Exp 2 - Control-Response Analysis

Carolyn Ritchey

08/03/2021

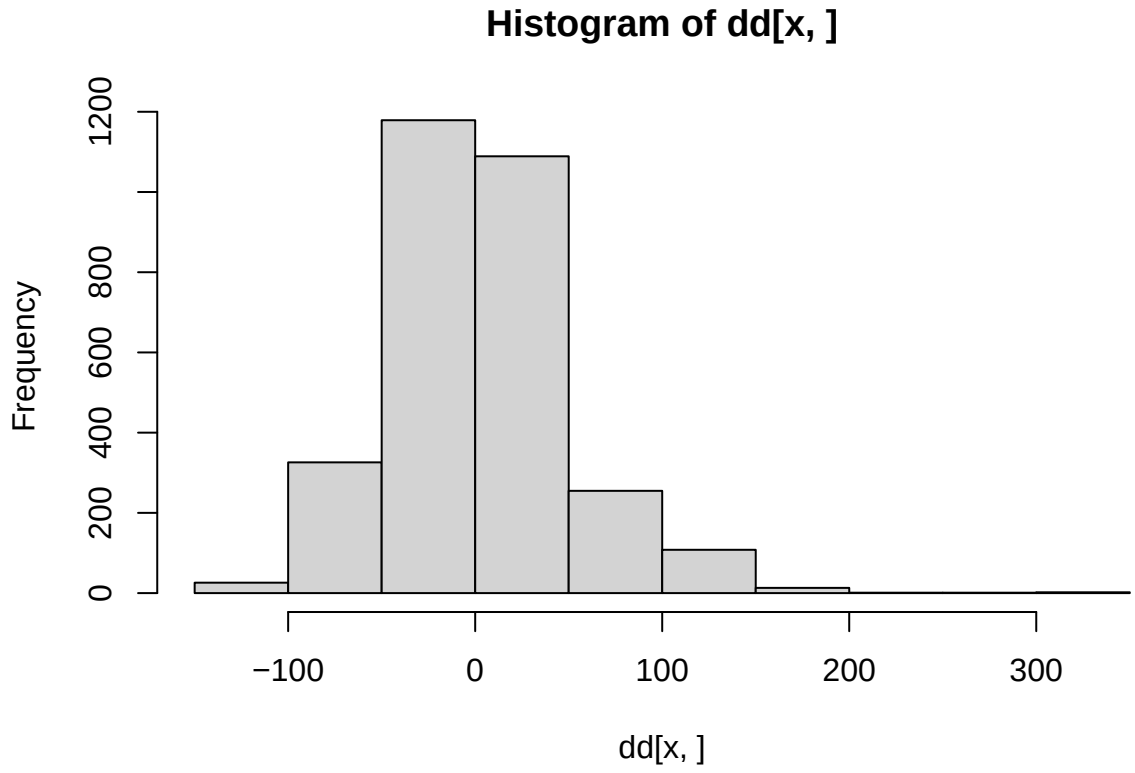
```
## Data: CC2Target
## Models:
## e2.ControlvTarget1: RespRate ~ Phase + ResponseType + (1 | ID)
## e2.ControlvTarget2: RespRate ~ Phase * ResponseType + (1 | ID)
##                    npar   AIC   BIC logLik deviance  Chisq Df Pr(>Chisq)
## e2.ControlvTarget1    6 47027 47066 -23508    47015
## e2.ControlvTarget2    8 46492 46543 -23238    46476 539.43  2  < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: RespRate ~ Phase * ResponseType + (1 | ID)
##    Data: CC2Target
##
##      AIC      BIC   logLik deviance df.resid
##  46491.8  46542.9 -23237.9  46475.8     4392
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.0463 -0.6917  0.0075  0.4262  6.8982
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  ID       (Intercept)  798.3   28.25
##  Residual             2121.1   46.05
## Number of obs: 4400, groups:  ID, 100
##
## Fixed effects:
##                            Estimate Std. Error t value
## (Intercept)                 19.9933     3.0654   6.522
## Phase2                       2.3667     2.3783   0.995
## Phase3                       0.4817     3.4669   0.139
## ResponseTypeTarget          81.3000     1.6817  48.344
## Phase2:ResponseTypeTarget -74.1500     3.3634 -22.046
## Phase3:ResponseTypeTarget -64.0250     4.9029 -13.059
##
## Correlation of Fixed Effects:
##             (Intr) Phase2 Phase3 RspnTT P2:RTT
## Phase2      -0.194
## Phase3      -0.133  0.171
## RspnsTypTrg -0.274  0.354  0.243
## Phs2:RspnTT  0.137 -0.707 -0.121 -0.500
## Phs3:RspnTT  0.094 -0.121 -0.707 -0.343  0.171
```

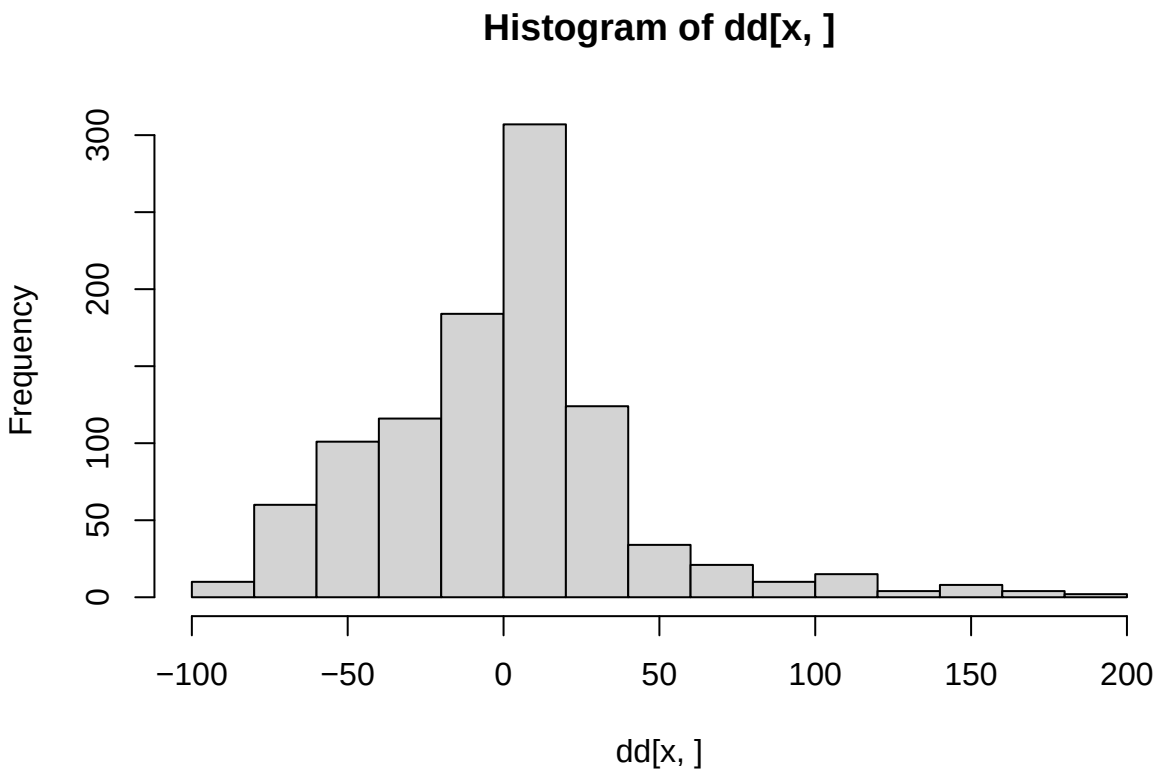
Fixed effects

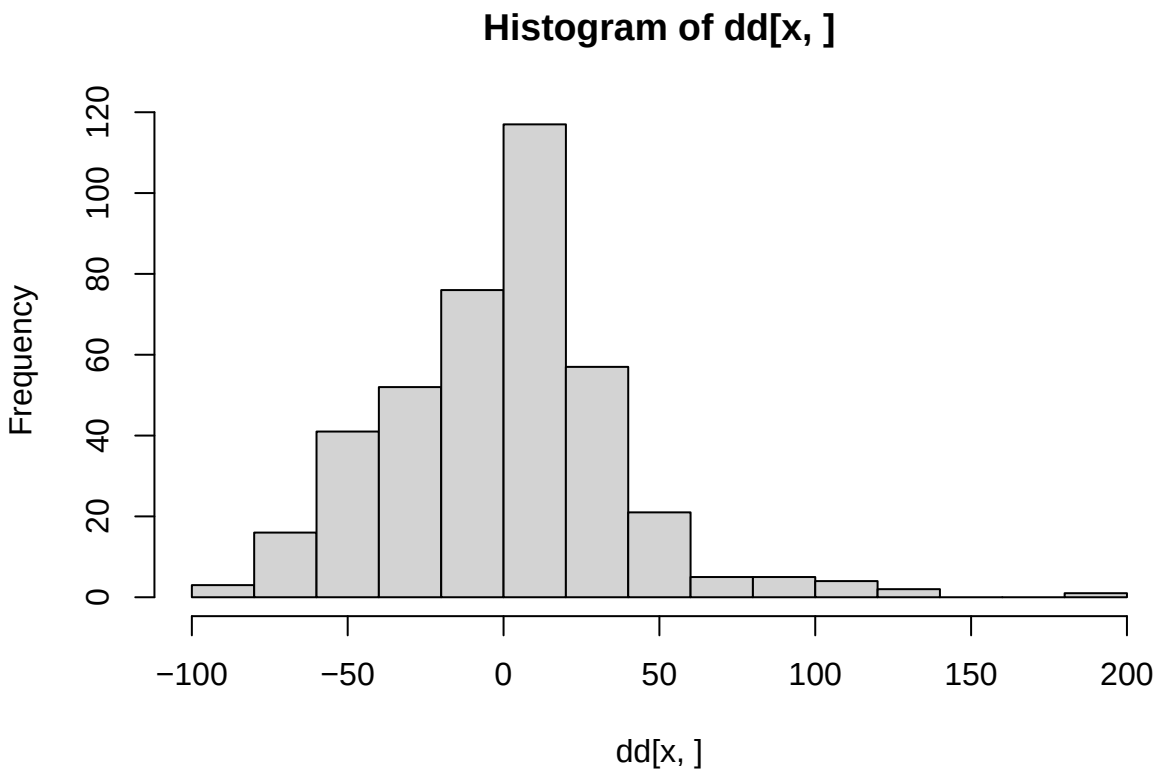
```
## Registered S3 methods overwritten by 'car':
##   method                          from
##   influence.merMod                lme4
##   cooks.distance.influence.merMod lme4
##   dfbeta.influence.merMod         lme4
##   dfbetas.influence.merMod        lme4
```

```
## Analysis of Deviance Table (Type II Wald chisquare tests)
##
## Response: RespRate
##                       Chisq Df Pr(>Chisq)
## Phase                515.51  2  < 2.2e-16 ***
## ResponseType        1782.54  1  < 2.2e-16 ***
## Phase:ResponseType   574.72  2  < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```



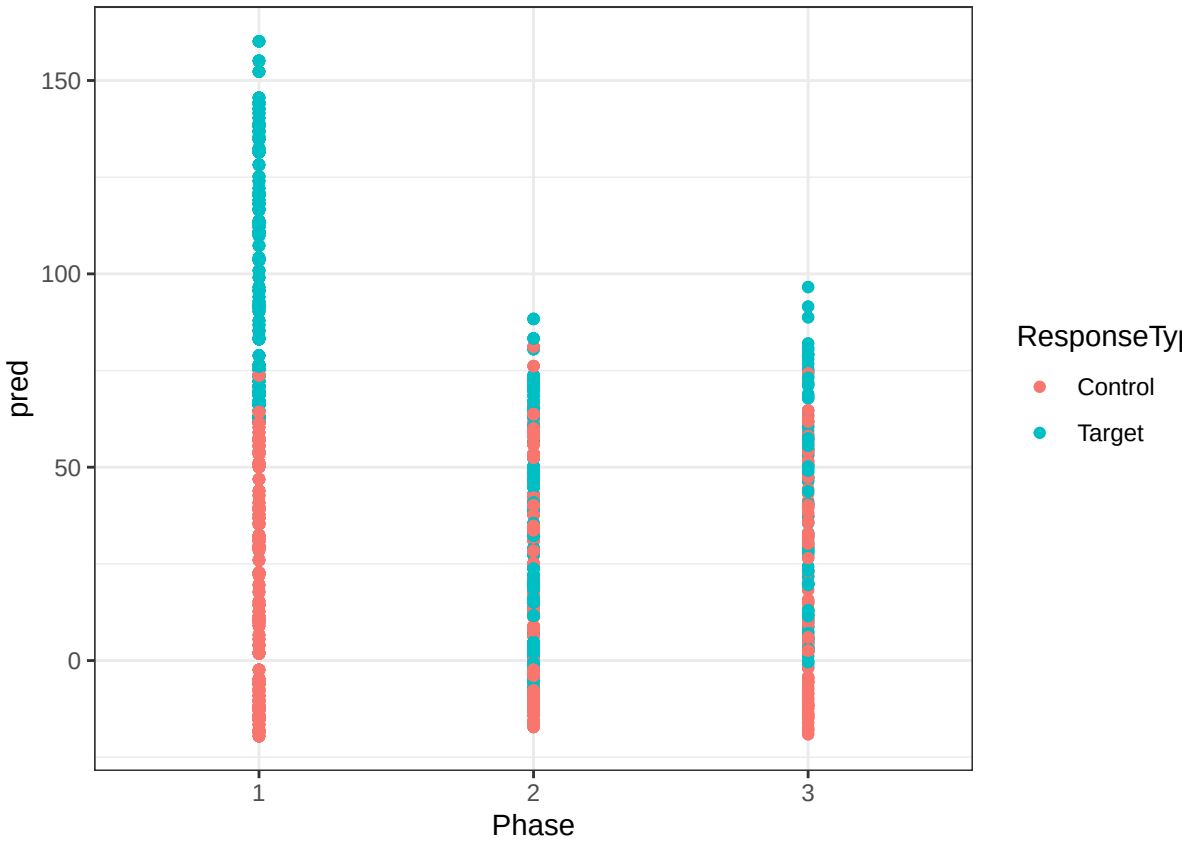
Checking residuals


Histogram of dd[x,]
Frequency
0
50
100
200
300
−100
−50
0
50
100
150
200
dd[x,]



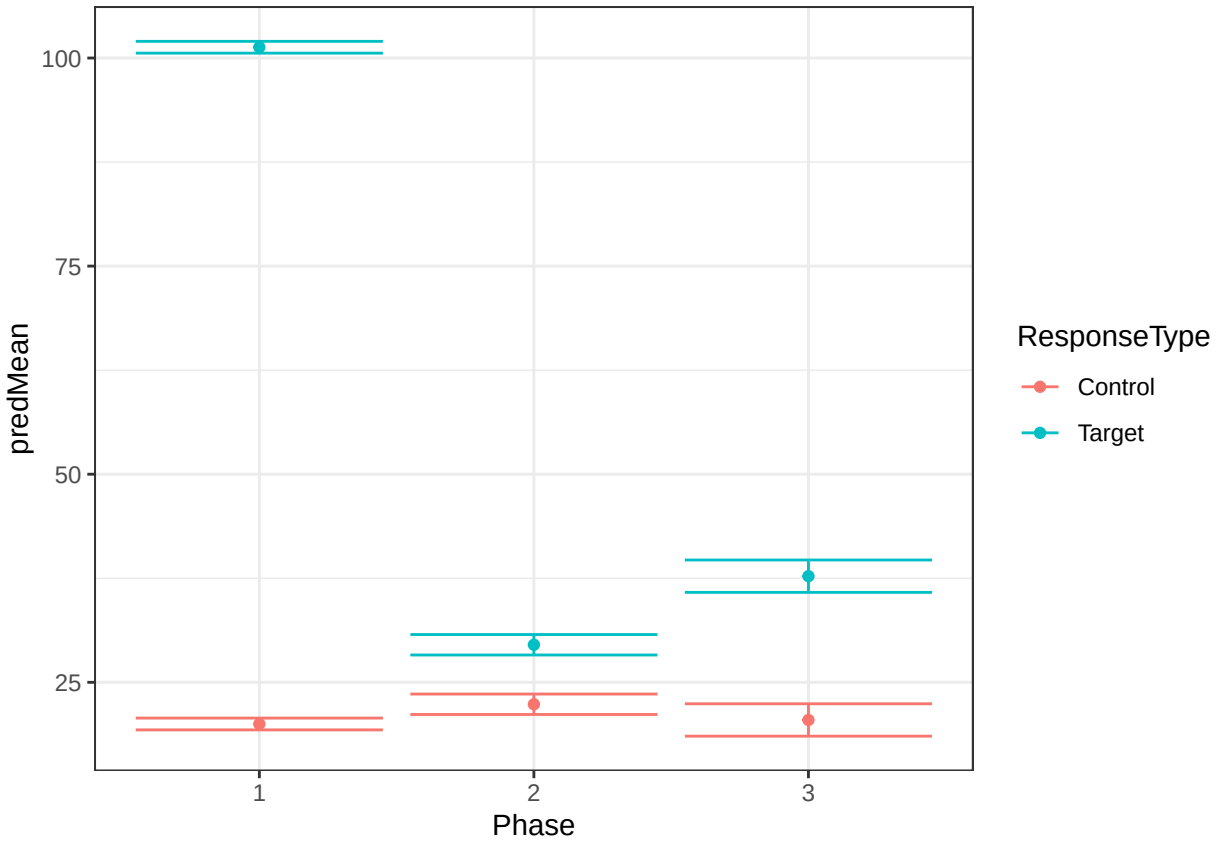

```
## CC2Target$Phase: 1
## $breaks
##  [1] -150 -100  -50    0   50  100  150  200  250  300  350
##
## $counts
##  [1]   26  326 1179 1089  255  108   13    1    1    2
##
## $density
##  [1] 1.733333e-04 2.173333e-03 7.860000e-03 7.260000e-03 1.700000e-03
##  [6] 7.200000e-04 8.666667e-05 6.666667e-06 6.666667e-06 1.333333e-05
##
## $mids
##  [1] -125  -75  -25   25   75  125  175  225  275  325
##
## $xname
## [1] "dd[x, ]"
##
## $equidist
## [1] TRUE
##
## attr(,"class")
## [1] "histogram"
## ------------------------------------------------------------
## CC2Target$Phase: 2
## $breaks
##  [1] -100  -80  -60  -40  -20    0   20   40   60   80  100  120  140  160  180
```

```
## [16]  200
##
## $counts
##  [1]  10  60 101 116 184 307 124  34  21  10  15   4   8   4   2
##
## $density
##  [1] 0.00050 0.00300 0.00505 0.00580 0.00920 0.01535 0.00620 0.00170 0.00105
## [10] 0.00050 0.00075 0.00020 0.00040 0.00020 0.00010
##
## $mids
##  [1] -90 -70 -50 -30 -10  10  30  50  70  90 110 130 150 170 190
##
## $xname
## [1] "dd[x, ]"
##
## $equidist
## [1] TRUE
##
## attr(,"class")
## [1] "histogram"
## ------------------------------------------------------------
## CC2Target$Phase: 3
## $breaks
##  [1] -100  -80  -60  -40  -20    0   20   40   60   80  100  120  140  160  180
## [16]  200
##
## $counts
##  [1]   3  16  41  52  76 117  57  21   5   5   4   2   0   0   1
##
## $density
##  [1] 0.000375 0.002000 0.005125 0.006500 0.009500 0.014625 0.007125 0.002625
##  [9] 0.000625 0.000625 0.000500 0.000250 0.000000 0.000000 0.000125
##
## $mids
##  [1] -90 -70 -50 -30 -10  10  30  50  70  90 110 130 150 170 190
##
## $xname
## [1] "dd[x, ]"
##
## $equidist
## [1] TRUE
##
## attr(,"class")
## [1] "histogram"
```



looking @ predictions

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



specific comparisons

```
## $emmeans
## ResponseType = Control:
##  Phase emmean   SE  df lower.CL upper.CL
##  1       20.0 3.08 124     13.9     26.1
##  2       22.4 3.51 210     15.4     29.3
##  3       20.5 4.32 471     12.0     29.0
##
## ResponseType = Target:
##  Phase emmean   SE  df lower.CL upper.CL
##  1      101.3 3.08 124     95.2    107.4
##  2       29.5 3.51 210     22.6     36.4
##  3       37.8 4.32 471     29.3     46.2
##
## Degrees-of-freedom method: kenward-roger
## Confidence level used: 0.95
##
## $contrasts
## ResponseType = Control:
##  contrast estimate   SE   df t.ratio p.value
##  1 - 2      -2.367 2.38 4305 -0.995  0.3200
##  1 - 3      -0.482 3.47 4305 -0.139  0.8896
##  2 - 3       1.885 3.86 4305  0.489  0.6249
##
## ResponseType = Target:
##  contrast estimate   SE   df t.ratio p.value
```

```
##  1 - 2      71.783 2.38 4305 30.165  <.0001
##  1 - 3      63.543 3.47 4305 18.318  <.0001
##  2 - 3      -8.240 3.86 4305 -2.137  0.0326
##
## Degrees-of-freedom method: kenward-roger
```

```
## $emmeans
## Phase = 1:
##  ResponseType emmean   SE  df lower.CL upper.CL
##  Control        20.0 3.08 124     13.9     26.1
##  Target        101.3 3.08 124     95.2    107.4
##
## Phase = 2:
##  ResponseType emmean   SE  df lower.CL upper.CL
##  Control        22.4 3.51 210     15.4     29.3
##  Target         29.5 3.51 210     22.6     36.4
##
## Phase = 3:
##  ResponseType emmean   SE  df lower.CL upper.CL
##  Control        20.5 4.32 471     12.0     29.0
##  Target         37.8 4.32 471     29.3     46.2
##
## Degrees-of-freedom method: kenward-roger
## Confidence level used: 0.95
##
## $contrasts
## Phase = 1:
##  contrast         estimate   SE   df t.ratio p.value
##  Control - Target   -81.30 1.68 4305 -48.316 <.0001
##
## Phase = 2:
##  contrast         estimate   SE   df t.ratio p.value
##  Control - Target    -7.15 2.91 4305  -2.453 0.0142
##
## Phase = 3:
##  contrast         estimate   SE   df t.ratio p.value
##  Control - Target   -17.27 4.61 4305  -3.749 0.0002
##
## Degrees-of-freedom method: kenward-roger
```

Conclusion: No statistically significant increases in control responses from Phase 2 to Phase 3. Control responses remained low throughout the experiment.