

Figure 3-Supplement 1a

Firing rate FMIs separated by cell types

```
# A mixed-effects model with any random intercept gives singular fits,  
# we therefore revert to fitting an ordinary linear model  
  
lmer.3_S1a = lm(grt_meanrate ~ sbc,  
               data = tb %>% drop_na(grt_meanrate))  
  
display(lmer.3_S1a)  
  
## lm(formula = grt_meanrate ~ sbc, data = tb %>% drop_na(grt_meanrate))  
##           coef.est coef.se  
## (Intercept) 0.05      0.05  
## sbc         0.03      0.08  
## ---  
## n = 44, k = 2  
## residual sd = 0.25, R-Squared = 0.00  
anova(lmer.3_S1a)  
  
## Analysis of Variance Table  
##  
## Response: grt_meanrate  
##           Df Sum Sq Mean Sq F value Pr(>F)  
## sbc         1 0.00786 0.007860  0.1213 0.7294  
## Residuals 42 2.72196 0.064809  
  
FMI sbc: 0.0796  
FMI non-sbc: 0.0509  
n = 44 neurons from 4 mice
```

Figure 3-Supplement 1b

Relation between firing rate FMI and recording depth

```
# Random intercept for mice
lmer.3_S1b = lmer(grt_meanrate ~ depth + (1 | mid),
                 data = tib %>% drop_na(grt_meanrate, depth))

display(lmer.3_S1b)

## lmer(formula = grt_meanrate ~ depth + (1 | mid), data = tib %>%
##   drop_na(grt_meanrate, depth))
##               coef.est coef.se
## (Intercept)  0.05      0.08
## depth        0.00      0.00
##
## Error terms:
## Groups   Name          Std.Dev.
## mid      (Intercept)  0.04
## Residual                    0.25
## ---
## number of obs: 42, groups: mid, 4
## AIC = 28.6, DIC = -17.3
## deviance = 1.6

anova(lmer.3_S1b)

## Type III Analysis of Variance Table with Satterthwaite's method
##           Sum Sq   Mean Sq NumDF  DenDF F value Pr(>F)
## depth 5.0103e-06 5.0103e-06     1 38.898  1e-04 0.9929

Slope of  $-2.8e-06 \pm 0.00063$  (95%-confidence interval)
n = 42 neurons from 4 mice
```

Figure 3-Supplement 1c

Relation between firing rate FMI and direction selectivity

```
# Random intercept for series, nested in mice
lmer.3_S1c = lmer(grt_meanrate ~ dsi + (1 | sid/mid),
                 data = tib %>% drop_na(grt_meanrate, dsi))

## boundary (singular) fit: see ?isSingular
display(lmer.3_S1c)

## lmer(formula = grt_meanrate ~ dsi + (1 | sid/mid), data = tib %>%
##   drop_na(grt_meanrate, dsi))
##           coef.est coef.se
## (Intercept) 0.04      0.05
## dsi         0.11      0.19
##
## Error terms:
## Groups   Name          Std.Dev.
## mid:sid (Intercept) 0.00
## sid     (Intercept) 0.00
## Residual                0.25
## ---
## number of obs: 44, groups: mid:sid, 8; sid, 8
## AIC = 18.4, DIC = -4.1
## deviance = 2.2

anova(lmer.3_S1c)

## Type III Analysis of Variance Table with Satterthwaite's method
##           Sum Sq Mean Sq NumDF DenDF F value Pr(>F)
## dsi 0.022426 0.022426     1    42  0.3479 0.5585

Slope of  $0.11 \pm 0.37$  (95%-confidence interval)
n = 44 neurons from 4 mice
```

Figure 3-Supplement 1d

Relation between firing rate FMI and receptive field location

```
# Random intercept for series, nested in mice
lmer.3_S1d = lmer(grt_meanrate ~ rfdist + (1 | mid/sid),
                data = tib %>% drop_na(grt_meanrate, rfdist))

## boundary (singular) fit: see ?isSingular
display(lmer.3_S1d)

## lmer(formula = grt_meanrate ~ rfdist + (1 | mid/sid), data = tib %>%
##   drop_na(grt_meanrate, rfdist))
##           coef.est coef.se
## (Intercept) 0.05      0.14
## rfdist      0.00      0.01
##
## Error terms:
##   Groups   Name      Std.Dev.
## sid:mid (Intercept) 0.11
## mid      (Intercept) 0.00
## Residual                0.21
## ---
## number of obs: 36, groups: sid:mid, 8; mid, 4
## AIC = 15.2, DIC = -19.6
## deviance = -7.2

anova(lmer.3_S1d)

## Type III Analysis of Variance Table with Satterthwaite's method
##           Sum Sq   Mean Sq NumDF  DenDF F value Pr(>F)
## rfdist 0.00015649 0.00015649     1 16.113  0.0036 0.9529

Slope of  $-0.00037 \pm 0.012$  (95%-confidence interval)
n = 36 neurons from 4 mice
```

Figure 3-Supplement 1e

Relation between firing rate FMI and firing rate

```
# Random intercept for series, nested in mice
lmer.3_S1e = lmer(grt_meanrate ~ grt_meanrate_raw + (1 | mid/sid),
                 data = tib %>% drop_na(grt_meanrate, grt_meanrate_raw))

## boundary (singular) fit: see ?isSingular
display(lmer.3_S1e)

## lmer(formula = grt_meanrate ~ grt_meanrate_raw + (1 | mid/sid),
##      data = tib %>% drop_na(grt_meanrate, grt_meanrate_raw))
##              coef.est coef.se
## (Intercept)    0.04    0.06
## grt_meanrate_raw 0.00    0.00
##
## Error terms:
## Groups   Name          Std.Dev.
## sid:mid (Intercept) 0.00
## mid      (Intercept) 0.00
## Residual                    0.25
## ---
## number of obs: 44, groups: sid:mid, 8; mid, 4
## AIC = 27.2, DIC = -12.4
## deviance = 2.4

anova(lmer.3_S1e)

## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq   Mean Sq NumDF DenDF F value Pr(>F)
## grt_meanrate_raw 0.0086593 0.0086593    1    42  0.1337 0.7165

Slope of 0.00094 ± 0.0051 (95%-confidence interval)
n = 44 neurons from 4 mice
```

Figure 3-Supplement 1f

Burst ratio FMIs separated by cell types

```
# Random intercept for series
lmer.3_S1f = lmer(grt_meanburstratio ~ sbc + (1 | sid),
                 data = tb %>% drop_na(grt_meanburstratio))

display(lmer.3_S1f)

## lmer(formula = grt_meanburstratio ~ sbc + (1 | sid), data = tb %>%
##   drop_na(grt_meanburstratio))
##           coef.est coef.se
## (Intercept) -0.23    0.18
## sbc         -0.25    0.13
##
## Error terms:
## Groups   Name      Std.Dev.
## sid      (Intercept) 0.43
## Residual                0.34
## ---
## number of obs: 42, groups: sid, 7
## AIC = 54.7, DIC = 38.7
## deviance = 42.7

anova(lmer.3_S1f)

## Type III Analysis of Variance Table with Satterthwaite's method
##      Sum Sq Mean Sq NumDF DenDF F value Pr(>F)
## sbc 0.44786 0.44786     1 33.95  3.7691 0.06055 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FMI sbc: -0.487
FMI non-sbc: -0.235
n = 42 neurons from 4 mice
```

Figure 3-Supplement 1g

Relation between burst ratio FMI and recording depth

```
# Random intercept for series, nested in mice
lmer.3_S1g = lmer(grt_meanburstratio ~ depth + (1 | mid/sid),
                 data = tib %>% drop_na(grt_meanburstratio, depth))

## boundary (singular) fit: see ?isSingular
display(lmer.3_S1g)

## lmer(formula = grt_meanburstratio ~ depth + (1 | mid/sid), data = tib %>%
##   drop_na(grt_meanburstratio, depth))
##           coef.est coef.se
## (Intercept) -0.37    0.22
## depth        0.00    0.00
##
## Error terms:
## Groups   Name          Std.Dev.
## sid:mid  (Intercept)  0.46
## mid      (Intercept)  0.00
## Residual                    0.37
## ---
## number of obs: 40, groups: sid:mid, 7; mid, 4
## AIC = 70.3, DIC = 31.2
## deviance = 45.8

anova(lmer.3_S1g)

## Type III Analysis of Variance Table with Satterthwaite's method
##           Sum Sq Mean Sq NumDF DenDF F value Pr(>F)
## depth 0.064419 0.064419     1 37.102  0.4768 0.4942

Slope of 0.00043 ± 0.0012 (95%-confidence interval)
n = 40 neurons from 4 mice
```

Figure 3-Supplement 1h

Relation between burst ratio FMI and direction selectivity

```
# Random intercept for series, nested in mice
lmer.3_S1h = lmer(grt_meanburstratio ~ dsi + (1 | mid/sid),
                 data = tib %>% drop_na(grt_meanburstratio, dsi))

display(lmer.3_S1h)

## lmer(formula = grt_meanburstratio ~ dsi + (1 | mid/sid), data = tib %>%
##   drop_na(grt_meanburstratio, dsi))
##           coef.est coef.se
## (Intercept) -0.14    0.31
## dsi         -0.18    0.31
##
## Error terms:
## Groups   Name      Std.Dev.
## sid:mid (Intercept) 0.36
## mid     (Intercept) 0.50
## Residual                0.35
## ---
## number of obs: 42, groups: sid:mid, 7; mid, 4
## AIC = 58.2, DIC = 44.7
## deviance = 46.5

anova(lmer.3_S1h)

## Type III Analysis of Variance Table with Satterthwaite's method
##      Sum Sq Mean Sq NumDF DenDF F value Pr(>F)
## dsi 0.040641 0.040641     1 35.931  0.3281 0.5703

Slope of  $-0.18 \pm 0.63$  (95%-confidence interval)
n = 42 neurons from 4 mice
```


Figure 3-Supplement 1i

Relation between burst ratio FMI and receptive field location

```
# Random intercept for series, nested in mice
lmer.3_S1i = lmer(grt_meanburstratio ~ rfdist + (1 | mid/sid),
                 data = tib %>% drop_na(grt_meanburstratio, rfdist))

display(lmer.3_S1i)

## lmer(formula = grt_meanburstratio ~ rfdist + (1 | mid/sid), data = tib %>%
##   drop_na(grt_meanburstratio, rfdist))
##           coef.est coef.se
## (Intercept)  0.06      0.42
## rfdist       -0.01      0.01
##
## Error terms:
## Groups   Name      Std.Dev.
## sid:mid (Intercept) 0.40
## mid      (Intercept) 0.47
## Residual                    0.36
## ---
## number of obs: 35, groups: sid:mid, 7; mid, 4
## AIC = 59.4, DIC = 33.7
## deviance = 41.5

anova(lmer.3_S1i)

## Type III Analysis of Variance Table with Satterthwaite's method
##           Sum Sq Mean Sq NumDF  DenDF F value Pr(>F)
## rfdist 0.11465 0.11465     1 24.154  0.8808 0.3573

Slope of  $-0.013 \pm 0.028$  (95%-confidence interval)
n = 35 neurons from 4 mice
```

Figure 3-Supplement 1j

Relation between burst ratio FMI and burst ratio

```
# Random intercept for series, nested in mice
lmer.3_S1j = lmer(grt_meanburstratio ~ grt_meanburstratio_raw + (1 | mid/sid),
                 data = tib %>% drop_na(grt_meanburstratio, grt_meanburstratio_raw))

display(lmer.3_S1j)
```

```
## lmer(formula = grt_meanburstratio ~ grt_meanburstratio_raw +
##       (1 | mid/sid), data = tib %>% drop_na(grt_meanburstratio,
##       grt_meanburstratio_raw))
##               coef.est coef.se
## (Intercept)      -0.13    0.27
## grt_meanburstratio_raw -1.45    1.09
##
## Error terms:
## Groups   Name          Std.Dev.
## sid:mid (Intercept) 0.37
## mid      (Intercept) 0.41
## Residual                    0.35
## ---
## number of obs: 42, groups: sid:mid, 7; mid, 4
## AIC = 54.2, DIC = 45.3
## deviance = 44.7
```

```
anova(lmer.3_S1j)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##               Sum Sq Mean Sq NumDF  DenDF F value Pr(>F)
## grt_meanburstratio_raw 0.21482 0.21482     1 33.801  1.7787 0.1912
```

Slope of -1.45 ± 2.18 (95%-confidence interval)

n = 42 neurons from 4 mice