

Spacek et al., 2021, Figure 5

Figure 5c

Effect of locomotion state on firing rate

```
# Random intercept, random slope for neurons,
# random intercept for experiments, nested in series
lmer.5c = lmer(rates ~ run + (1 + run | uid) + (1 | sid/eid),
              data = tbf %>% drop_na(rates))

display(lmer.5c)

## lmer(formula = rates ~ run + (1 + run | uid) + (1 | sid/eid),
##      data = tbf %>% drop_na(rates))
##              coef.est coef.se
## (Intercept) 8.87      1.73
## run          3.03      0.31
##
## Error terms:
## Groups   Name          Std.Dev. Corr
## uid      (Intercept) 8.03
##          run          2.34    0.58
## eid:sid (Intercept) 1.52
## sid      (Intercept) 4.18
## Residual                5.89
## ---
## number of obs: 13220, groups: uid, 66; eid:sid, 22; sid, 10
## AIC = 84952.2, DIC = 84940.8
## deviance = 84938.5

anova(lmer.5c)

## Type III Analysis of Variance Table with Satterthwaite's method
##      Sum Sq Mean Sq NumDF DenDF F value    Pr(>F)
## run 3261.8  3261.8     1 63.94  94.063 3.507e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Running: 11.9 spikes/s
Sitting: 8.9 spikes/s
n = 66 neurons from 6 mice
```

Figure 5d

Effect of locomotion state on burst ratio

```
# Random intercept, random slope for neurons,
# random intercept for experiments, nested in series
lmer.5d = lmer(burstratios ~ run + (1 + run | uid) + (1 | sid/eid),
              data = tbf %>% drop_na(burstratios))

display(lmer.5d)

## lmer(formula = burstratios ~ run + (1 + run | uid) + (1 | sid/eid),
##      data = tbf %>% drop_na(burstratios))
##              coef.est coef.se
## (Intercept)  0.06      0.01
## run          -0.03      0.01
##
## Error terms:
## Groups   Name      Std.Dev. Corr
## uid      (Intercept) 0.08
##          run          0.05   -0.92
## eid:sid (Intercept) 0.02
## sid      (Intercept) 0.02
## Residual                0.09
## ---
## number of obs: 12291, groups: uid, 66; eid:sid, 22; sid, 10
## AIC = -23922.1, DIC = -23970
## deviance = -23954.0

anova(lmer.5d)

## Type III Analysis of Variance Table with Satterthwaite's method
##      Sum Sq Mean Sq NumDF DenDF F value  Pr(>F)
## run 0.16277 0.16277     1 66.662  20.199 2.85e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Running: 0.035
Sitting: 0.063
n = 66 neurons from 6 mice
```

Figure 5e

Effect of locomotion state on sparseness

```
# Random intercept for neurons,  
# random intercept for experiments, nested in series  
lmer.5e = lmer(spars ~ run + (1 | uid) + (1 | sid/eid),  
              data = tbfef %>% drop_na(spars))  
  
display(lmer.5e)  
  
## lmer(formula = spars ~ run + (1 | uid) + (1 | sid/eid), data = tbfef %>%  
##   drop_na(spars))  
##           coef.est coef.se  
## (Intercept)  0.47    0.06  
## run         -0.07    0.02  
##  
## Error terms:  
## Groups   Name      Std.Dev.  
## uid      (Intercept) 0.16  
## eid:sid  (Intercept) 0.04  
## sid      (Intercept) 0.15  
## Residual                0.12  
## ---  
## number of obs: 260, groups: uid, 66; eid:sid, 22; sid, 10  
## AIC = -177.9, DIC = -211  
## deviance = -200.5  
  
anova(lmer.5e)  
  
## Type III Analysis of Variance Table with Satterthwaite's method  
##      Sum Sq Mean Sq NumDF DenDF F value    Pr(>F)  
## run  0.34195  0.34195     1 181.89  22.747 3.776e-06 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Running: 0.40  
Sitting: 0.47  
n = 66 neurons from 6 mice
```

Figure 5f

Effect of locomotion state on reliability

```
# Random intercept for neurons,  
# random intercept for experiments, nested in series  
lmer.5f = lmer(rel ~ run + (1 | uid) + (1 | sid/eid),  
              data = tbfef %>% drop_na(rel))  
  
display(lmer.5f)  
  
## lmer(formula = rel ~ run + (1 | uid) + (1 | sid/eid), data = tbfef %>%  
##   drop_na(rel))  
##           coef.est coef.se  
## (Intercept)  0.16     0.02  
## run         -0.03     0.01  
##  
## Error terms:  
## Groups   Name          Std.Dev.  
## uid      (Intercept)  0.10  
## eid:sid  (Intercept)  0.03  
## sid      (Intercept)  0.04  
## Residual                0.06  
## ---  
## number of obs: 258, groups: uid, 66; eid:sid, 22; sid, 10  
## AIC = -505.5, DIC = -545.1  
## deviance = -531.3  
  
anova(lmer.5f)  
  
## Type III Analysis of Variance Table with Satterthwaite's method  
##      Sum Sq Mean Sq NumDF DenDF F value    Pr(>F)  
## run 0.045474 0.045474     1 176.12  11.828 0.0007282 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Running: 0.13  
Sitting: 0.16  
n = 66 neurons from 6 mice
```

Figure 5i

Effect of locomotion state on firing rate during V1 suppression

```
# Random intercept, random slope for neurons,  
# random intercept for experiments nested in series  
lmer.5i = lmer(rates ~ run + (1 + run | uid) + (1 | sid/eid),  
              data = tbs %>% drop_na(rates))  
  
display(lmer.5i)  
  
## lmer(formula = rates ~ run + (1 + run | uid) + (1 | sid/eid),  
##      data = tbs %>% drop_na(rates))  
##              coef.est coef.se  
## (Intercept) 7.62      1.45  
## run          2.05      0.24  
##  
## Error terms:  
## Groups   Name          Std.Dev. Corr  
## uid      (Intercept) 8.96  
##          run          1.80      0.77  
## eid:sid (Intercept) 1.58  
## sid      (Intercept) 2.52  
## Residual                4.75  
## ---  
## number of obs: 12479, groups: uid, 66; eid:sid, 22; sid, 10  
## AIC = 74867.9, DIC = 74854.3  
## deviance = 74853.1  
  
anova(lmer.5i)  
  
## Type III Analysis of Variance Table with Satterthwaite's method  
##      Sum Sq Mean Sq NumDF DenDF F value    Pr(>F)  
## run 1603.4  1603.4     1   64.8  71.055 5.163e-12 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Running: 9.7 spikes/s  
Sitting: 7.6 spikes/s  
n = 66 neurons from 6 mice
```

Figure 5j

Effect of locomotion state on burst ratio during V1 suppression

```
# Random intercept, random slope for neurons,  
# random intercept for experiments, nested in series  
lmer.5j = lmer(burstratios ~ run + (1 + run | uid) + (1 | sid/eid),  
              data = tbs %>% drop_na(burstratios))  
  
display(lmer.5j)  
  
## lmer(formula = burstratios ~ run + (1 + run | uid) + (1 | sid/eid),  
##      data = tbs %>% drop_na(burstratios))  
##           coef.est coef.se  
## (Intercept)  0.11      0.02  
## run         -0.03      0.01  
##  
## Error terms:  
## Groups   Name          Std.Dev. Corr  
## uid      (Intercept)  0.11  
##          run           0.05    -0.56  
## eid:sid (Intercept)  0.02  
## sid      (Intercept)  0.06  
## Residual                0.12  
## ---  
## number of obs: 11524, groups: uid, 66; eid:sid, 22; sid, 10  
## AIC = -15131.2, DIC = -15175.1  
## deviance = -15161.2  
  
anova(lmer.5j)  
  
## Type III Analysis of Variance Table with Satterthwaite's method  
##      Sum Sq Mean Sq NumDF DenDF F value    Pr(>F)  
## run  0.29436  0.29436     1  68.084  19.489 3.707e-05 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Running: 0.081  
Sitting: 0.11  
n = 66 neurons from 6 mice
```

Figure 5k

Effect of locomotion state on sparseness during V1 suppression

```
# Random intercept for neurons,  
# random intercept for experiments, nested in series, nested in mice  
lmer.5k = lmer(spars ~ run + (1 | uid) + (1 | mid/sid/eid),  
              data = tbskl %>% drop_na(spars))  
  
display(lmer.5k)  
  
## lmer(formula = spars ~ run + (1 | uid) + (1 | mid/sid/eid), data = tbskl %>%  
##   drop_na(spars))  
##           coef.est coef.se  
## (Intercept)  0.56      0.06  
## run          -0.09      0.01  
##  
## Error terms:  
## Groups      Name          Std.Dev.  
## uid         (Intercept)  0.18  
## eid:(sid:mid) (Intercept)  0.03  
## sid:mid     (Intercept)  0.09  
## mid         (Intercept)  0.12  
## Residual                    0.10  
## ---  
## number of obs: 258, groups: uid, 66; eid:(sid:mid), 22; sid:mid, 10; mid, 6  
## AIC = -246.5, DIC = -281.9  
## deviance = -271.2  
  
anova(lmer.5k)  
  
## Type III Analysis of Variance Table with Satterthwaite's method  
##      Sum Sq Mean Sq NumDF  DenDF F value    Pr(>F)  
## run  0.548  0.548      1 179.51  54.74 5.101e-12 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Running: 0.47  
Sitting: 0.56  
n = 66 neurons from 6 mice
```

Figure 51

Effect of locomotion state on reliability during V1 suppression

```
# Random intercept for neurons,  
# random intercept for experiments, nested in series  
lmer.51 = lmer(rel ~ run + (1 | uid) + (1 | sid/eid),  
              data = tbskl %>% drop_na(rel))  
  
display(lmer.51)  
  
## lmer(formula = rel ~ run + (1 | uid) + (1 | sid/eid), data = tbskl %>%  
##   drop_na(rel))  
##           coef.est coef.se  
## (Intercept)  0.18     0.03  
## run          -0.04     0.01  
##  
## Error terms:  
## Groups   Name          Std.Dev.  
## uid      (Intercept)  0.10  
## eid:sid (Intercept)  0.03  
## sid      (Intercept)  0.06  
## Residual                0.07  
## ---  
## number of obs: 256, groups: uid, 66; eid:sid, 22; sid, 10  
## AIC = -448.4, DIC = -486.8  
## deviance = -473.6  
  
anova(lmer.51)  
  
## Type III Analysis of Variance Table with Satterthwaite's method  
##      Sum Sq Mean Sq NumDF DenDF F value    Pr(>F)  
## run  0.12051  0.12051     1 175.65   24.89 1.451e-06 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Running: 0.14  
Sitting: 0.18  
n = 66 neurons from 6 mice
```