512 -0.296 -0.717 -0.480 -0.715 -0.435  0.360       0.686
## dsds:trgtbx   0.446 -0.525 -0.312 -0.418 -0.423 -0.681  0.605       0.308
## dspds:trgtbx  0.436 -0.250 -0.640 -0.409 -0.414 -0.666  0.304       0.603
##              dsds:trgtbt dspds:trgtbt dsds:trgtbx
## dsids
## dspds
## targetbead
## targetboot
## targetbox
## dsds:trgtbd
## dspds:trgtbd
## dsds:trgtbt
## dspds:trgtbt  0.532
## dsds:trgtbx   0.609       0.303
## dspds:trgtbx  0.305       0.613        0.467

## Warning: NAs introduced by coercion

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
```

```
## Formula: Pitch ~ ds * target + (1 + ds | motID)
##    Data: dat
##
## REML criterion at convergence: 6746.6
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.3545 -0.5564 -0.1364  0.4836  8.8010
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  motID    (Intercept)  348.8   18.68
##           dsids       3636.3   60.30    -0.59
##           dspds       1946.0   44.11    -0.44  0.98
##  Residual             4369.5   66.10
## Number of obs: 606, groups:  motID, 10
##
## Fixed effects:
##                  Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)      200.1587    14.7500  42.3778  13.570   <2e-16 ***
## dsids             27.1051    26.6546  24.2858   1.017   0.3192
## dspds             46.6849    22.5136  31.7025   2.074   0.0463 *
## targetbead        -2.0223    16.1501 298.5380  -0.125   0.9004
## targetboot        11.7437    15.9741 294.1606   0.735   0.4628
## targetbox         -3.3188    18.8580 117.0155  -0.176   0.8606
## dsids:targetbead  16.4764    21.4548 503.9741   0.768   0.4429
## dspds:targetbead   0.1623    21.0737 336.0349   0.008   0.9939
## dsids:targetboot  25.0384    21.4710 504.4648   1.166   0.2441
## dspds:targetboot  11.1454    21.1429 288.3700   0.527   0.5985
## dsids:targetbox   10.9551    26.8979 343.5838   0.407   0.6841
## dspds:targetbox  -13.5956    25.4359 111.5193  -0.535   0.5941
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) dsids  dspds  trgtbd trgtbt trgtbx dsds:trgtbd dspds:trgtbd
## dsids        -0.660
## dspds        -0.630  0.768
## targetbead   -0.762  0.443  0.474
## targetboot   -0.772  0.449  0.479  0.701
## targetbox    -0.710  0.423  0.428  0.644  0.651
## dsds:trgtbd   0.595 -0.582 -0.395 -0.772 -0.546 -0.511
## dspds:trgtbd  0.562 -0.349 -0.651 -0.748 -0.517 -0.466  0.596
## dsds:trgtbt   0.597 -0.586 -0.397 -0.541 -0.765 -0.512  0.704       0.419
## dspds:trgtbt  0.554 -0.351 -0.653 -0.505 -0.730 -0.456  0.418       0.690
## dsds:trgtbx   0.536 -0.544 -0.371 -0.485 -0.491 -0.750  0.641       0.387
## dspds:trgtbx  0.485 -0.331 -0.573 -0.441 -0.445 -0.689  0.387       0.602
##              dsds:trgtbt dspds:trgtbt dsds:trgtbx
## dsids
## dspds
## targetbead
## targetboot
## targetbox
## dsds:trgtbd
```

```
## dspds:trgtbd
## dsds:trgtbt
## dspds:trgtbt  0.583
## dsds:trgtbx   0.645       0.390
## dspds:trgtbx  0.389       0.605        0.586
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: f1 ~ ds * target + (1 + ds | motID)
##    Data: dat
##
## REML criterion at convergence: 7352.5
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.9580 -0.5054 -0.0140  0.5005  3.6533
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  motID    (Intercept)  1802     42.46
##           dsids        1336     36.55   -0.69
##           dspds        2056     45.35   -0.75  0.75
##  Residual             11086    105.29
## Number of obs: 611, groups:  motID, 10
##
## Fixed effects:
##                  Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)        716.49      25.49   40.48  28.106  < 2e-16 ***
## dsids               16.74      30.00   45.67   0.558    0.580
## dspds               38.90      32.50   49.79   1.197    0.237
## targetbead        -322.74      25.82  458.13 -12.498  < 2e-16 ***
## targetboot        -306.20      25.51  458.03 -12.005  < 2e-16 ***
## targetbox          146.59      31.04  264.54   4.723 3.78e-06 ***
## dsids:targetbead   -38.79      33.04  424.12  -1.174    0.241
## dspds:targetbead   -55.05      34.15  492.90  -1.612    0.108
## dsids:targetboot   -12.69      32.94  417.43  -0.385    0.700
## dspds:targetboot   -35.35      34.39  447.67  -1.028    0.305
## dsids:targetbox    -12.15      40.21  148.61  -0.302    0.763
## dspds:targetbox    -37.64      42.66  239.88  -0.882    0.378
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) dsids  dspds  trgtbd trgtbt trgtbx dsds:trgtbd dspds:trgtbd
## dsids        -0.731
## dspds        -0.736  0.602
## targetbead   -0.707  0.579  0.550
## targetboot   -0.716  0.586  0.557  0.701
## targetbox    -0.666  0.535  0.516  0.652  0.659
## dsds:trgtbd   0.538 -0.758 -0.428 -0.767 -0.534 -0.489
## dspds:trgtbd  0.532 -0.446 -0.749 -0.753 -0.528 -0.489  0.584
## dsds:trgtbt   0.539 -0.762 -0.429 -0.528 -0.759 -0.489  0.683       0.404
## dspds:trgtbt  0.527 -0.445 -0.753 -0.516 -0.738 -0.483  0.402       0.701
## dsds:trgtbx   0.486 -0.694 -0.395 -0.476 -0.482 -0.734  0.613       0.369
```

```
## dspds:trgtbx  0.479 -0.404 -0.679 -0.469 -0.474 -0.720  0.364       0.625
##              dsds:trgtbt dspds:trgtbt dsds:trgtbx
## dsids
## dspds
## targetbead
## targetboot
## targetbox
## dsds:trgtbd
## dspds:trgtbd
## dsds:trgtbt
## dspds:trgtbt  0.569
## dsds:trgtbx   0.616       0.369
## dspds:trgtbx  0.364       0.632        0.552
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: f2 ~ ds * target + (1 | motID)
##    Data: dat
##
## REML criterion at convergence: 8892.5
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.3784 -0.4657  0.0809  0.6162  3.5867
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  motID    (Intercept)  20970   144.8
##  Residual             146885   383.3
## Number of obs: 611, groups:  motID, 10
##
## Fixed effects:
##                  Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)      1215.902     86.546   77.610  14.049  < 2e-16 ***
## dsids             121.682     92.610  589.882   1.314  0.18938
## dspds               5.147     96.225  590.271   0.053  0.95736
## targetbead       1166.371     89.679  597.501  13.006  < 2e-16 ***
## targetboot        500.447     88.580  597.450   5.650 2.49e-08 ***
## targetbox         189.969    103.213  598.231   1.841  0.06618 .
## dsids:targetbead  277.876    114.914  590.458   2.418  0.01590 *
## dspds:targetbead  327.536    117.963  590.915   2.777  0.00567 **
## dsids:targetboot -454.262    114.473  590.218  -3.968 8.13e-05 ***
## dspds:targetboot -330.646    117.766  590.092  -2.808  0.00516 **
## dsids:targetbox  -139.676    131.426  590.281  -1.063  0.28832
## dspds:targetbox    65.126    137.244  590.525   0.475  0.63530
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) dsids  dspds  trgtbd trgtbt trgtbx dsds:trgtbd dspds:trgtbd
## dsids        -0.613
## dspds        -0.592  0.551
## targetbead   -0.692  0.592  0.572
## targetboot   -0.701  0.599  0.578  0.674
```

```
## targetbox    -0.637  0.514  0.496  0.612  0.619
## dsds:trgtbd   0.507 -0.806 -0.445 -0.749 -0.495 -0.431
## dspds:trgtbd  0.495 -0.450 -0.817 -0.731 -0.483 -0.422  0.563
## dsds:trgtbt   0.507 -0.809 -0.446 -0.488 -0.740 -0.430  0.654       0.365
## dspds:trgtbt  0.485 -0.450 -0.816 -0.469 -0.713 -0.408  0.364       0.667
## dsds:trgtbx   0.432 -0.705 -0.389 -0.416 -0.422 -0.691  0.567       0.317
## dspds:trgtbx  0.415 -0.387 -0.701 -0.401 -0.405 -0.664  0.312       0.573
##              dsds:trgtbt dspds:trgtbt dsds:trgtbx
## dsids
## dspds
## targetbead
## targetboot
## targetbox
## dsds:trgtbd
## dspds:trgtbd
## dsds:trgtbt
## dspds:trgtbt  0.549
## dsds:trgtbx   0.570       0.317
## dspds:trgtbx  0.312       0.572        0.522
```

Variability analyses

Get standard deviation of f1 and f2, separating by mom and register.

```
## `summarise()` has grouped output by 'motID', 'ds'. You can override using the `.groups` argument.
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: f1.sd ~ ds * target + (1 | motID)
##    Data: sds
##
## REML criterion at convergence: 803.1
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.5964 -0.5157  0.0173  0.4615  3.2291
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  motID    (Intercept)   95.23   9.758
##  Residual             1211.56  34.807
## Number of obs: 90, groups:  motID, 10
##
## Fixed effects:
##                  Estimate Std. Error     df t value Pr(>|t|)
## (Intercept)        112.08      17.95  77.95   6.245 2.07e-08 ***
## dsids              -10.49      24.61  69.22  -0.426 0.671215
## dspds               37.71      24.61  69.22   1.532 0.130086
## targetbead         -62.41      20.83  73.75  -2.997 0.003716 **
## targetboot         -69.92      20.83  73.75  -3.357 0.001247 **
## targetbox          -50.30      23.06  77.33  -2.181 0.032210 *
## dsids:targetbead    21.06      29.12  69.22   0.723 0.472112
## dspds:targetbead   -15.93      29.12  69.22  -0.547 0.586190
## dsids:targetboot    19.44      29.12  69.22   0.667 0.506734
```

```
## dspds:targetboot   -11.49      29.12  69.22  -0.394 0.694478
## dsids:targetbox    111.52      31.77  69.22   3.510 0.000794 ***
## dspds:targetbox     70.58      31.77  69.22   2.221 0.029616 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) dsids  dspds  trgtbd trgtbt trgtbx dsds:trgtbd dspds:trgtbd
## dsids        -0.686
## dspds        -0.686  0.500
## targetbead   -0.836  0.591  0.591
## targetboot   -0.836  0.591  0.591  0.721
## targetbox    -0.771  0.534  0.534  0.664  0.664
## dsds:trgtbd   0.580 -0.845 -0.423 -0.699 -0.499 -0.451
## dspds:trgtbd  0.580 -0.423 -0.845 -0.699 -0.499 -0.451  0.500
## dsds:trgtbt   0.580 -0.845 -0.423 -0.499 -0.699 -0.451  0.714       0.357
## dspds:trgtbt  0.580 -0.423 -0.845 -0.499 -0.699 -0.451  0.357       0.714
## dsds:trgtbx   0.531 -0.775 -0.387 -0.458 -0.458 -0.689  0.655       0.327
## dspds:trgtbx  0.531 -0.387 -0.775 -0.458 -0.458 -0.689  0.327       0.655
##              dsds:trgtbt dspds:trgtbt dsds:trgtbx
## dsids
## dspds
## targetbead
## targetboot
## targetbox
## dsds:trgtbd
## dspds:trgtbd
## dsds:trgtbt
## dspds:trgtbt  0.500
## dsds:trgtbx   0.655       0.327
## dspds:trgtbx  0.327       0.655        0.500

## boundary (singular) fit: see ?isSingular

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: f2.sd ~ ds * target + (1 | motID)
##    Data: sds
##
## REML criterion at convergence: 1019.6
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.7122 -0.5822 -0.0900  0.4701  3.3161
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  motID    (Intercept)     0      0.0
##  Residual             20638    143.7
## Number of obs: 90, groups:  motID, 10
##
## Fixed effects:
##                  Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)        121.25      71.83   78.00   1.688  0.09541 .
## dsids               80.26     101.58   78.00   0.790  0.43189
```

```
## dspds               42.89     101.58   78.00   0.422  0.67400
## targetbead         488.77      84.99   78.00   5.751 1.65e-07 ***
## targetboot          65.34      84.99   78.00   0.769  0.44435
## targetbox          -45.07      92.73   78.00  -0.486  0.62831
## dsids:targetbead  -396.78     120.20   78.00  -3.301  0.00145 **
## dspds:targetbead  -212.95     120.20   78.00  -1.772  0.08035 .
## dsids:targetboot   -29.54     120.20   78.00  -0.246  0.80654
## dspds:targetboot    50.50     120.20   78.00   0.420  0.67553
## dsids:targetbox     31.85     131.14   78.00   0.243  0.80876
## dspds:targetbox     21.80     131.14   78.00   0.166  0.86843
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) dsids  dspds  trgtbd trgtbt trgtbx dsds:trgtbd dspds:trgtbd
## dsids        -0.707
## dspds        -0.707  0.500
## targetbead   -0.845  0.598  0.598
## targetboot   -0.845  0.598  0.598  0.714
## targetbox    -0.775  0.548  0.548  0.655  0.655
## dsds:trgtbd   0.598 -0.845 -0.423 -0.707 -0.505 -0.463
## dspds:trgtbd  0.598 -0.423 -0.845 -0.707 -0.505 -0.463  0.500
## dsds:trgtbt   0.598 -0.845 -0.423 -0.505 -0.707 -0.463  0.714       0.357
## dspds:trgtbt  0.598 -0.423 -0.845 -0.505 -0.707 -0.463  0.357       0.714
## dsds:trgtbx   0.548 -0.775 -0.387 -0.463 -0.463 -0.707  0.655       0.327
## dspds:trgtbx  0.548 -0.387 -0.775 -0.463 -0.463 -0.707  0.327       0.655
##              dsds:trgtbt dspds:trgtbt dsds:trgtbx
## dsids
## dspds
## targetbead
## targetboot
## targetbox
## dsds:trgtbd
## dspds:trgtbd
## dsds:trgtbt
## dspds:trgtbt  0.500
## dsds:trgtbx   0.655       0.327
## dspds:trgtbx  0.327       0.655        0.500
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```