MWM Analysis

Anna MacFarlane

```
## Analysis of Variance Table
##                      npar   Sum Sq  Mean Sq F value
## Stage                   1 0.264193 0.264193 24.8948
## APOE                    6 0.139758 0.023293  2.1949
## Sex                     1 0.000478 0.000478  0.0450
## Diet                    1 0.111274 0.111274 10.4853
## Stage:APOE              6 0.032026 0.005338  0.5030
## Stage:Sex               1 0.031294 0.031294  2.9488
## APOE:Sex                6 0.112192 0.018699  1.7620
## Stage:Diet              1 0.022941 0.022941  2.1617
## APOE:Diet               3 0.101812 0.033937  3.1979
## Sex:Diet                1 0.016718 0.016718  1.5753
## Stage:APOE:Sex          6 0.032211 0.005369  0.5059
## Stage:APOE:Diet         3 0.002704 0.000901  0.0849
## Stage:Sex:Diet          1 0.001843 0.001843  0.1736
## APOE:Sex:Diet           2 0.000171 0.000085  0.0080
## Stage:APOE:Sex:Diet     2 0.025896 0.012948  1.2201
```

```
##  contrast      estimate     SE  df t.ratio p.value
##  Female - Male -0.00454 0.0184 292  -0.247  0.8051
##
## Results are averaged over the levels of: APOE
```

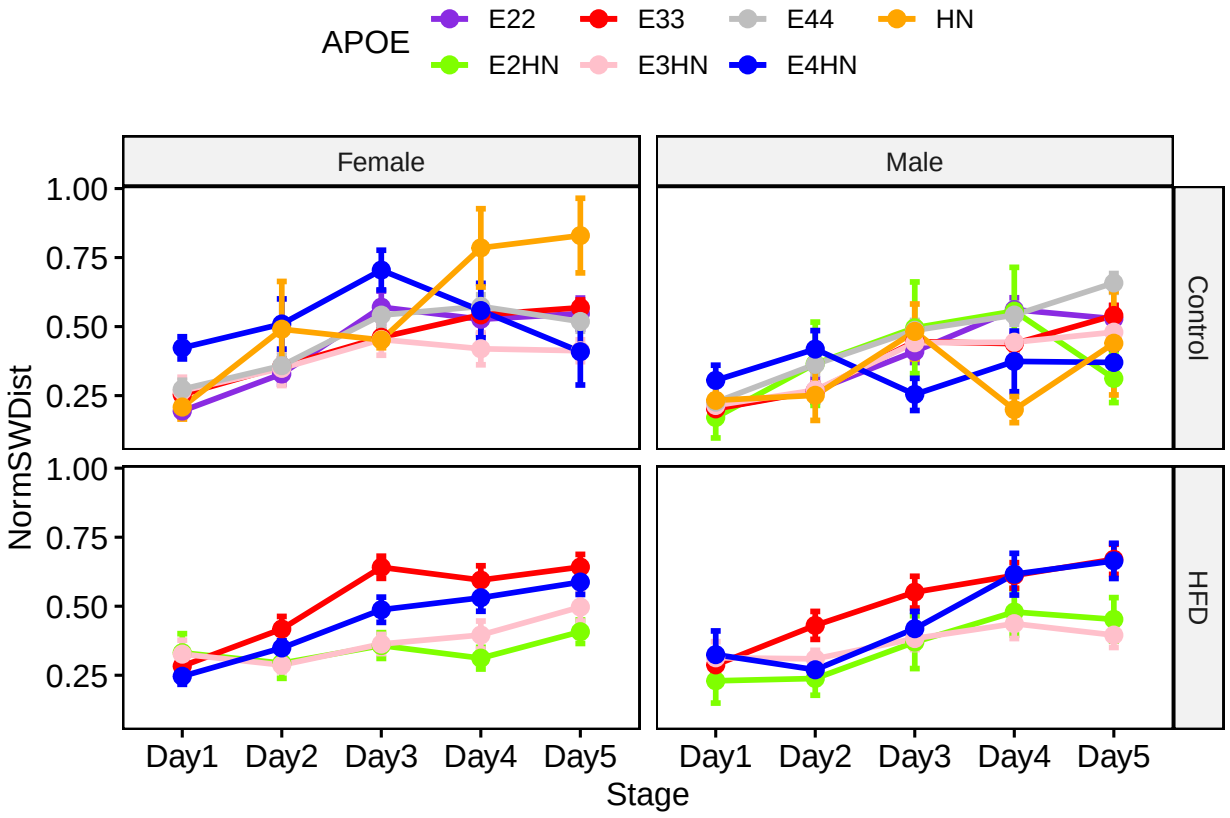
```
## Linear mixed model fit by REML ['lmerMod']
## Formula: NormSWDist ~ Stage * APOE * Sex * Diet + (1 | Animal)
##    Data: probe_trials
##
## REML criterion at convergence: -227.4
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.05286 -0.49505  0.02678  0.47553  2.57501
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  Animal   (Intercept) 0.01112  0.1054
##  Residual             0.01061  0.1030
## Number of obs: 300, groups:  Animal, 150
##
## Fixed effects:
##                                      Estimate Std. Error t value
## (Intercept)                          0.453771   0.052119   8.706
## StageProbe_D8                       -0.027854   0.051508  -0.541
## APOEE2HN                            -0.042318   0.267839  -0.158
```

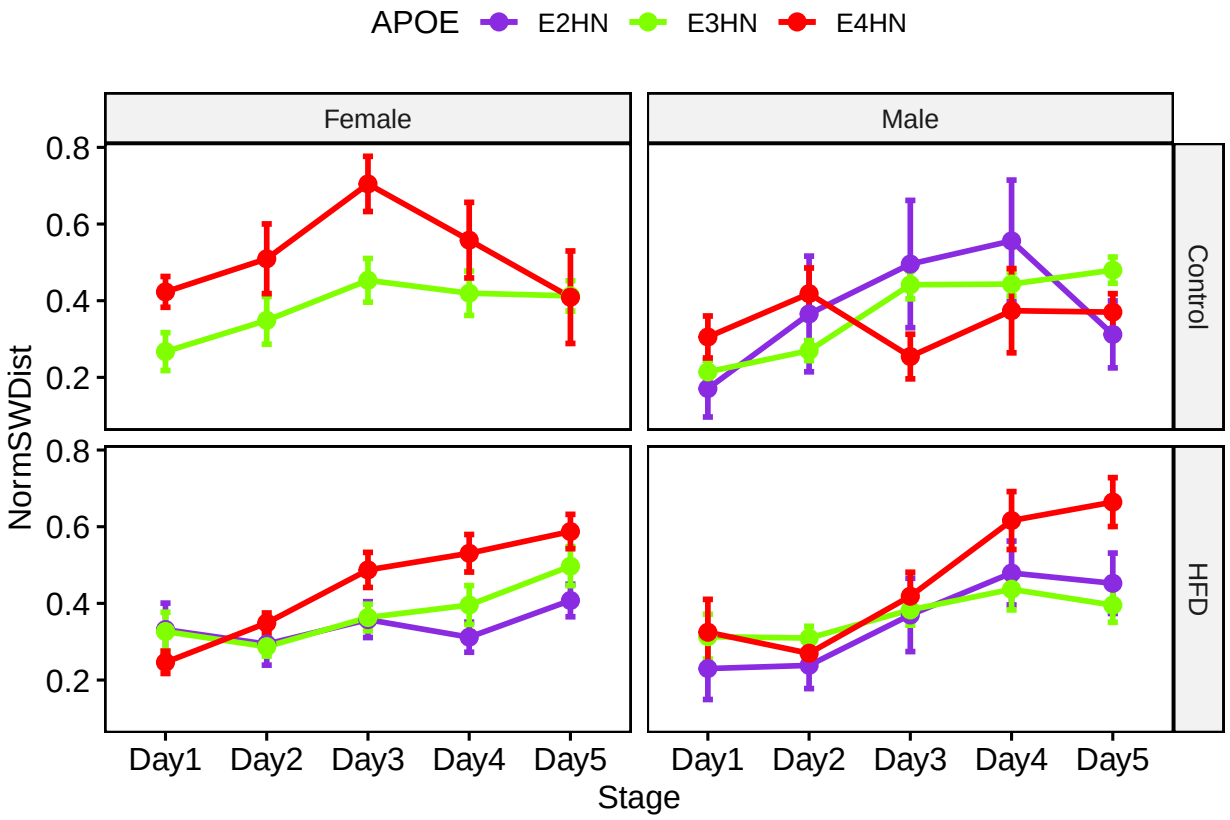
```
## APOEE33                                  -0.018873   0.059880  -0.315
## APOEE3HN                                 -0.052987   0.079613  -0.666
## APOEE44                                  -0.004948   0.069925  -0.071
## APOEE4HN                                 -0.090720   0.116541  -0.778
## APOEHN                                    0.210931   0.156356   1.349
## SexMale                                  -0.008881   0.069925  -0.127
## DietHFD                                   0.194423   0.118194   1.645
## StageProbe_D8:APOEE2HN                    0.062442   0.264702   0.236
## StageProbe_D8:APOEE33                    -0.029197   0.059178  -0.493
## StageProbe_D8:APOEE3HN                   -0.033956   0.078680  -0.432
## StageProbe_D8:APOEE44                    -0.032199   0.069106  -0.466
## StageProbe_D8:APOEE4HN                   -0.008777   0.115176  -0.076
## StageProbe_D8:APOEHN                      0.068323   0.154525   0.442
## StageProbe_D8:SexMale                    -0.092360   0.069106  -1.337
## APOEE2HN:SexMale                          0.188971   0.228429   0.827
## APOEE33:SexMale                           0.104944   0.085504   1.227
## APOEE3HN:SexMale                          0.022586   0.100317   0.225
## APOEE44:SexMale                           0.050886   0.093457   0.544
## APOEE4HN:SexMale                          0.065908   0.163157   0.404
## APOEHN:SexMale                           -0.464123   0.219889  -2.111
## StageProbe_D8:DietHFD                    -0.008157   0.116810  -0.070
## APOEE2HN:DietHFD                         -0.237098   0.225178  -1.053
## APOEE33:DietHFD                          -0.011052   0.133953  -0.083
## APOEE3HN:DietHFD                         -0.205805   0.143861  -1.431
## SexMale:DietHFD                          -0.156062   0.179106  -0.871
## StageProbe_D8:APOEE2HN:SexMale           -0.103402   0.225754  -0.458
## StageProbe_D8:APOEE33:SexMale             0.003622   0.084502   0.043
## StageProbe_D8:APOEE3HN:SexMale            0.088046   0.099142   0.888
## StageProbe_D8:APOEE44:SexMale             0.112700   0.092362   1.220
## StageProbe_D8:APOEE4HN:SexMale            0.019104   0.161246   0.118
## StageProbe_D8:APOEHN:SexMale              0.094071   0.217313   0.433
## StageProbe_D8:APOEE2HN:DietHFD           -0.058504   0.222541  -0.263
## StageProbe_D8:APOEE33:DietHFD             0.024379   0.132384   0.184
## StageProbe_D8:APOEE3HN:DietHFD            0.098084   0.142176   0.690
## StageProbe_D8:SexMale:DietHFD             0.176732   0.177008   0.998
## APOEE33:SexMale:DietHFD                   0.034434   0.203043   0.170
## APOEE3HN:SexMale:DietHFD                  0.140895   0.209712   0.672
## StageProbe_D8:APOEE33:SexMale:DietHFD    -0.094129   0.200665  -0.469
## StageProbe_D8:APOEE3HN:SexMale:DietHFD   -0.276319   0.207256  -1.333
## fit warnings:
## fixed-effect model matrix is rank deficient so dropping 14 columns / coefficients

##                                              2.5 %      97.5 %
## .sig01                                  0.08096136  0.11584630
## .sigma                                  0.08566382  0.10745475
## (Intercept)                             0.35865513  0.54888630
## StageProbe_D8                          -0.12207747  0.06636994
## APOEE2HN                               -0.53111933  0.44648242
## APOEE33                                -0.12815248  0.09040649
## APOEE3HN                               -0.19827796  0.09230495
## APOEE44                                -0.13255890  0.12266300
## APOEE4HN                               -0.30340516  0.12196467
## APOEHN                                 -0.07441527  0.49627825
## SexMale                                -0.13649196  0.11872994
```

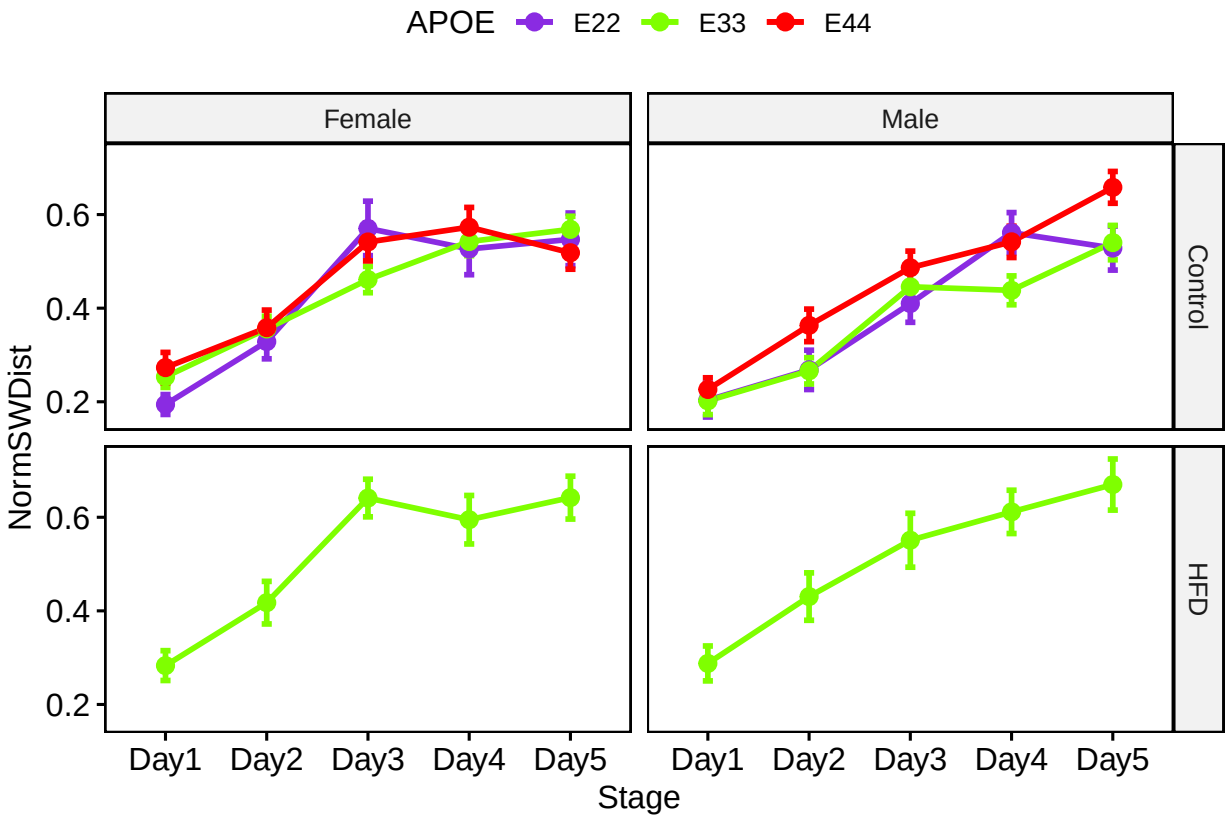
```
## DietHFD                                  -0.02127937  0.41012438
## StageProbe_D8:APOEE2HN                   -0.42177555  0.54665941
## StageProbe_D8:APOEE33                    -0.13745194  0.07905765
## StageProbe_D8:APOEE3HN                   -0.17788476  0.10997341
## StageProbe_D8:APOEE44                    -0.15861355  0.09421518
## StageProbe_D8:APOEE4HN                   -0.21946761  0.20191360
## StageProbe_D8:APOEHN                     -0.21434817  0.35099406
## StageProbe_D8:SexMale                    -0.21877460  0.03405413
## APOEE2HN:SexMale                         -0.22790758  0.60585036
## APOEE33:SexMale                          -0.05109861  0.26098654
## APOEE3HN:SexMale                         -0.16049002  0.20566234
## APOEE44:SexMale                          -0.11967095  0.22144196
## APOEE4HN:SexMale                         -0.23185125  0.36366651
## APOEHN:SexMale                           -0.86541658 -0.06283038
## StageProbe_D8:DietHFD                    -0.22183581  0.20552275
## APOEE2HN:DietHFD                         -0.64804456  0.17384804
## APOEE33:DietHFD                          -0.25551458  0.23340967
## APOEE3HN:DietHFD                         -0.46834919  0.05673873
## SexMale:DietHFD                          -0.48292695  0.17080224
## StageProbe_D8:APOEE2HN:SexMale           -0.51637207  0.30956787
## StageProbe_D8:APOEE33:SexMale            -0.15095715  0.15820164
## StageProbe_D8:APOEE3HN:SexMale           -0.09331343  0.26940559
## StageProbe_D8:APOEE44:SexMale            -0.05625739  0.28165696
## StageProbe_D8:APOEE4HN:SexMale           -0.27586311  0.31407060
## StageProbe_D8:APOEHN:SexMale             -0.30345915  0.49160135
## StageProbe_D8:APOEE2HN:DietHFD           -0.46559644  0.34858943
## StageProbe_D8:APOEE33:DietHFD            -0.21779039  0.26654931
## StageProbe_D8:APOEE3HN:DietHFD           -0.16199783  0.35816644
## StageProbe_D8:SexMale:DietHFD            -0.14706721  0.50053208
## APOEE33:SexMale:DietHFD                  -0.33611551  0.40498429
## APOEE3HN:SexMale:DietHFD                 -0.24182538  0.52361522
## StageProbe_D8:APOEE33:SexMale:DietHFD    -0.46120411  0.27294653
## StageProbe_D8:APOEE3HN:SexMale:DietHFD -0.65545107  0.10281214

##  contrast      estimate SE df z.ratio p.value
##  Female - Male   nonEst NA NA      NA      NA
##
## Results are averaged over the levels of: Stage, APOE, Diet
## Degrees-of-freedom method: kenward-roger

##  contrast    estimate     SE  df t.ratio p.value
##  E22 - E2HN    nonEst     NA  NA      NA      NA
##  E22 - E33     nonEst     NA  NA      NA      NA
##  E22 - E3HN    nonEst     NA  NA      NA      NA
##  E22 - E44     nonEst     NA  NA      NA      NA
##  E22 - E4HN    nonEst     NA  NA      NA      NA
##  E22 - HN      nonEst     NA  NA      NA      NA
##  E2HN - E33    nonEst     NA  NA      NA      NA
##  E2HN - E3HN   nonEst     NA  NA      NA      NA
##  E2HN - E44    nonEst     NA  NA      NA      NA
##  E2HN - E4HN   nonEst     NA  NA      NA      NA
##  E2HN - HN     nonEst     NA  NA      NA      NA
##  E33 - E3HN    0.1317 0.0315 129   4.176  0.0010
##  E33 - E44     nonEst     NA  NA      NA      NA
```

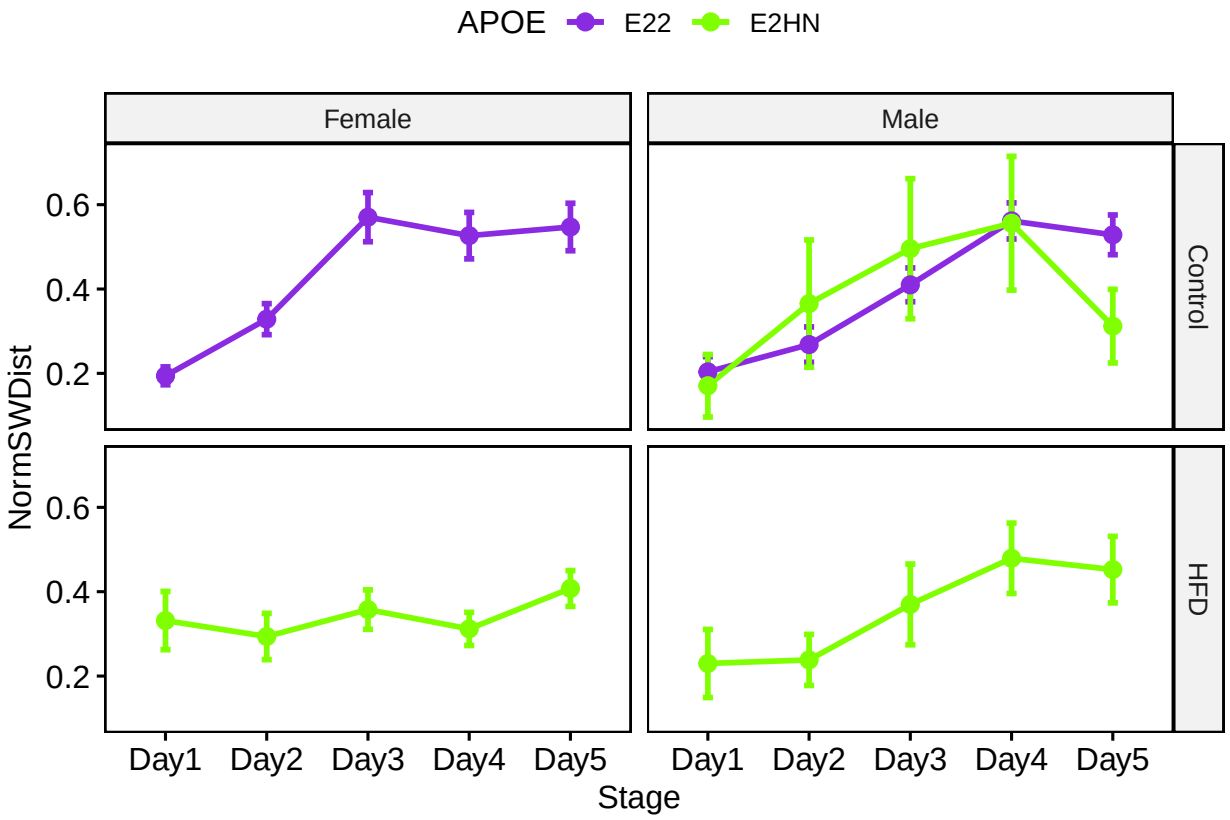
```
##  E33 - E4HN    0.0747 0.0441 129   1.693  0.6222
##  E33 - HN      nonEst     NA  NA      NA      NA
##  E3HN - E44    nonEst     NA  NA      NA      NA
##  E3HN - E4HN  -0.0570 0.0456 129  -1.250  0.8729
##  E3HN - HN     nonEst     NA  NA      NA      NA
##  E44 - E4HN    nonEst     NA  NA      NA      NA
##  E44 - HN      nonEst     NA  NA      NA      NA
##  E4HN - HN     nonEst     NA  NA      NA      NA
##
## Results are averaged over the levels of: Stage, Sex, Diet
## Degrees-of-freedom method: kenward-roger
## P value adjustment: tukey method for comparing a family of 7 estimates
```

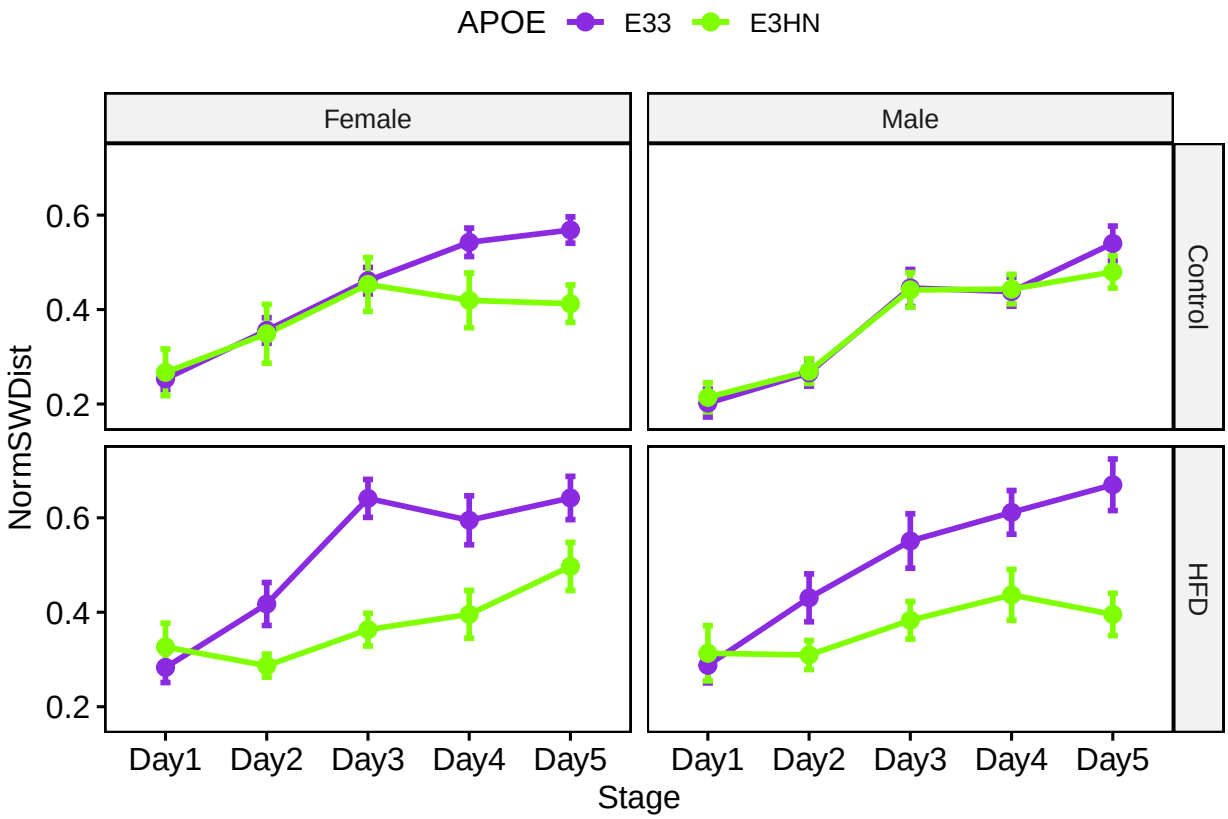
lm <- lm(Duration ~ Sex$APOE$Diet, reg_trials) summary(lm) anova(lm)

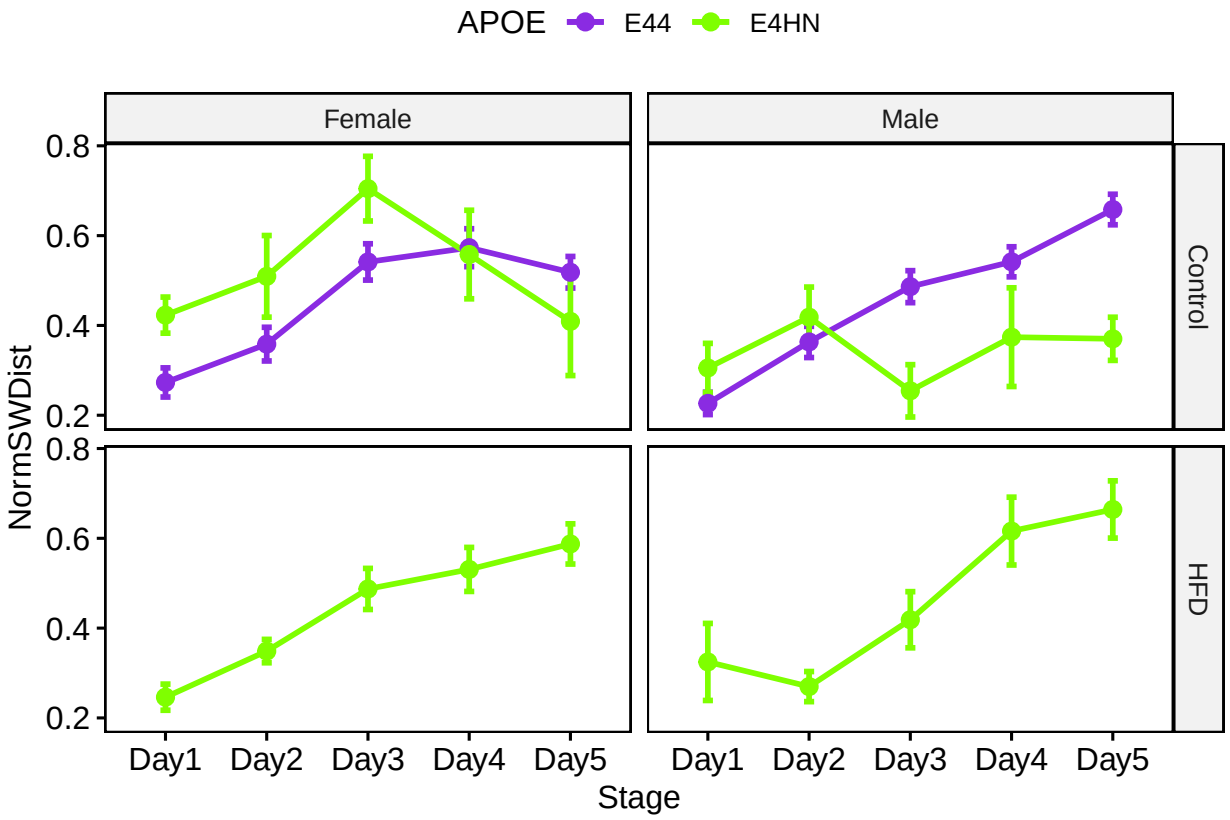


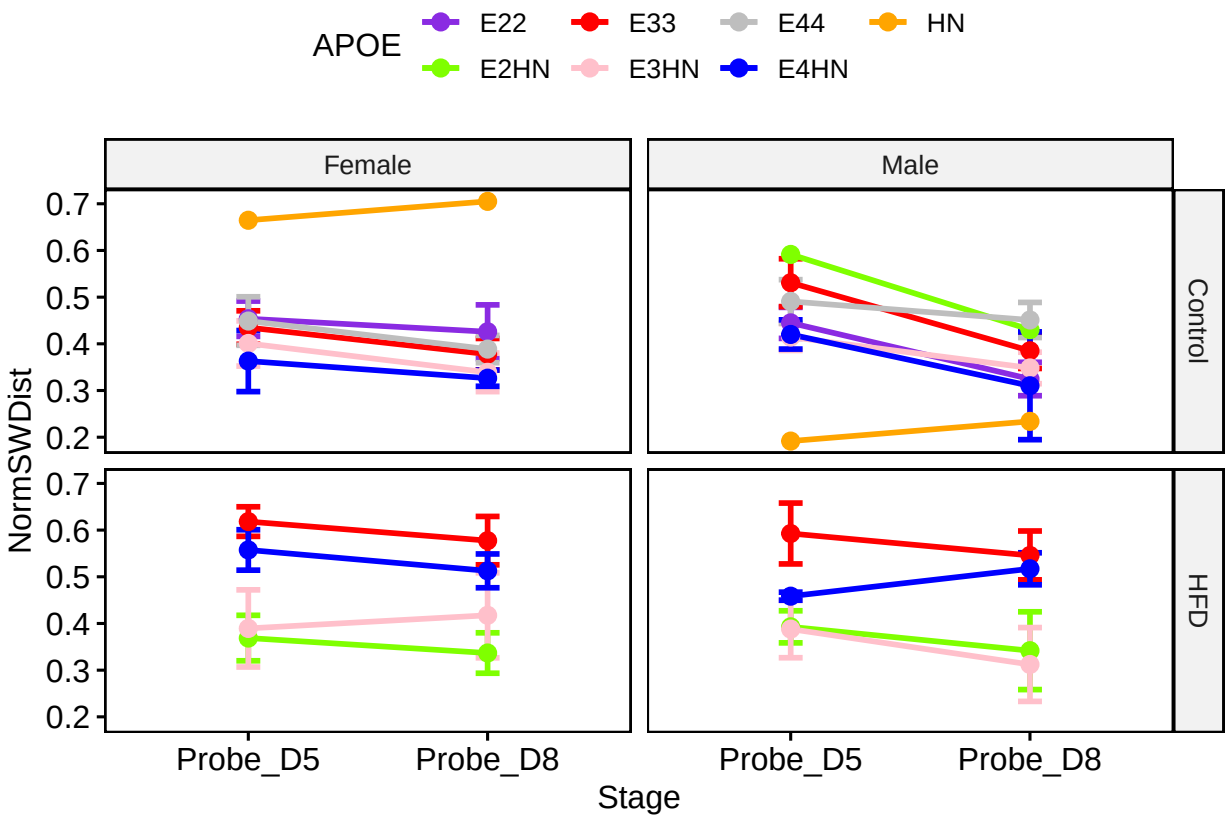

APOE
E2HN
E3HN
E4HN
Female
Male
Control
HFD
NormSWDist
0.8
0.6
0.4
0.2
Day1
Day2
Day3
Day4
Day5
Stage

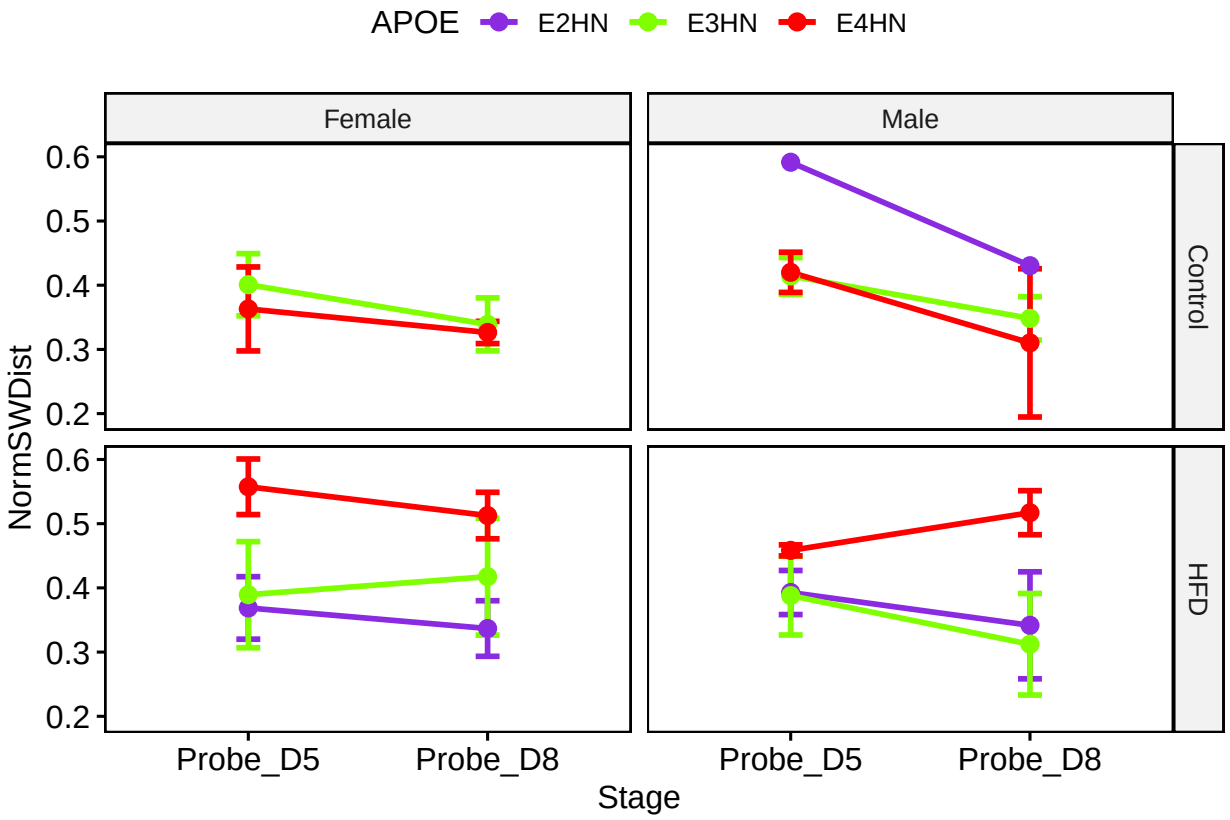

APOE
E22
E33
E44
Female
Male
Control
HFD
NormSWDist
0.2
0.4
0.6
Day1
Day2
Day3
Day4
Day5
Stage

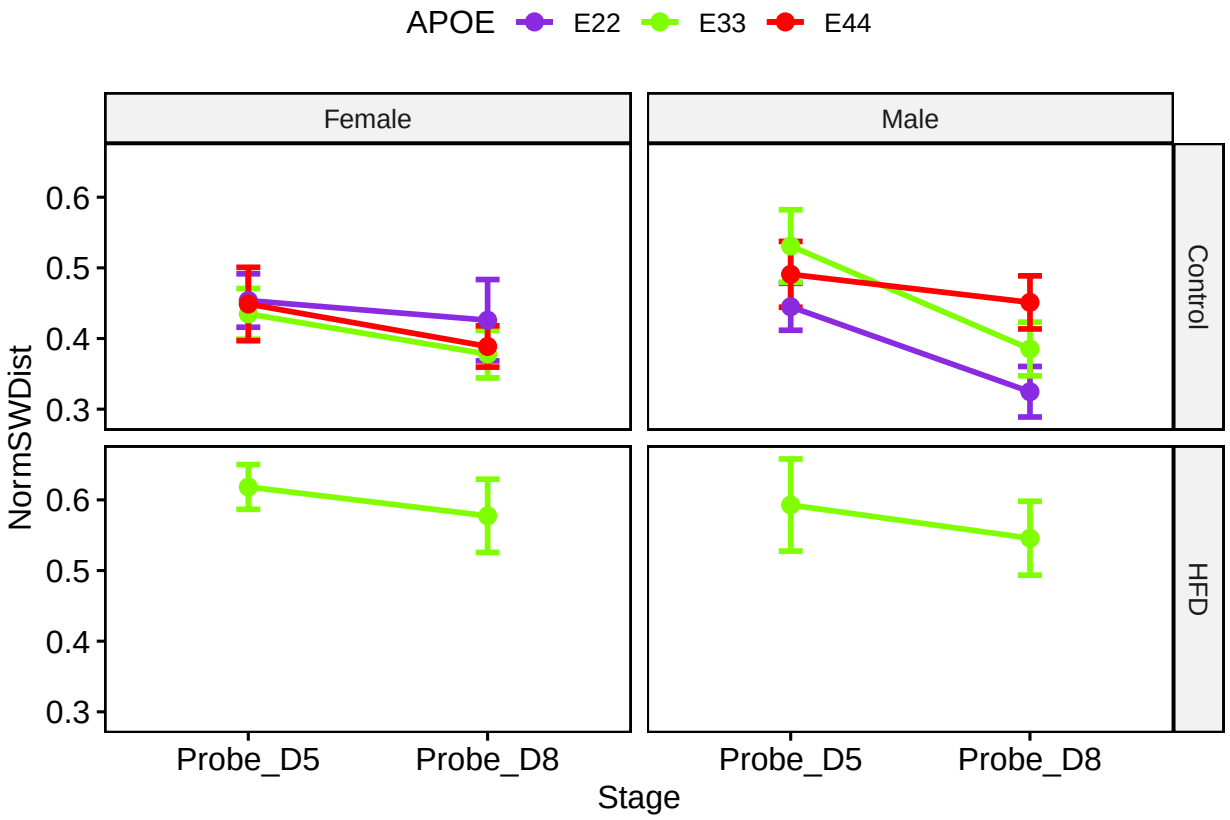

APOE
E22
E2HN
Female
Male
Control
HFD
NormSWDist
0.6
0.4
0.2
Day1
Day2
Day3
Day4
Day5
Stage

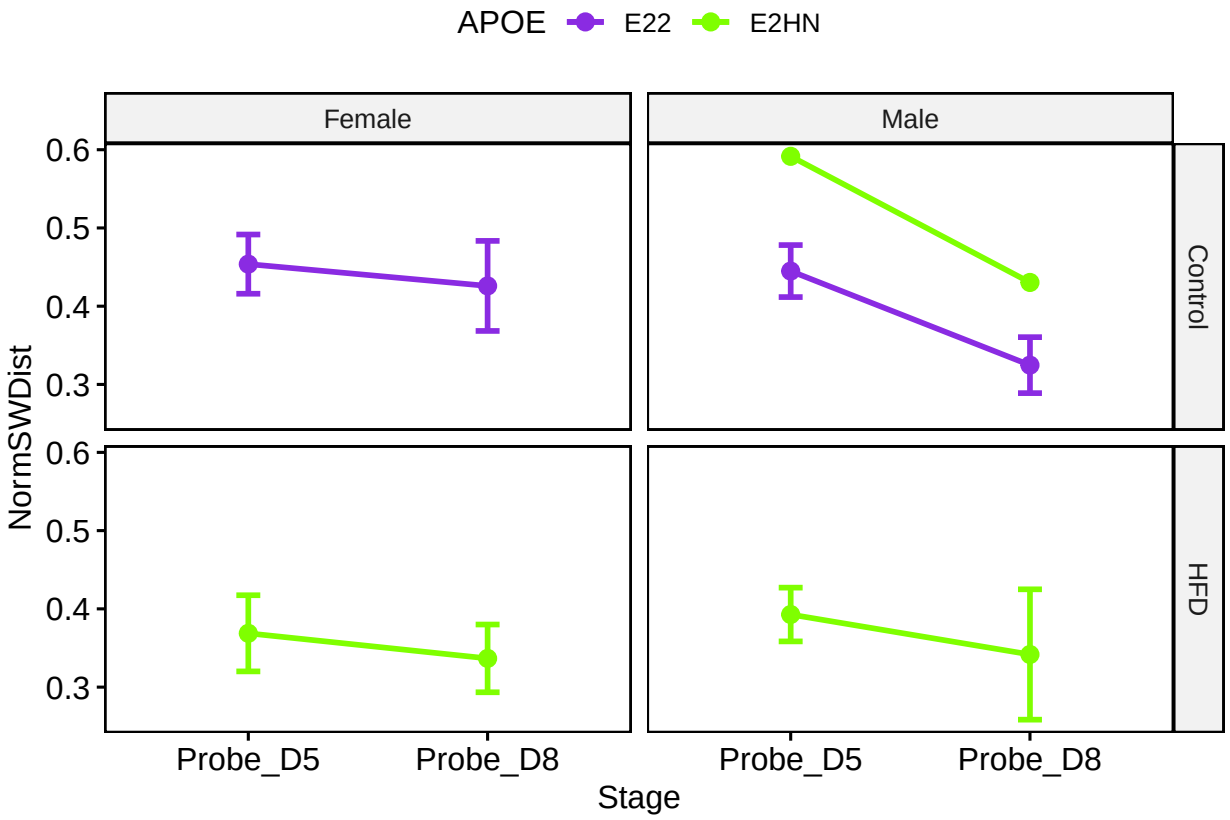

APOE
E33
E3HN
Female
Male
Control
HFD
NormSWDist
0.2
0.4
0.6
Day1
Day2
Day3
Day4
Day5
Stage

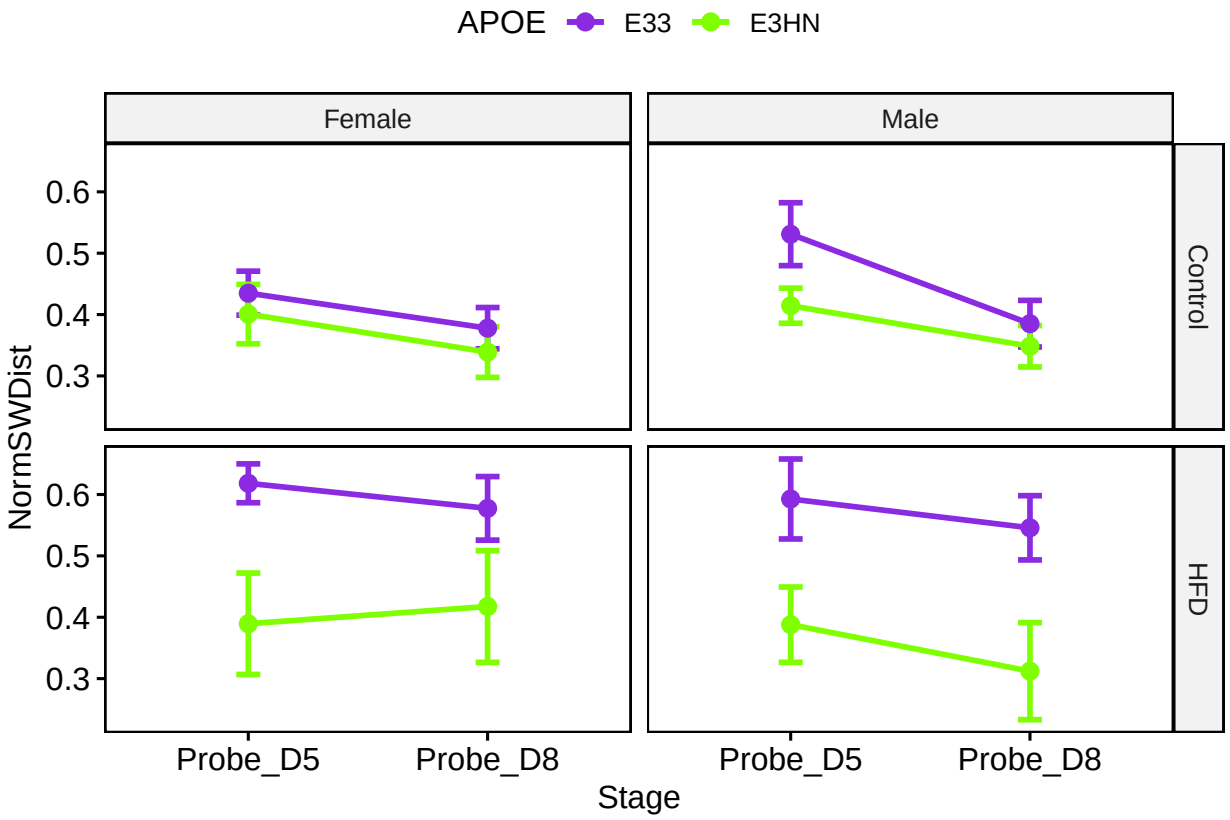

APOE
E44
E4HN
Female
Male
Control
HFD
NormSWDist
0.8
0.6
0.4
0.2
Day1
Day2
Day3
Day4
Day5
Stage

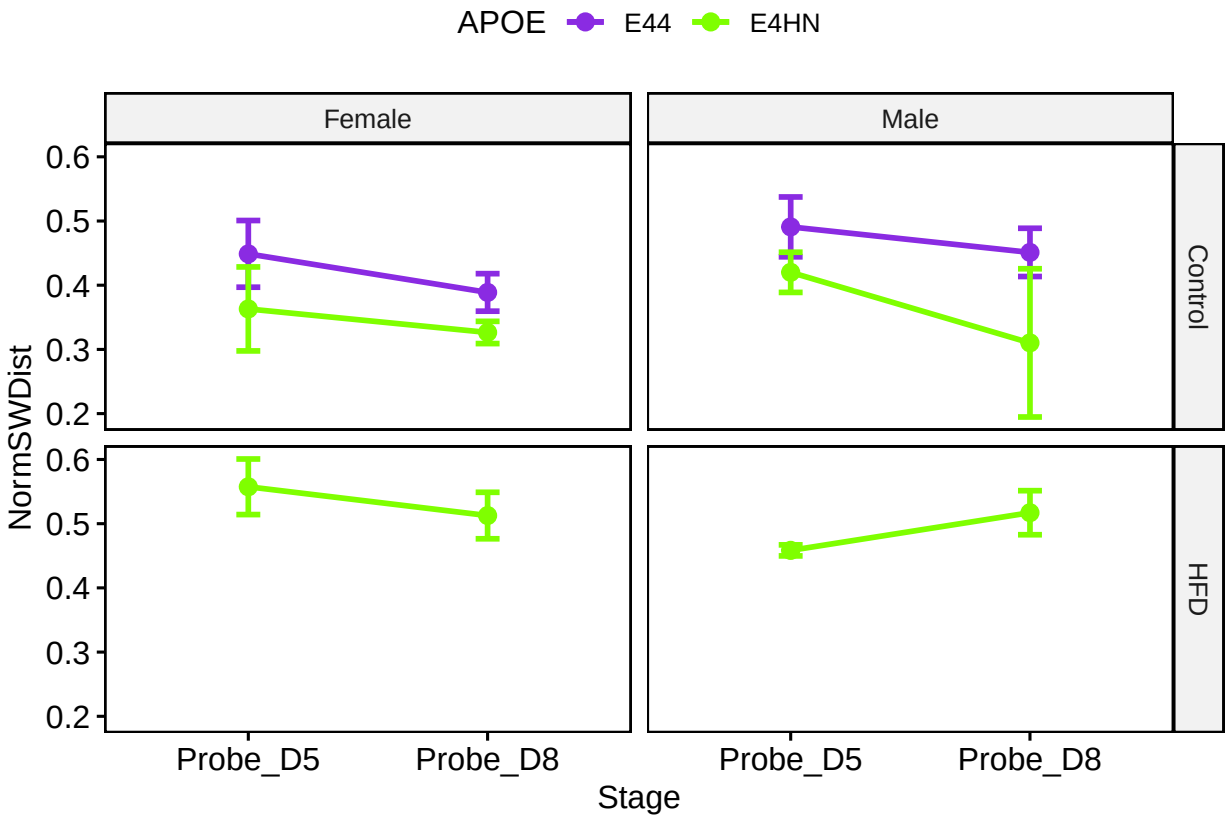

APOE
E22
E33
E44
HN
E2HN
E3HN
E4HN
Female
Male
Control
HFD
NormSWDist
0.7
0.6
0.5
0.4
0.3
0.2
Probe_D5
Probe_D8
Stage

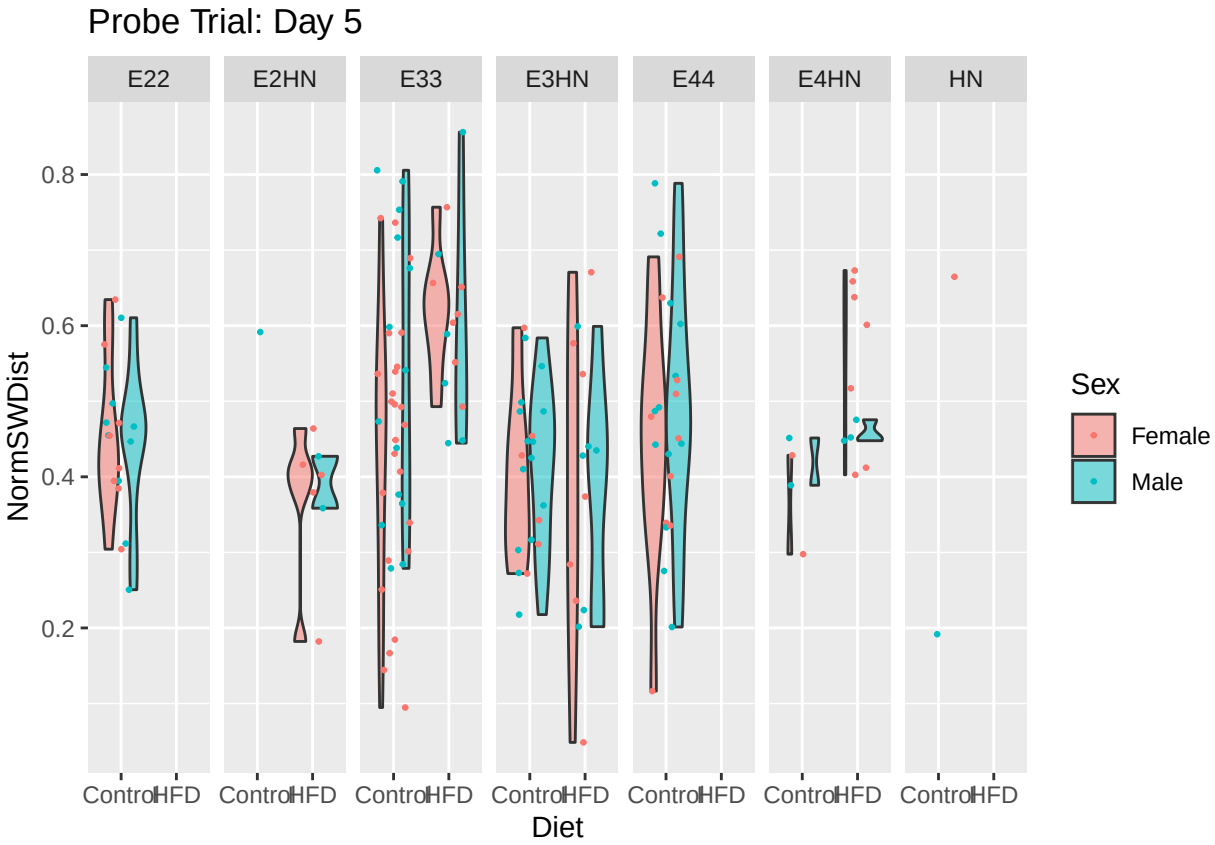

APOE
E2HN
E3HN
E4HN
Female
Male
Control
HFD
NormSWDist
0.6
0.5
0.4
0.3
0.2
Probe_D5
Probe_D8
Stage

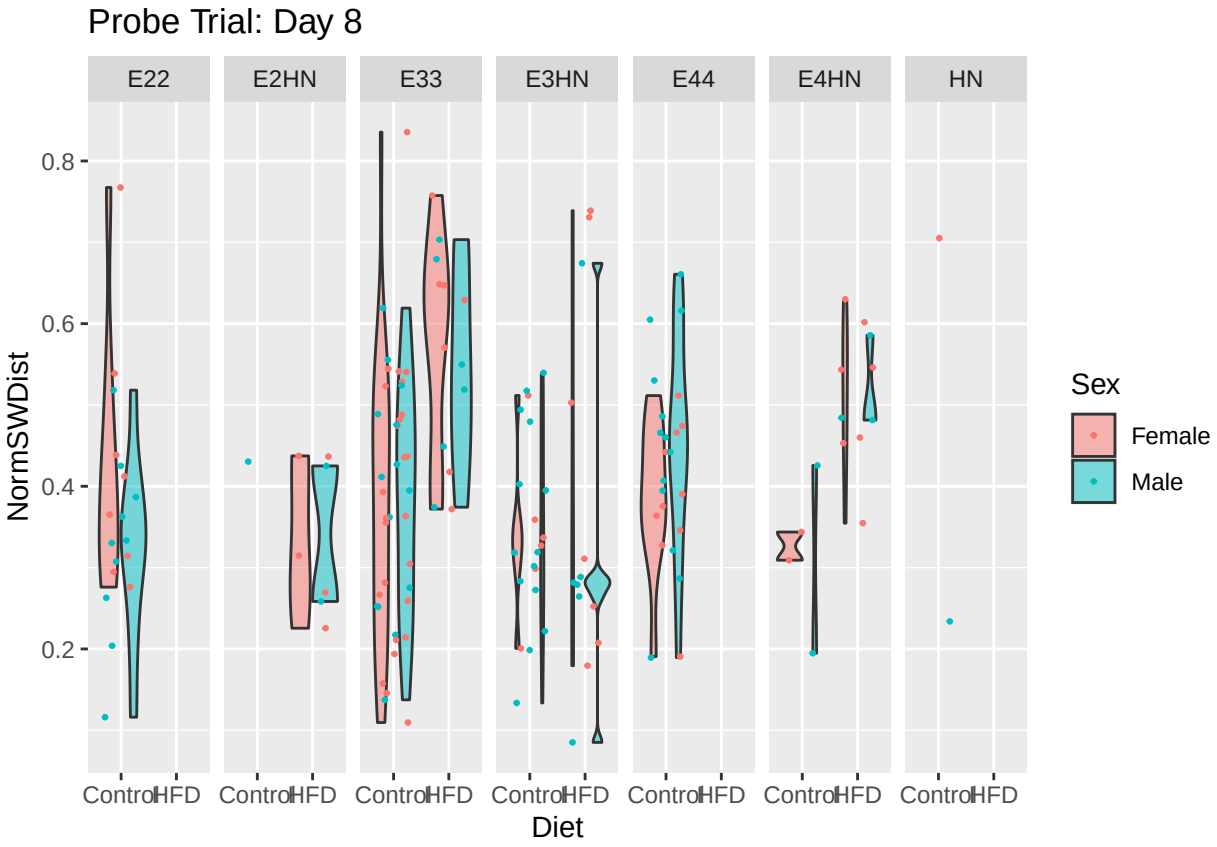

APOE
E22
E33
E44
Female
Male
Control
HFD
NormSWDist
0.6
0.5
0.4
0.3
Probe_D5
Probe_D8
Stage

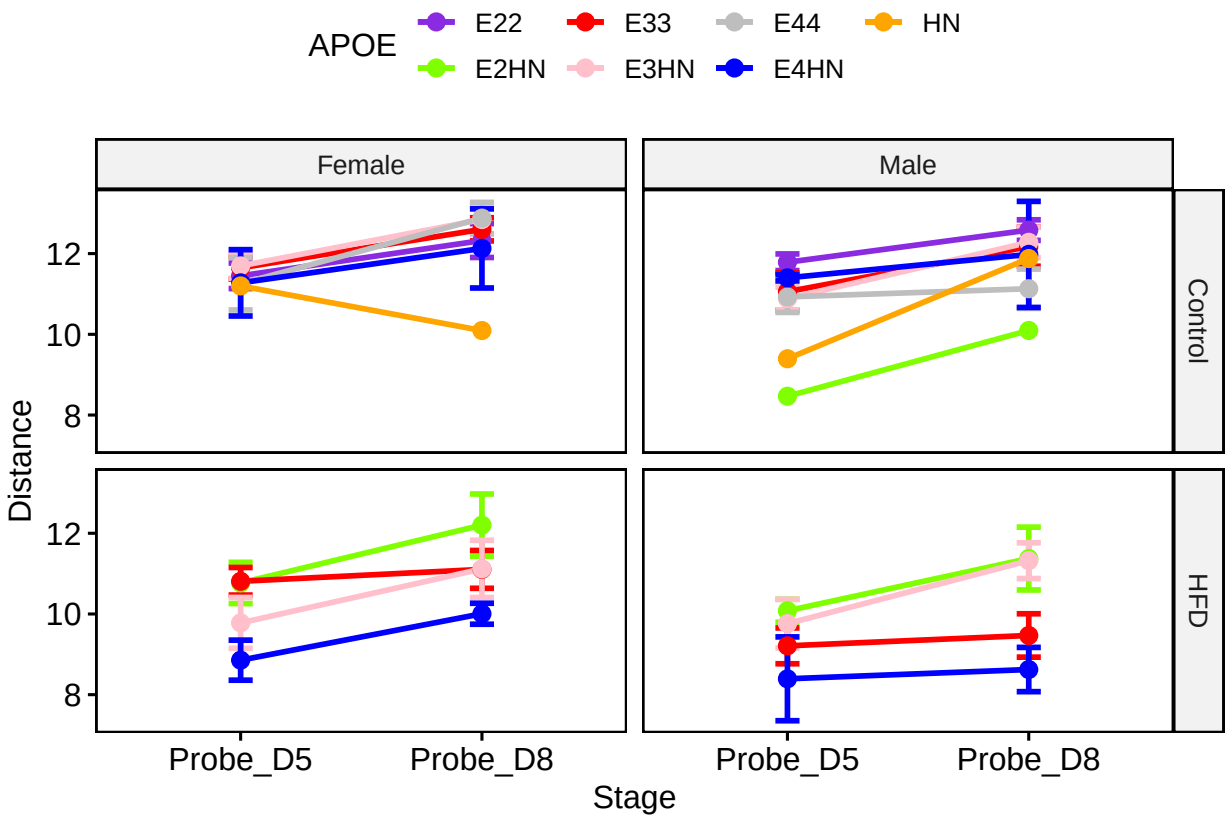

APOE
E22
E2HN
Female
Male
Control
HFD
NormSWDist
0.6
0.5
0.4
0.3
Probe_D5
Probe_D8
Stage

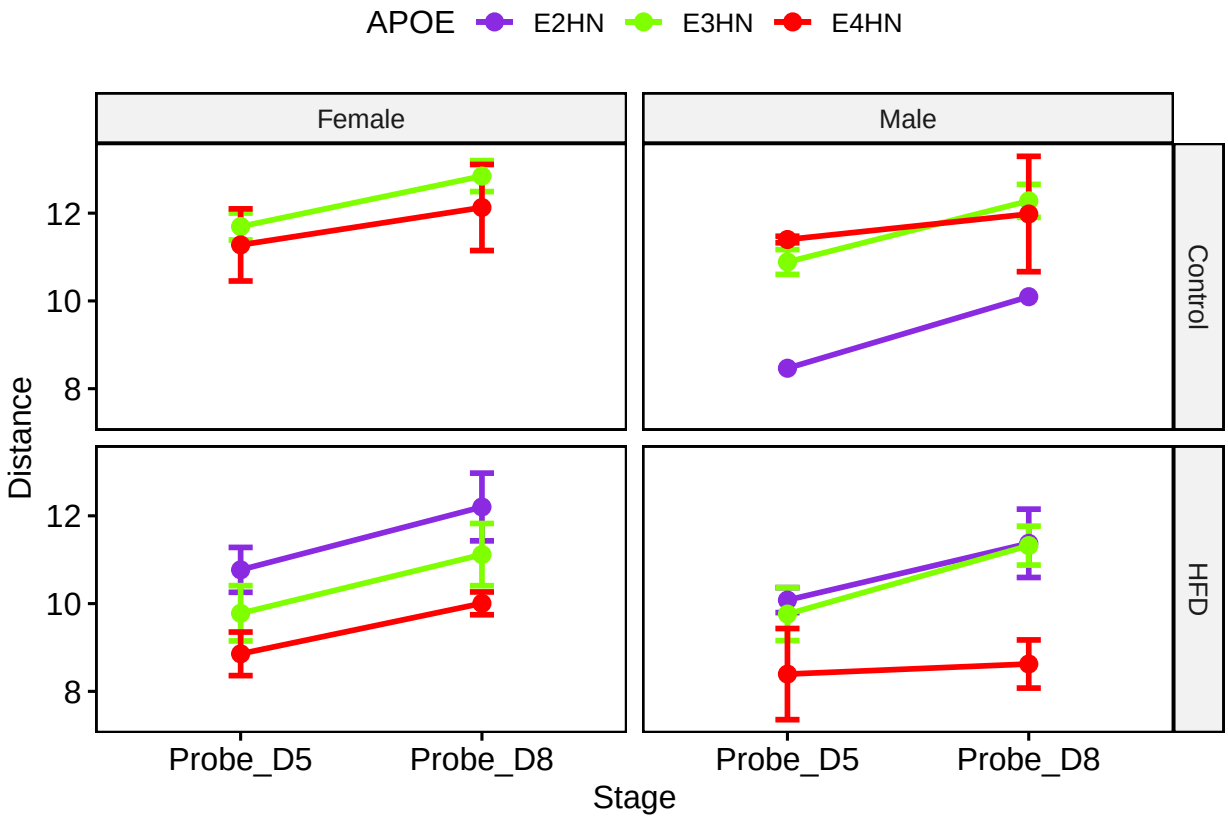

APOE
E33
E3HN
Female
Male
Control
HFD
NormSWDist
0.6
0.5
0.4
0.3
Probe_D5
Probe_D8
Stage

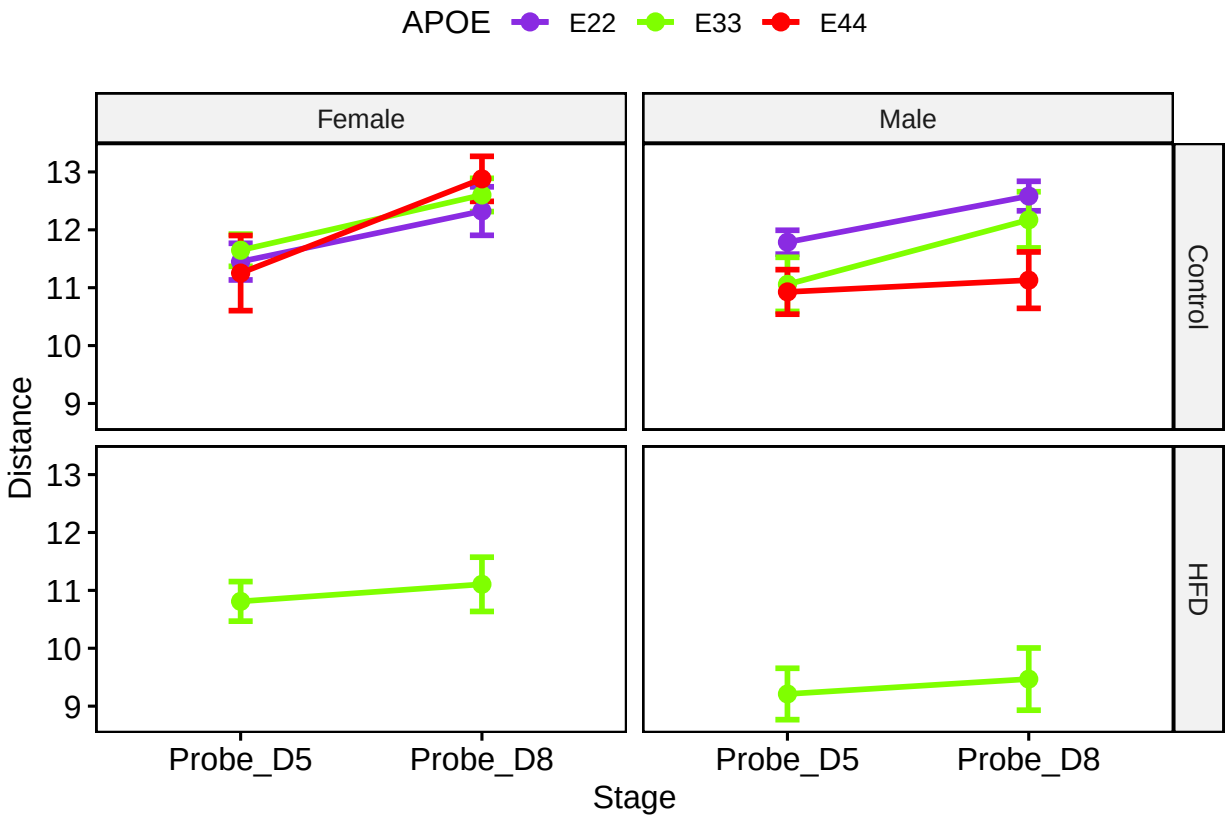

APOE
E44
E4HN
Female
Male
Control
HFD
NormSWDist
0.6
0.5
0.4
0.3
0.2
Probe_D5
Probe_D8
Stage

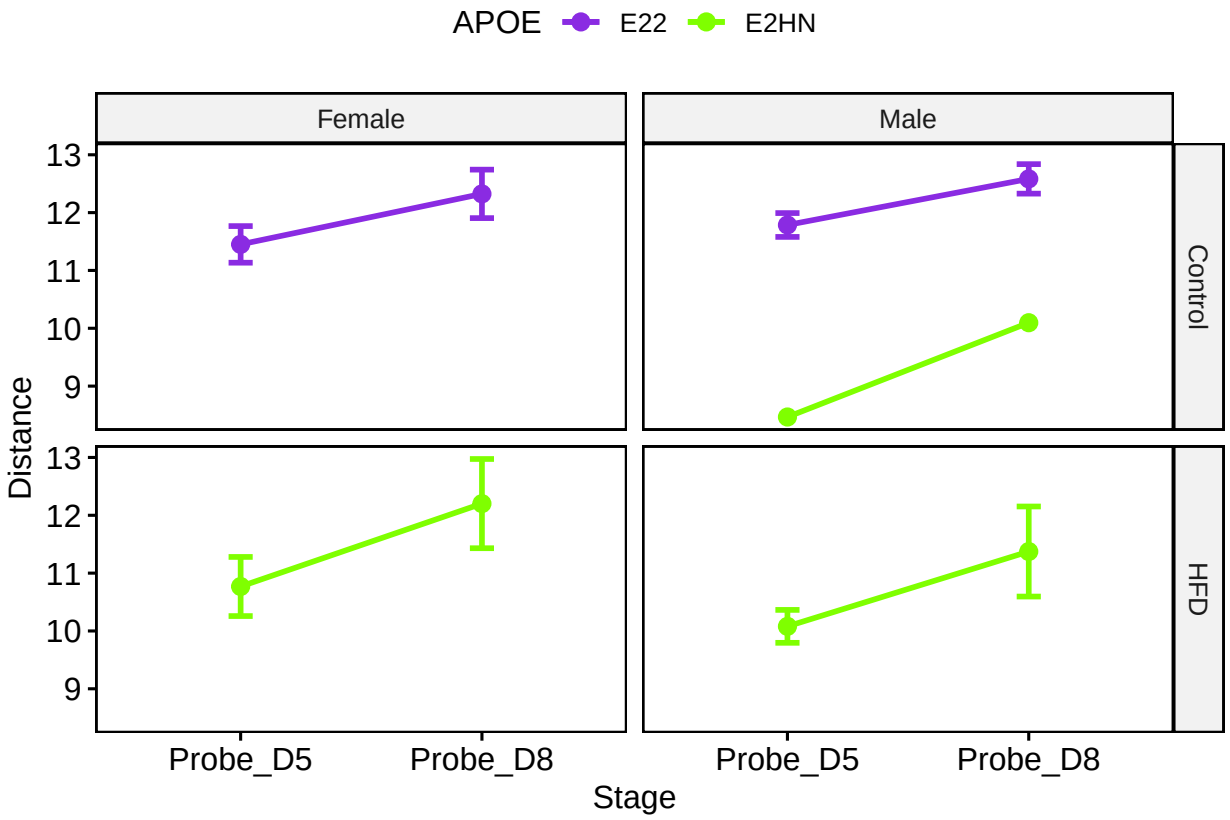

Probe Trial: Day 5
E22
E2HN
E33
E3HN
E44
E4HN
HN
NormSWDist
0.8
0.6
0.4
0.2
Control
HFD
Diet
Sex
Female
Male

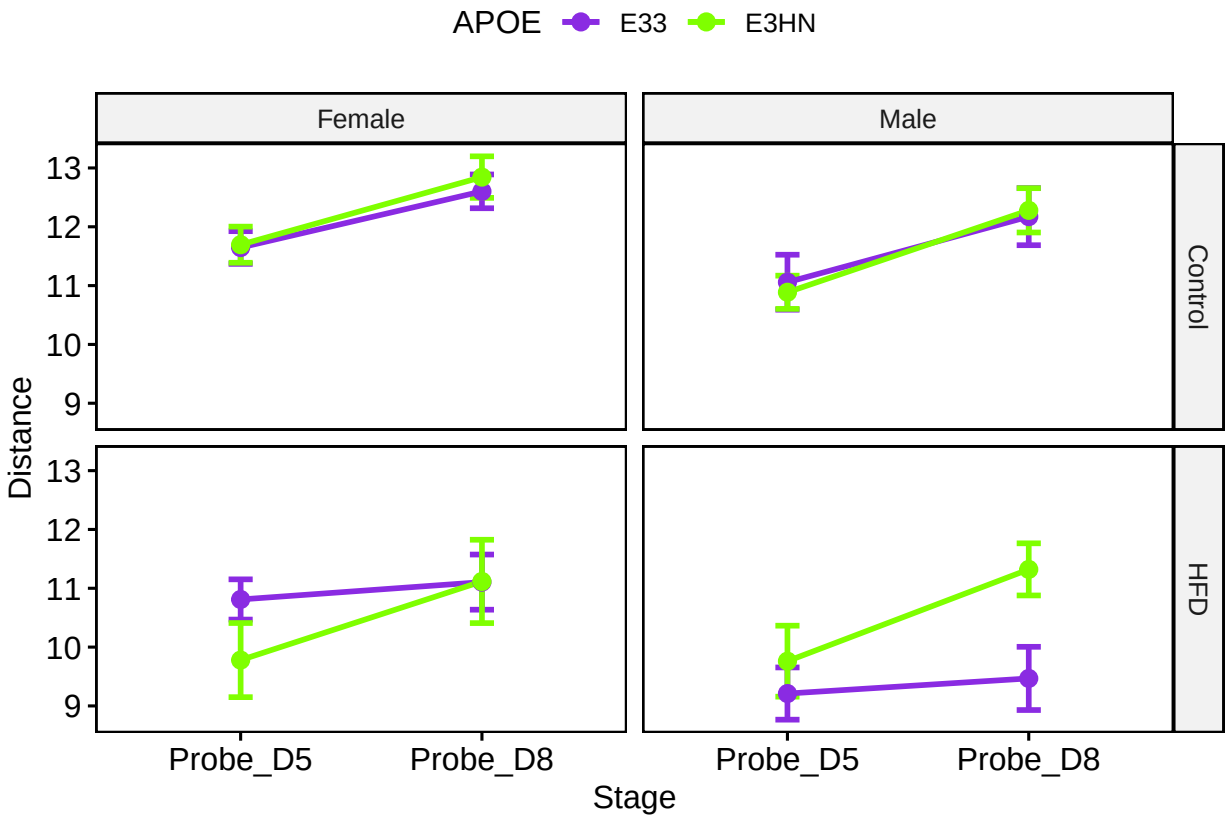

Probe Trial: Day 8
E22
E2HN
E33
E3HN
E44
E4HN
HN
NormSWDist
0.8
0.6
0.4
0.2
Control
HFD
Diet
Sex
Female
Male

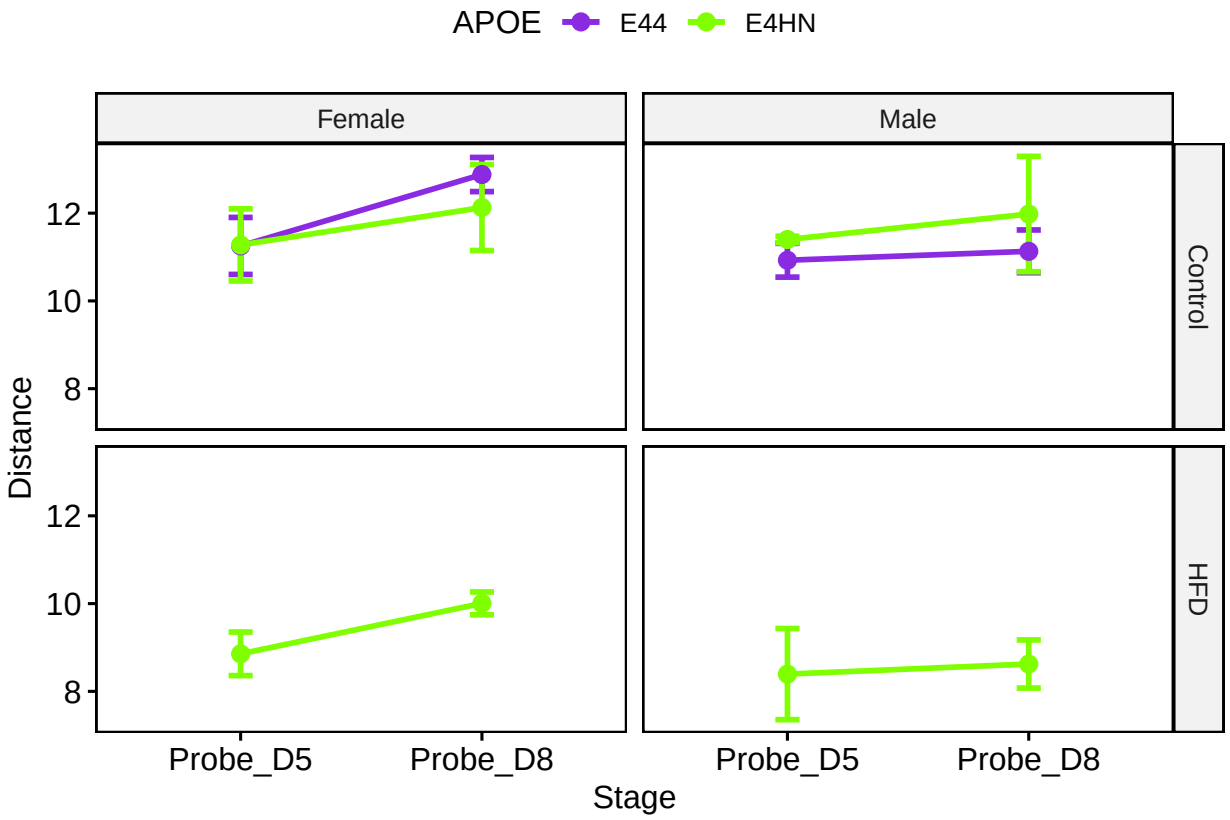

APOE
E22
E33
E44
HN
E2HN
E3HN
E4HN
Female
Male
Control
HFD
Distance
12
10
8
Probe_D5
Probe_D8
Stage

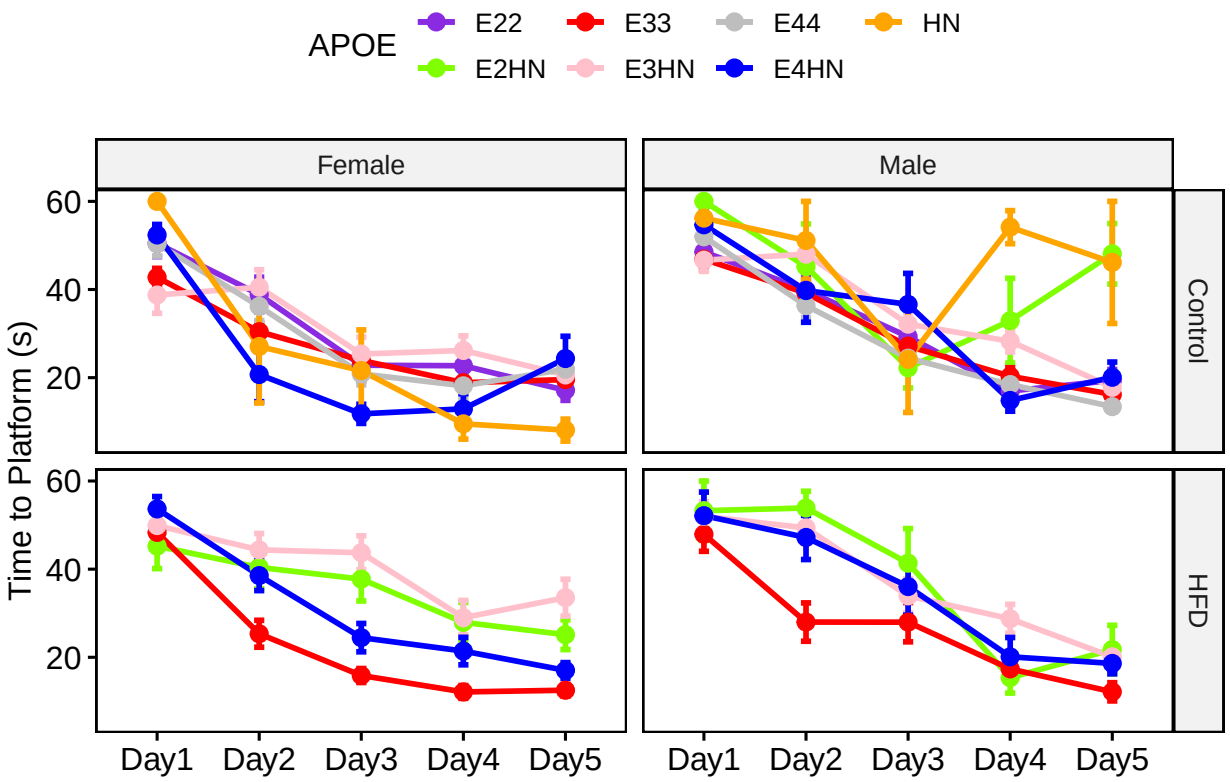

APOE
E2HN
E3HN
E4HN
Female
Male
Control
HFD
Distance
12
10
8
Probe_D5
Probe_D8
Stage

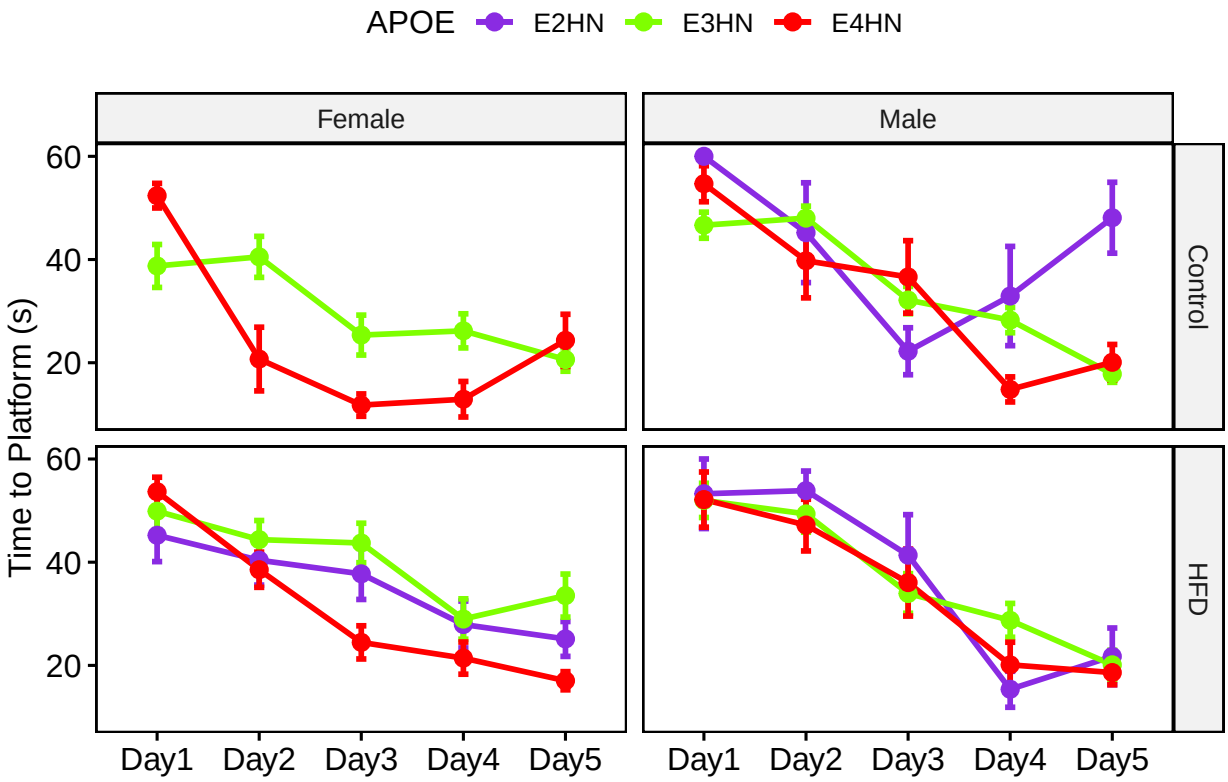

APOE
E22
E33
E44
Female
Male
Control
HFD
Distance
13
12
11
10
9
Probe_D5
Probe_D8
Stage

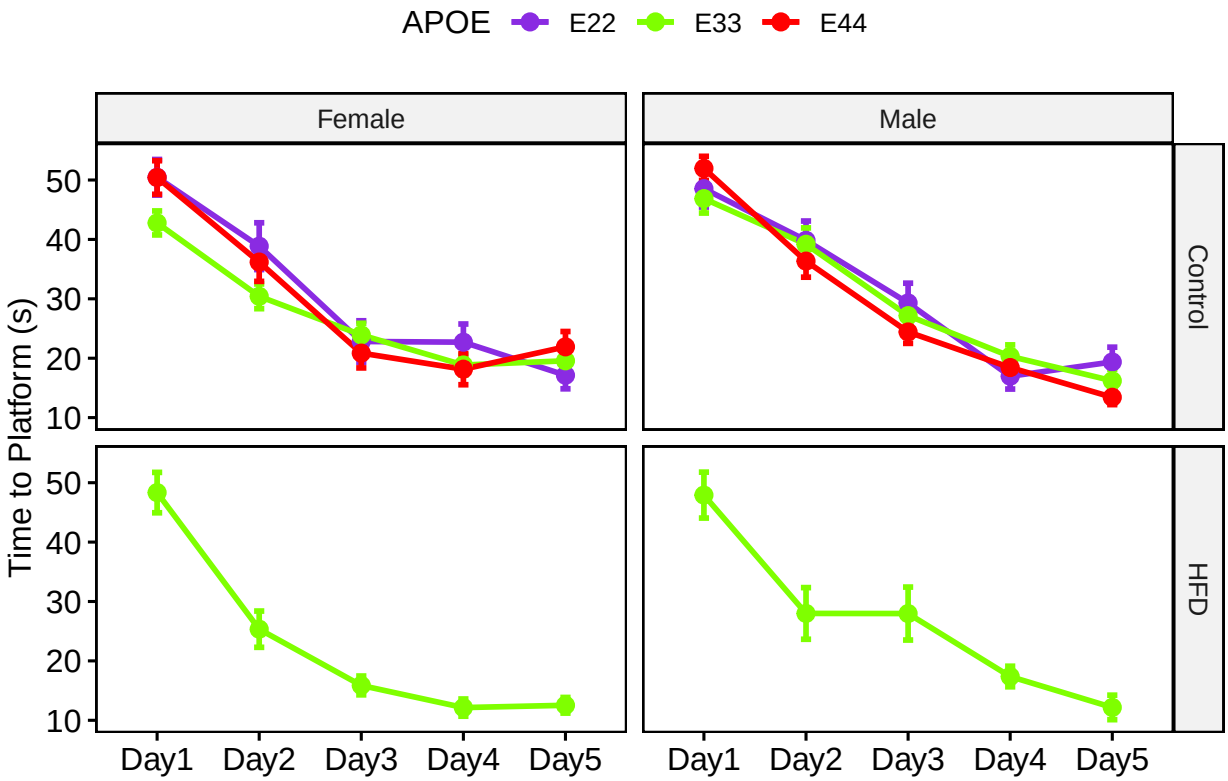

APOE
E22
E2HN
Female
Male
Control
HFD
Distance
13
12
11
10
9
Probe_D5
Probe_D8
Stage

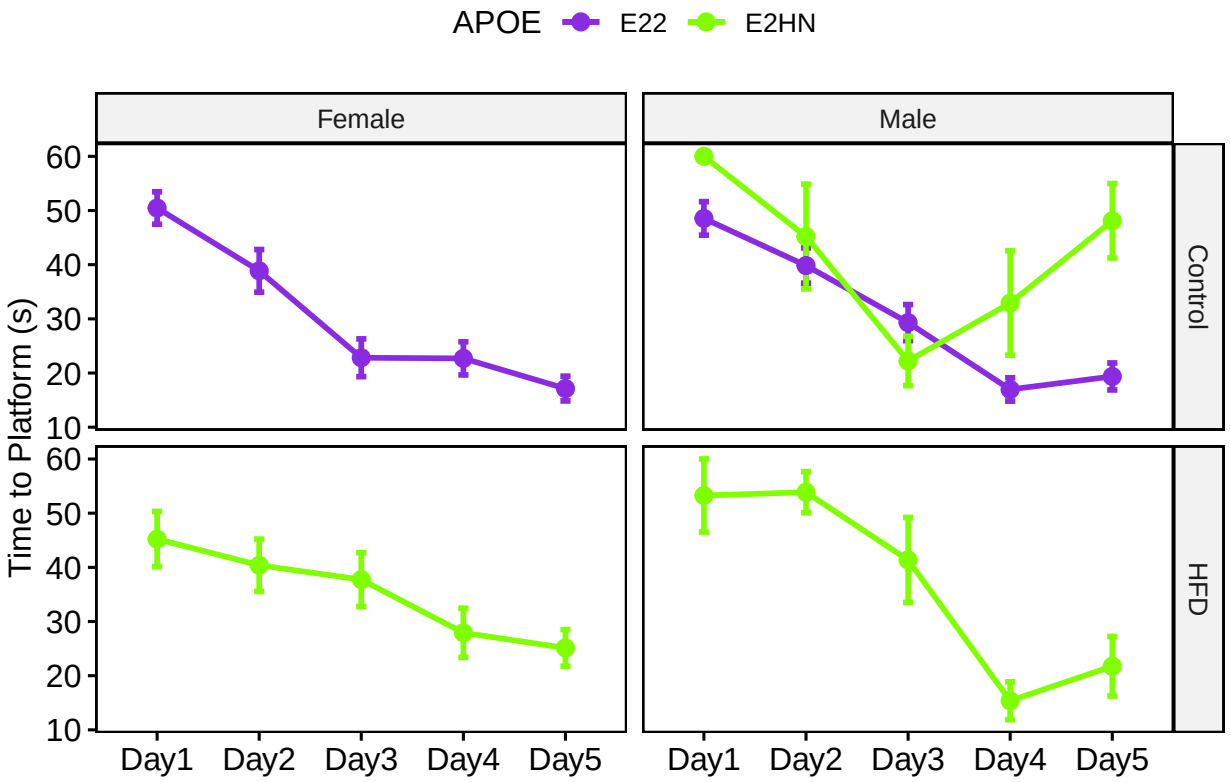

APOE
E33
E3HN
Female
Male
Control
HFD
Distance
13
12
11
10
9
Probe_D5
Probe_D8
Stage

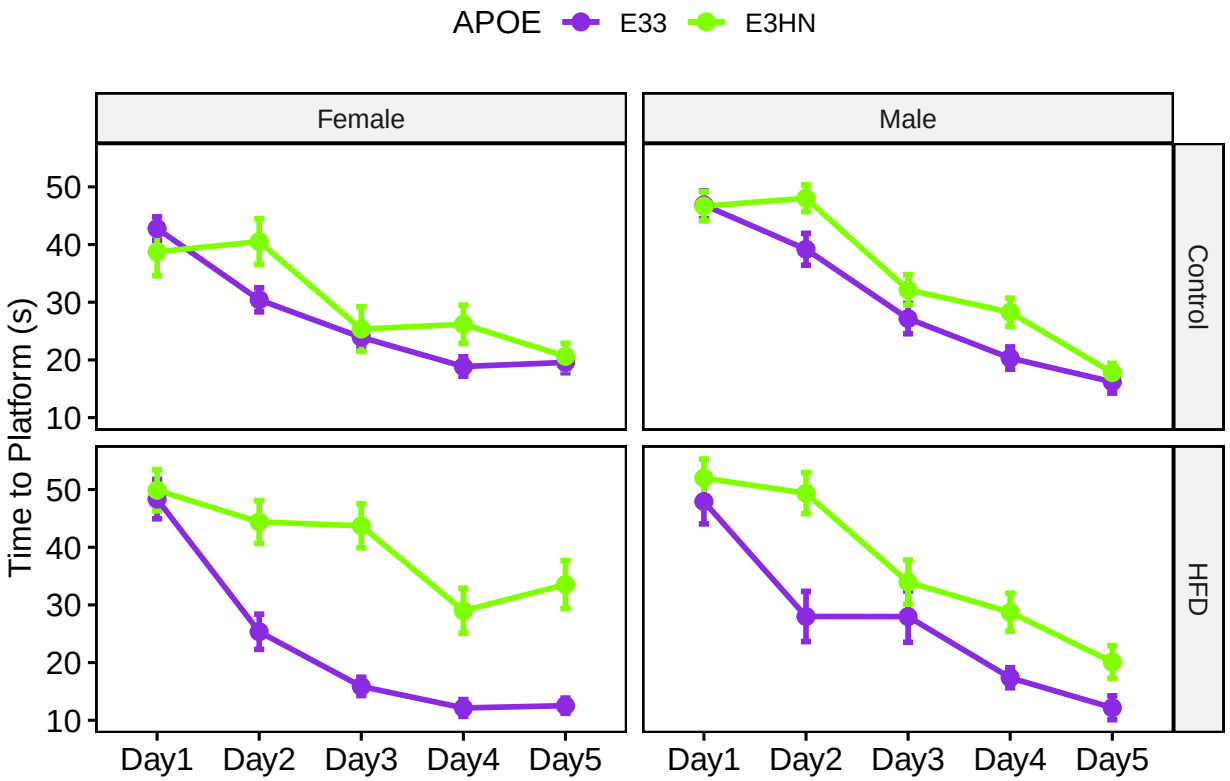

APOE
E44
E4HN
Female
Male
Control
HFD
Distance
12
10
8
Probe_D5
Probe_D8
Stage

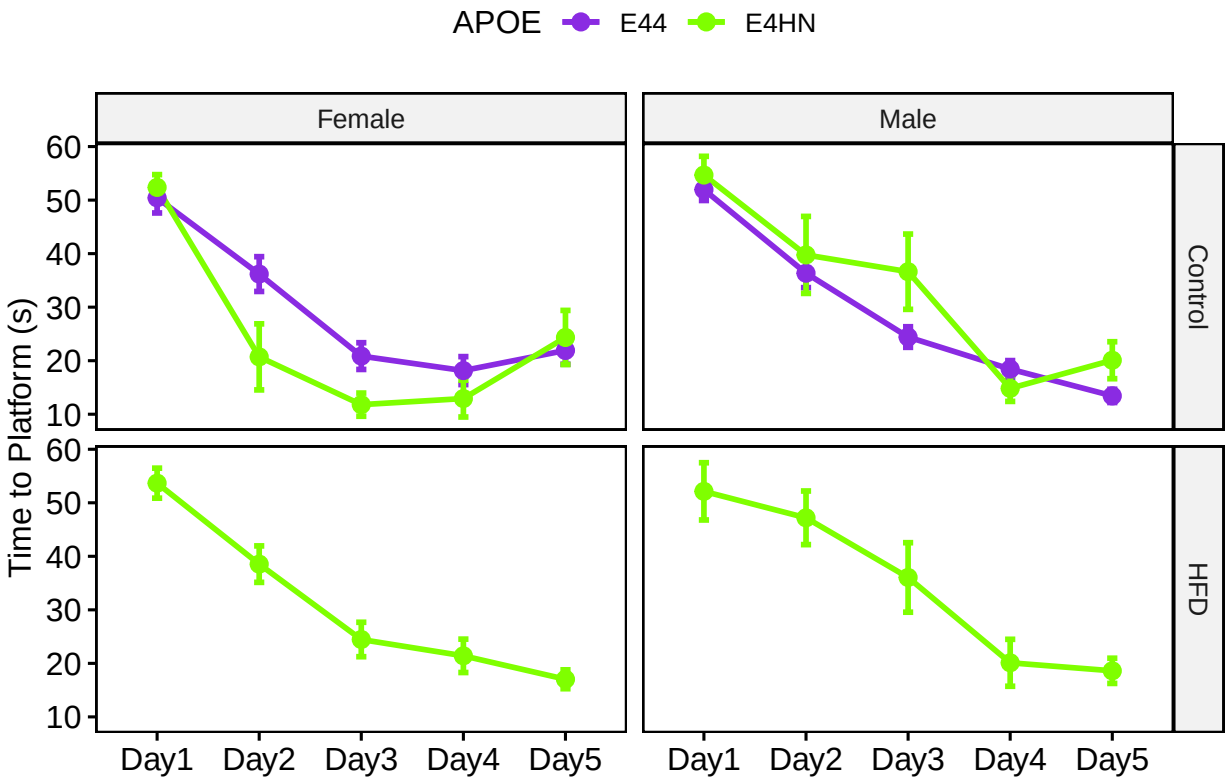

APOE
E22
E33
E44
HN
E2HN
E3HN
E4HN
Female
Male
Control
HFD
Time to Platform (s)
60
40
20
Day1
Day2
Day3
Day4
Day5

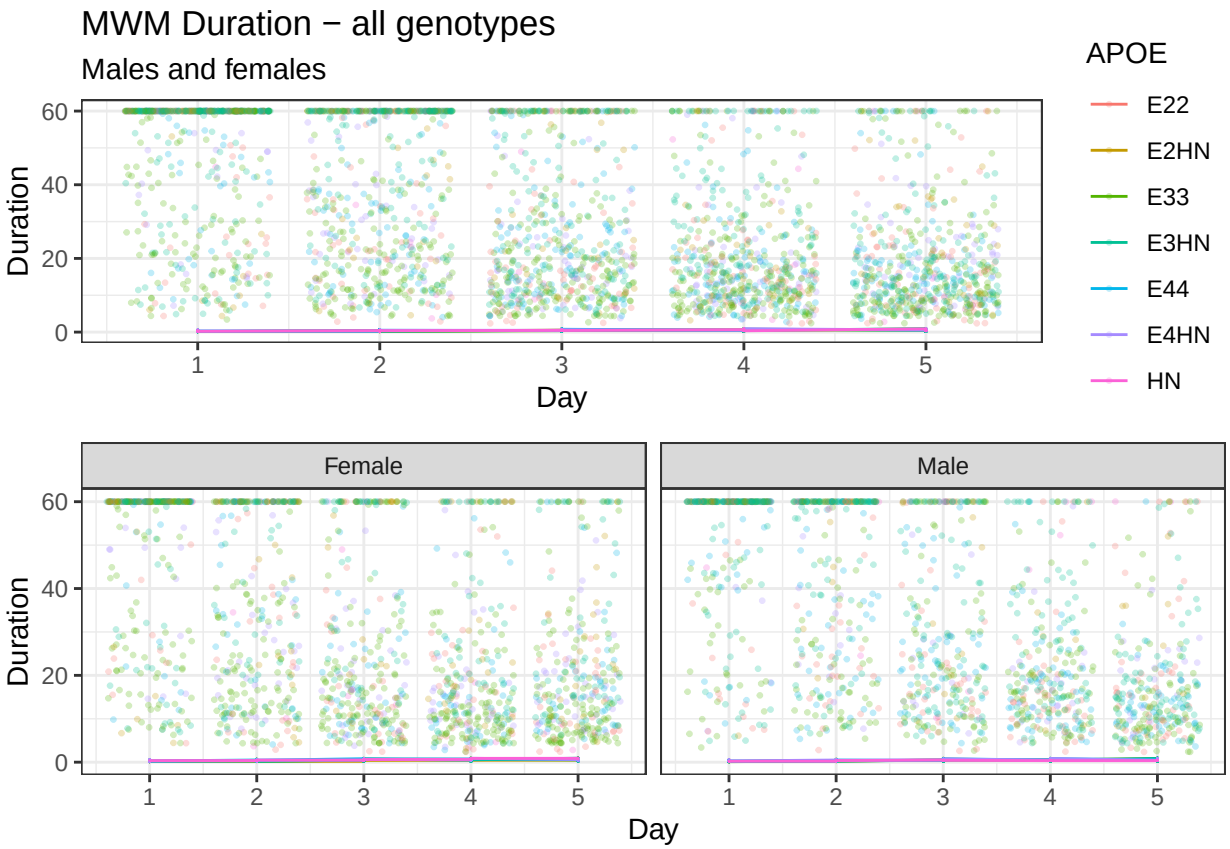

APOE
E2HN
E3HN
E4HN
Female
Male
Control
HFD
Time to Platform (s)
60
40
20
Day1
Day2
Day3
Day4
Day5

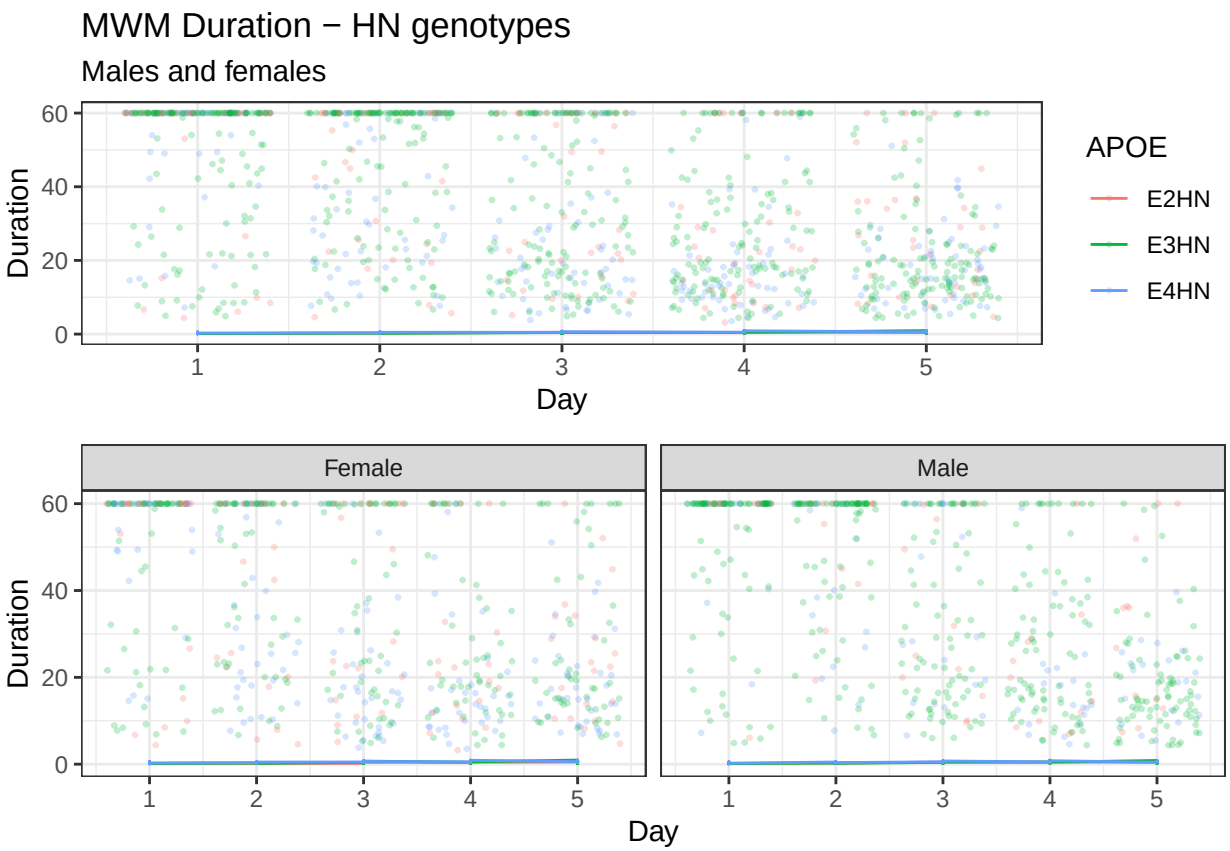

APOE
E22
E33
E44
Female
Male
Control
HFD
Time to Platform (s)
50
40
30
20
10
Day1
Day2
Day3
Day4
Day5

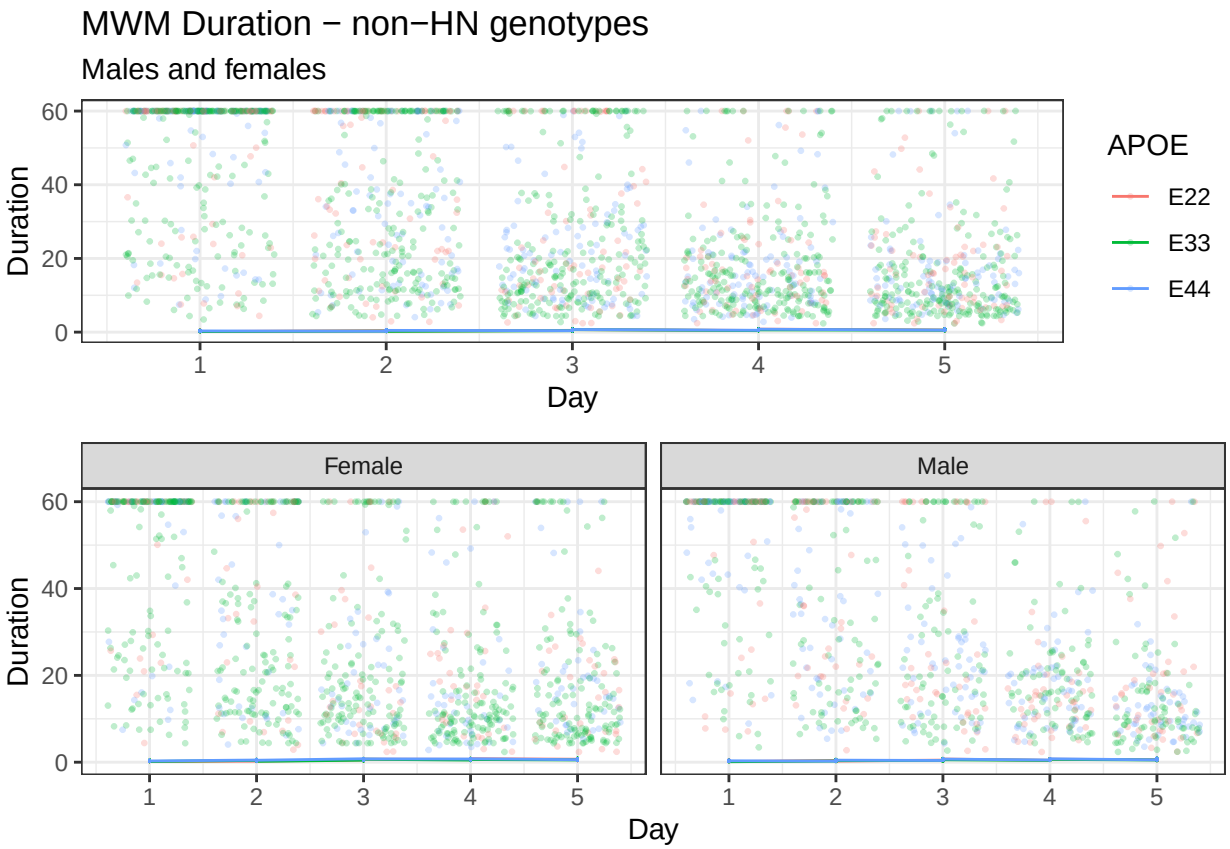

APOE
E22
E2HN
Female
Male
Control
HFD
Time to Platform (s)
60
50
40
30
20
10
Day1
Day2
Day3
Day4
Day5

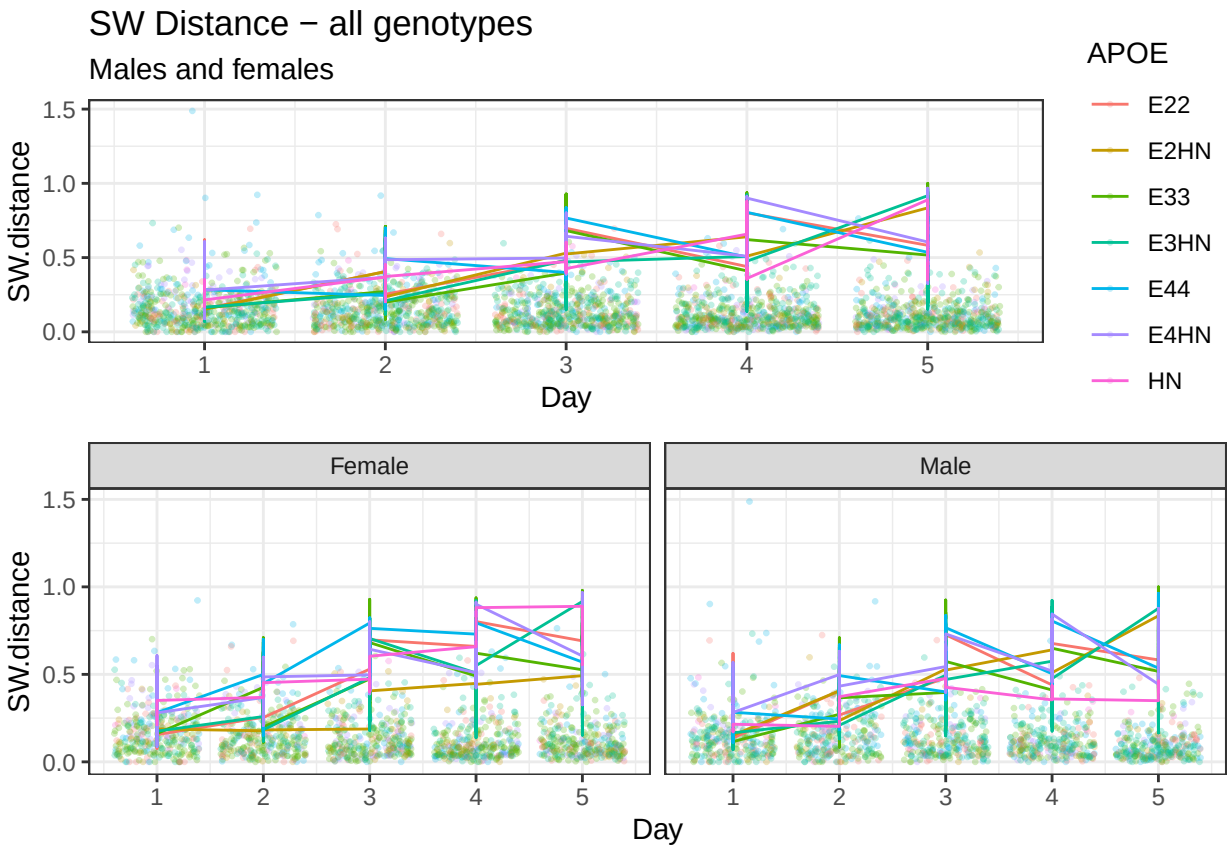

APOE
E33
E3HN
Female
Male
Control
HFD
Time to Platform (s)
50
40
30
20
10
Day1
Day2
Day3
Day4
Day5

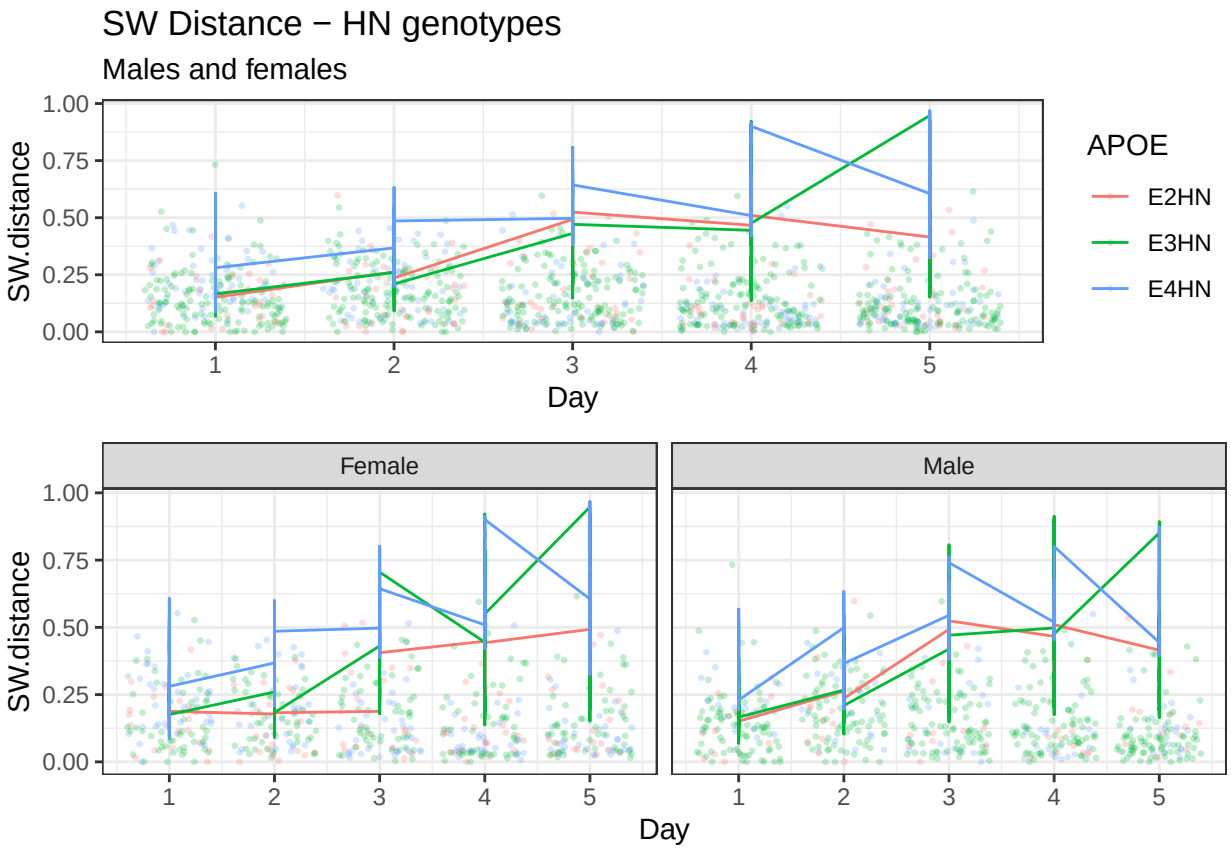

APOE
E44
E4HN
Female
Male
Control
HFD
Time to Platform (s)
60
50
40
30
20
10
Day1
Day2
Day3
Day4
Day5

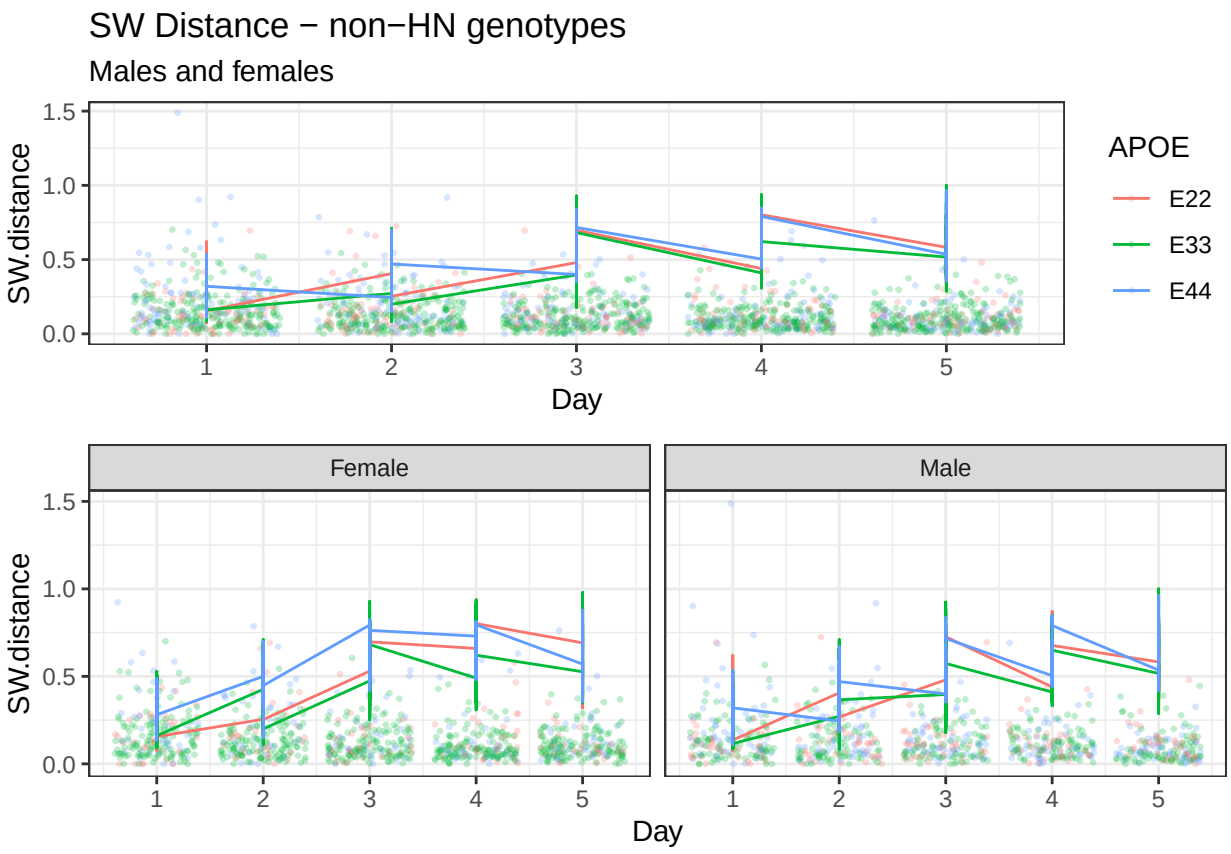

MWM Duration − all genotypes
Males and females
APOE
E22
E2HN
E33
E3HN
E44
E4HN
HN
Duration
Day
Female
Male
0
20
40
60
1
2
3
4
5

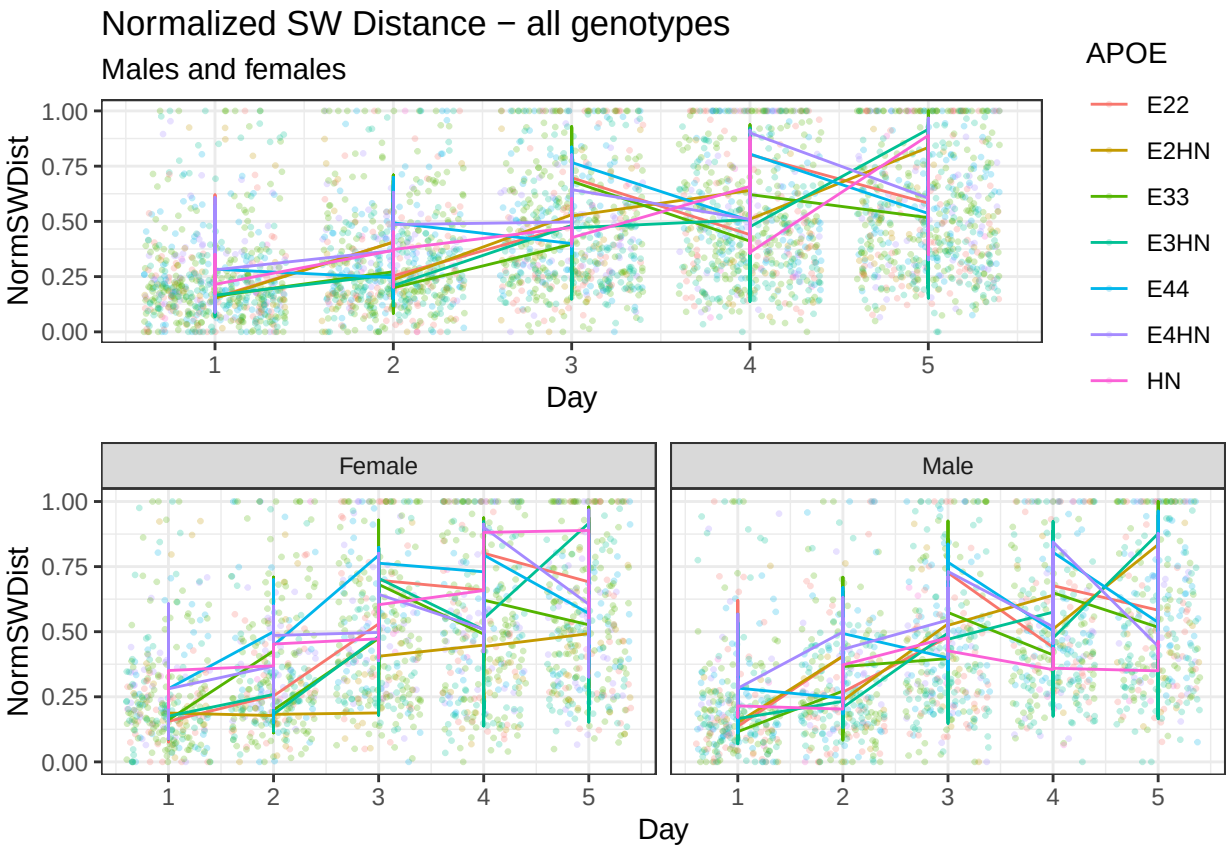

MWM Duration − HN genotypes
Males and females
Duration
Day
APOE
E2HN
E3HN
E4HN
Female
Male

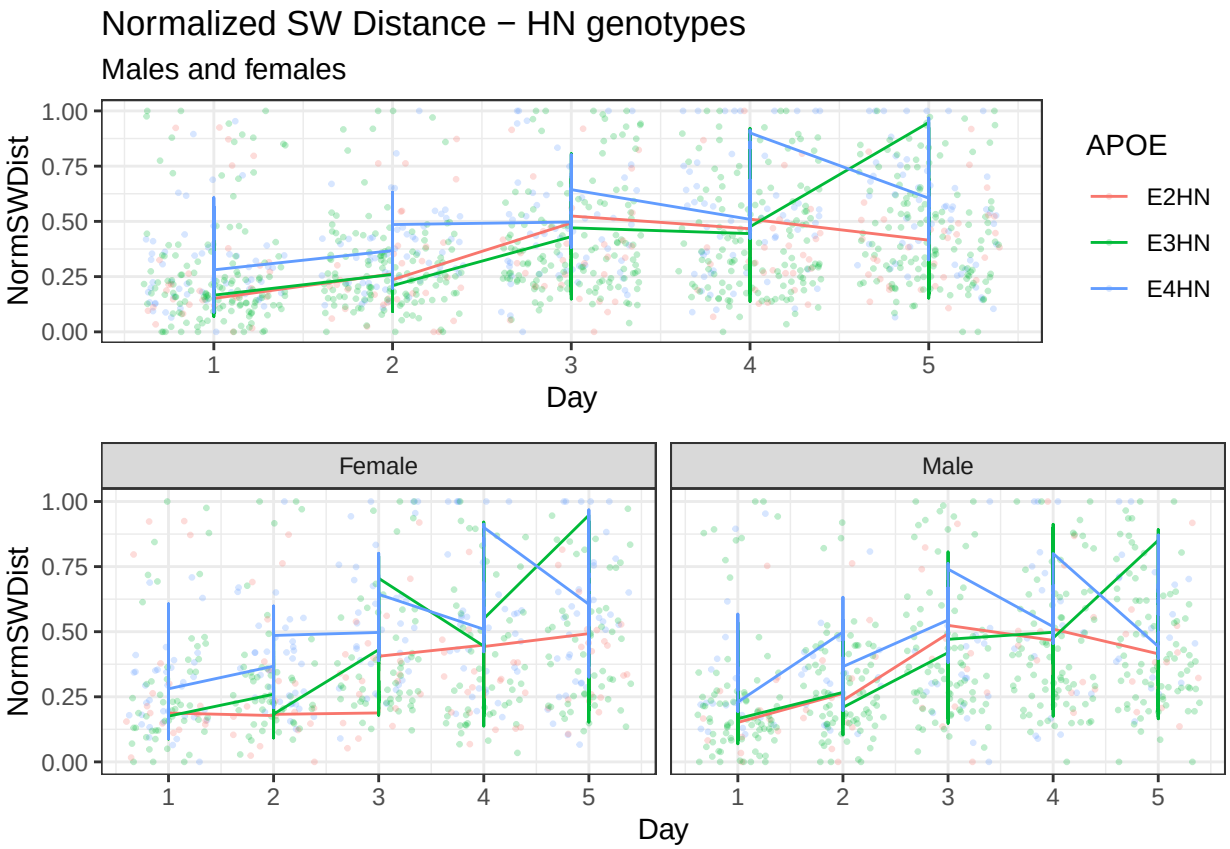

MWM Duration − non−HN genotypes
Males and females
Duration
60
40
20
0
1
2
3
4
5
Day
APOE
E22
E33
E44
Female
Male

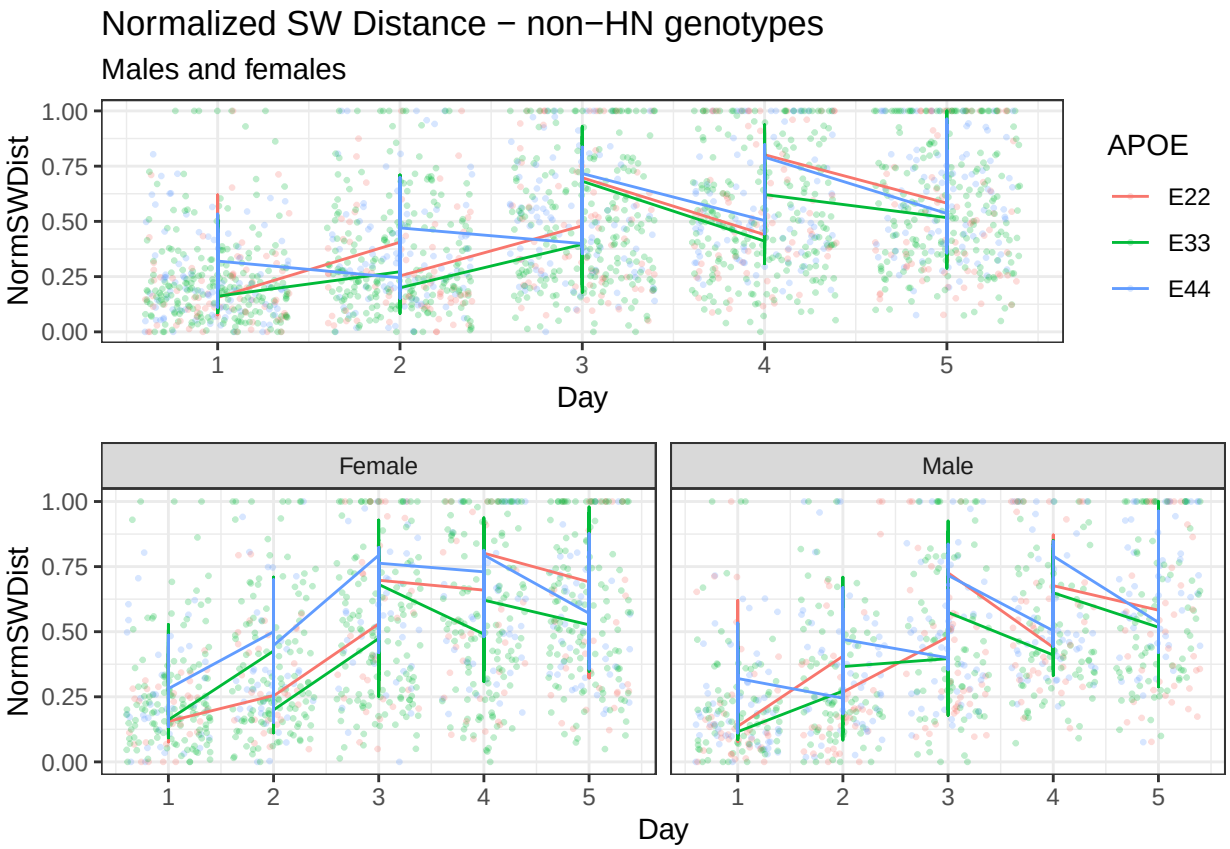

SW Distance − all genotypes
Males and females
APOE
E22
E2HN
E33
E3HN
E44
E4HN
HN
SW.distance
Day
Female
Male

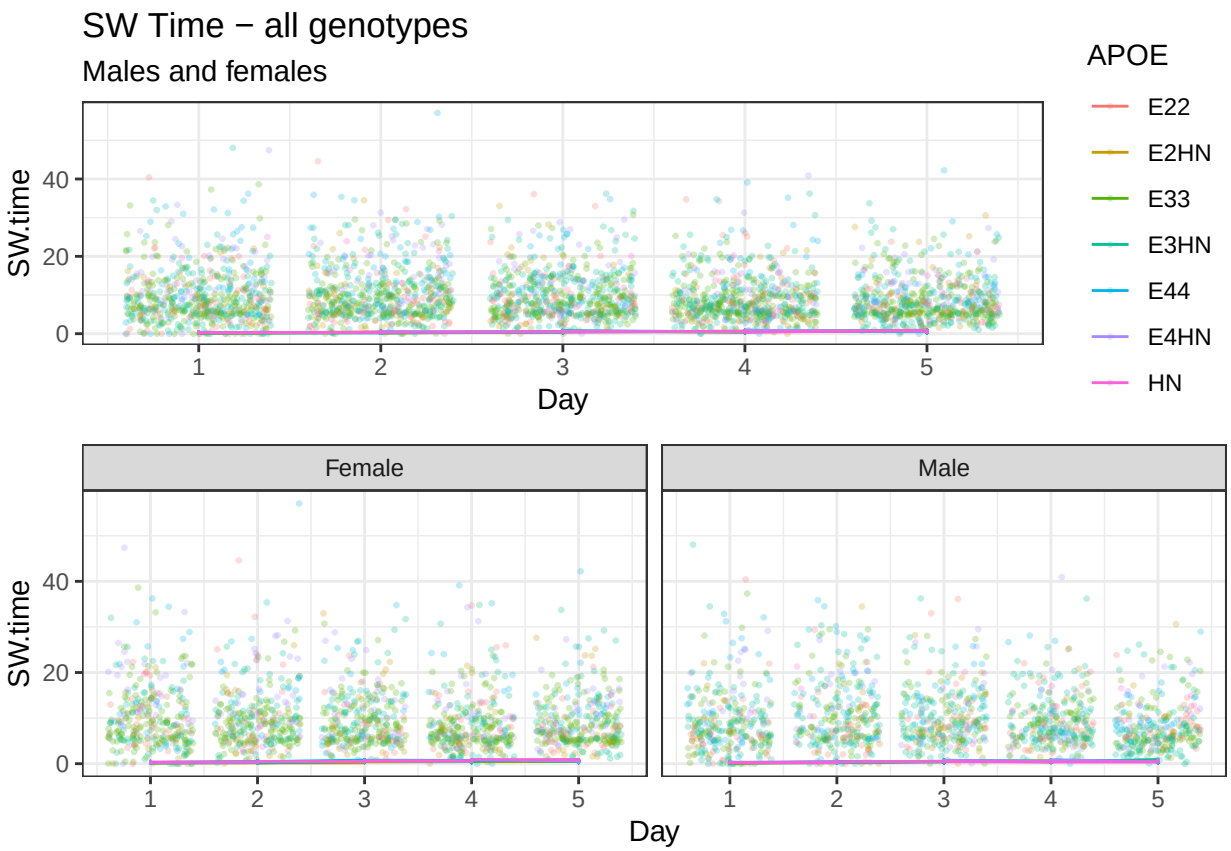

SW Distance − HN genotypes
Males and females
SW.distance
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
Day
APOE
E2HN
E3HN
E4HN
Female
Male

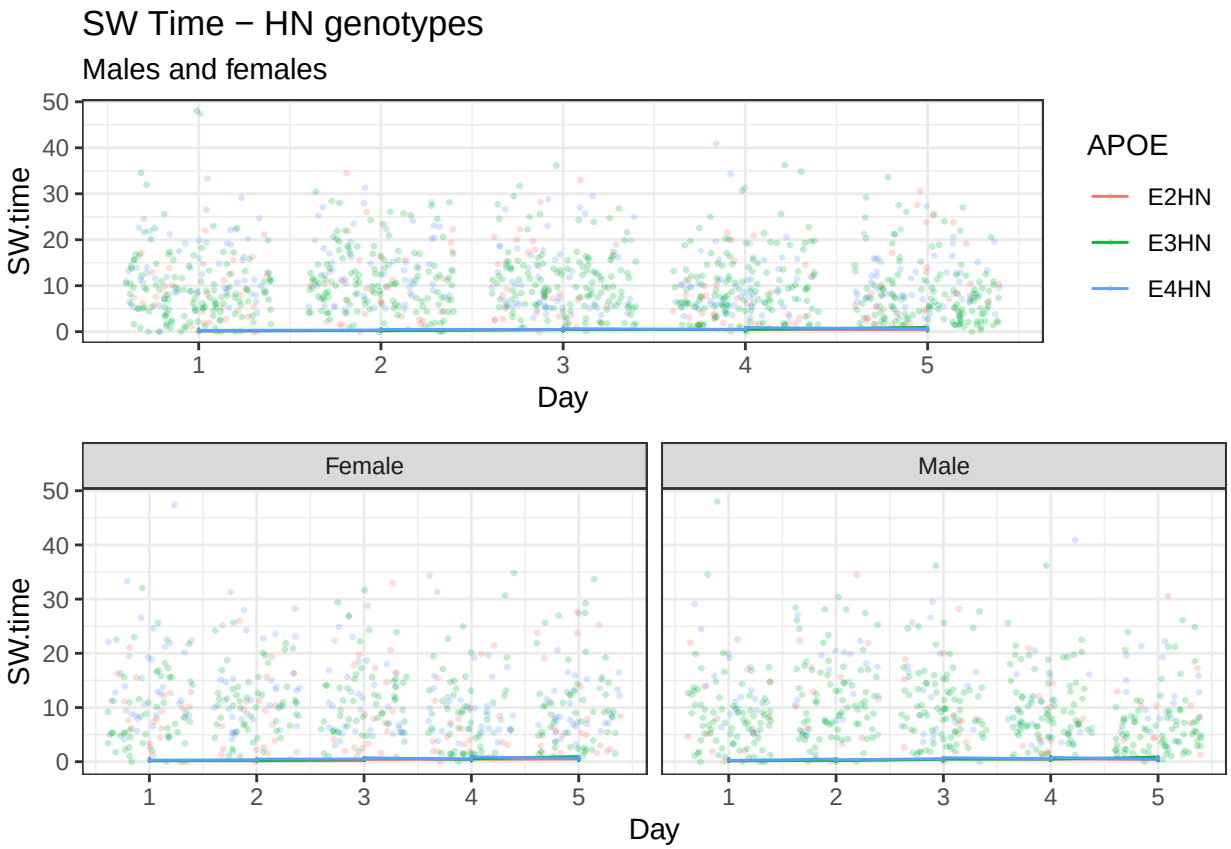

SW Distance − non−HN genotypes
Males and females
SW.distance
1.5
1.0
0.5
0.0
1
2
3
4
5
Day
APOE
E22
E33
E44
Female
Male

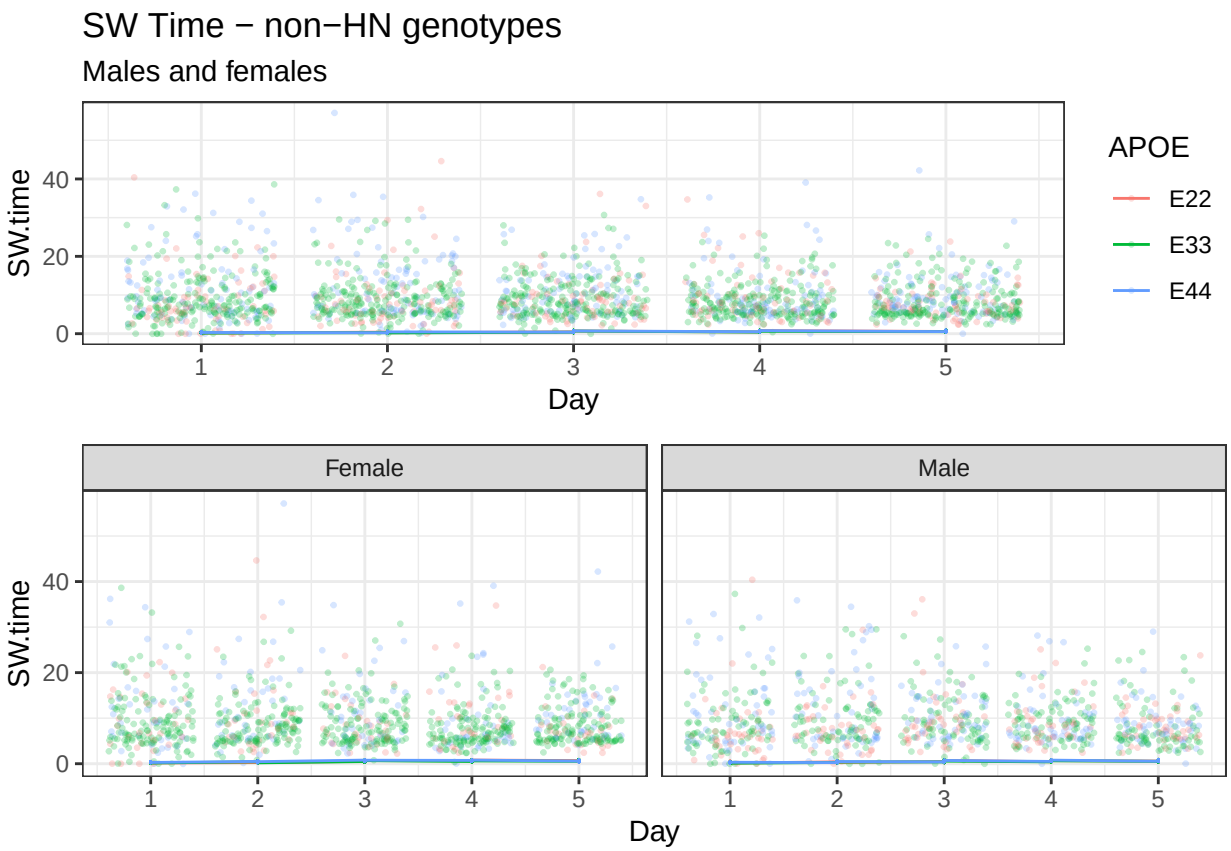

Normalized SW Distance − all genotypes
Males and females
APOE
E22
E2HN
E33
E3HN
E44
E4HN
HN
NormSWDist
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
Day
Female
Male

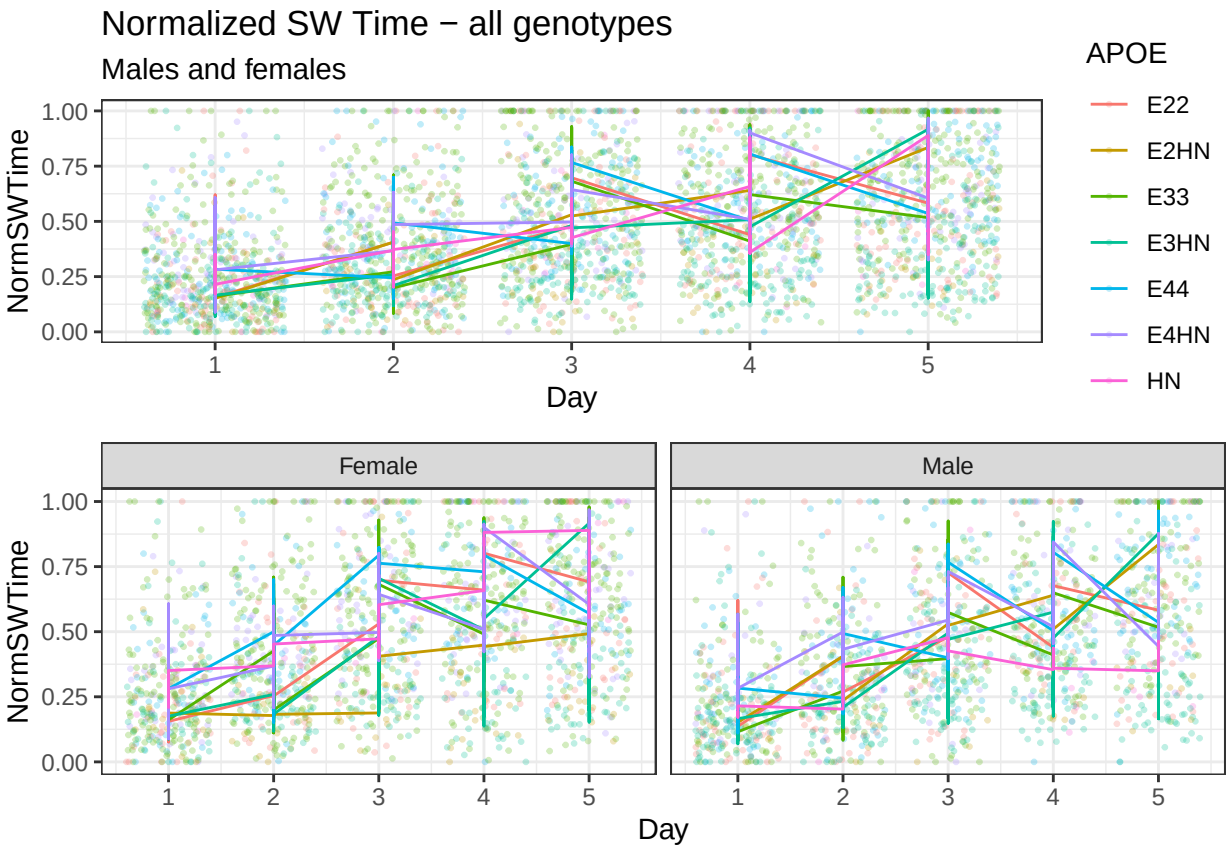

Normalized SW Distance − HN genotypes
Males and females
NormSWDist
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
Day
APOE
E2HN
E3HN
E4HN
Female
Male

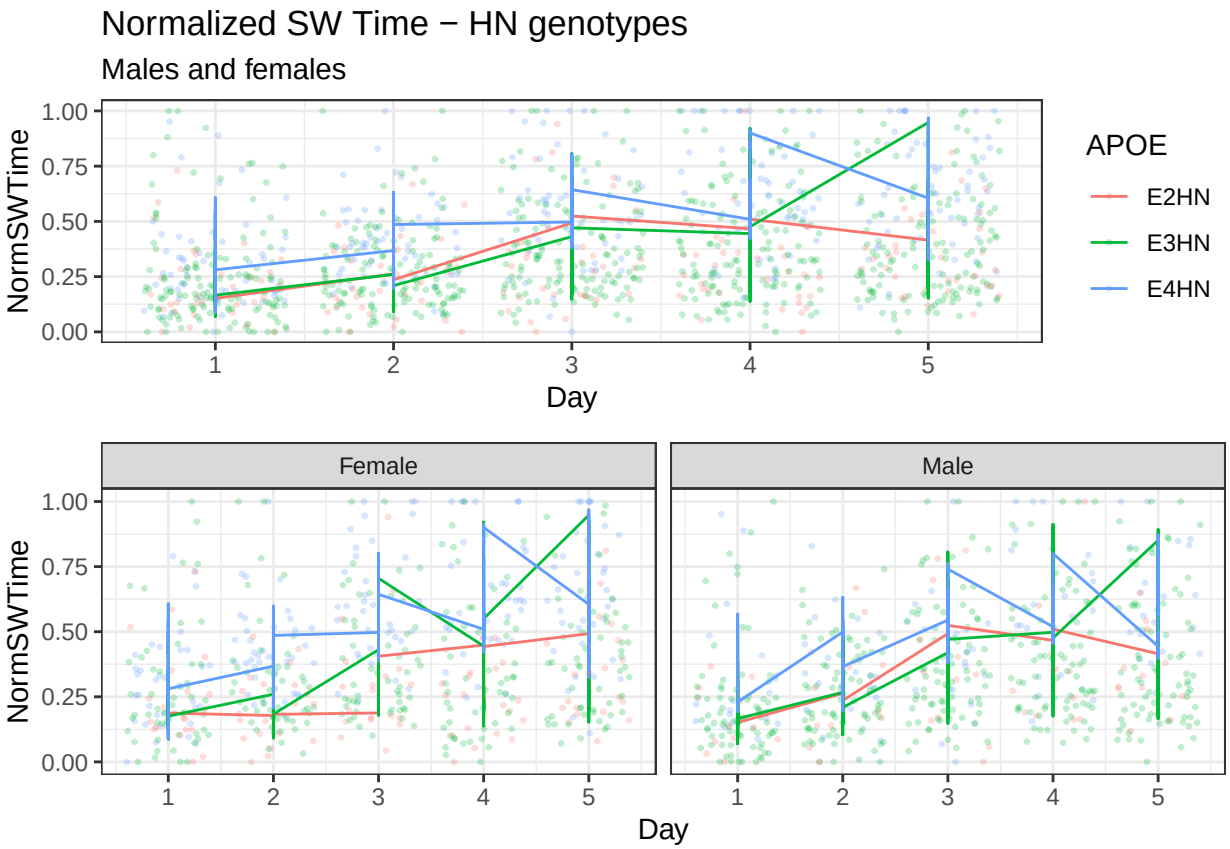

Normalized SW Distance − non−HN genotypes
Males and females
NormSWDist
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
Day
APOE
E22
E33
E44
Female
Male

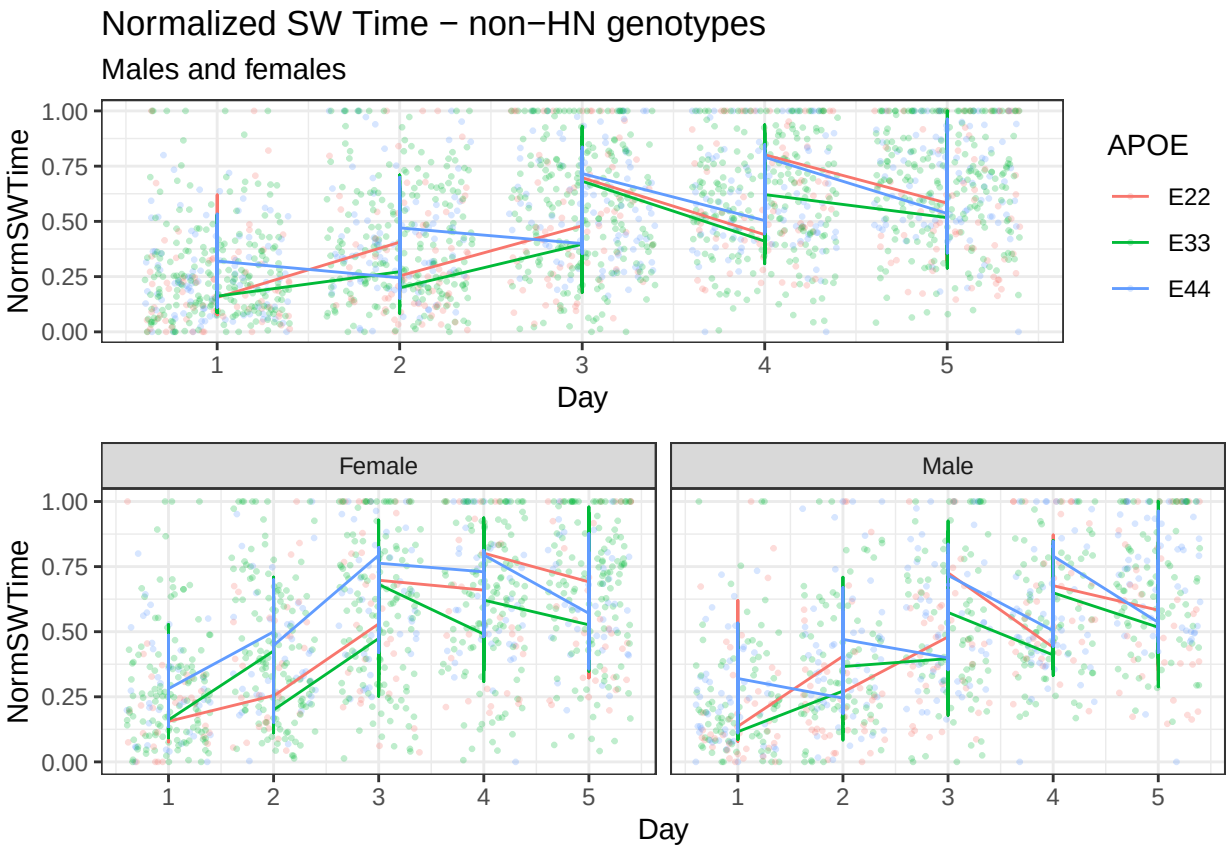

SW Time − all genotypes
Males and females
APOE
E22
E2HN
E33
E3HN
E44
E4HN
HN
SW.time
Day
Female
Male


SW Time − HN genotypes
Males and females
SW.time
Day
APOE
E2HN
E3HN
E4HN
Female
Male


SW Time − non−HN genotypes
Males and females
SW.time
40
20
0
1
2
3
4
5
Day
APOE
E22
E33
E44
Female
Male
SW.time
40
20
0
1
2
3
4
5
Day


Normalized SW Time − all genotypes
Males and females
APOE
E22
E2HN
E33
E3HN
E44
E4HN
HN
NormSWTime
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
Day
Female
Male


Normalized SW Time − HN genotypes
Males and females
NormSWTime
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
Day
APOE
E2HN
E3HN
E4HN
Female
Male


Normalized SW Time − non−HN genotypes
Males and females
NormSWTime
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
Day
APOE
E22
E33
E44
Female
Male