Spontaneous Withdrawal Data

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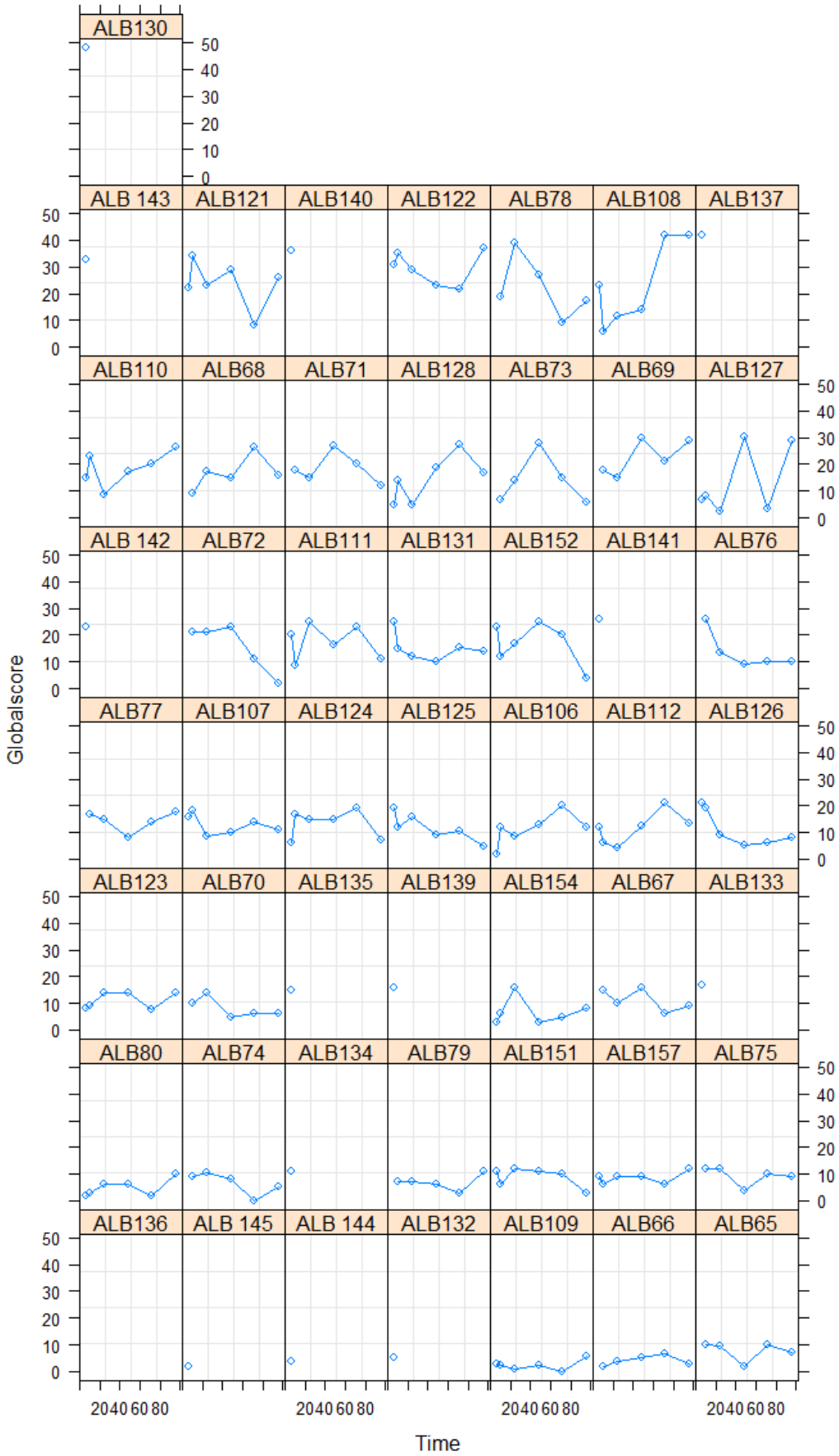
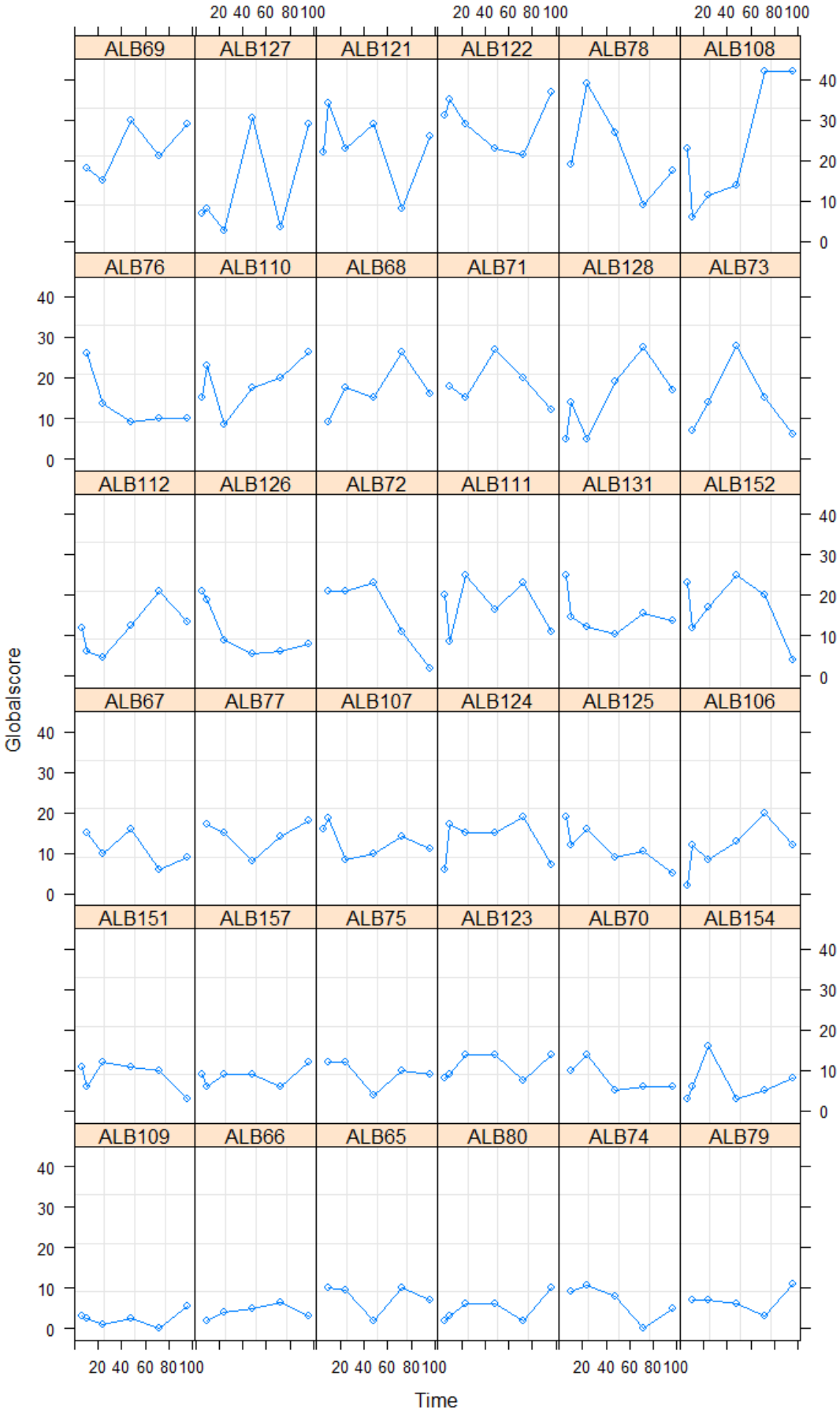
```
library(nlme)

## Warning: package 'nlme' was built under R version 4.1.3

data=read.csv('C:/Users/micke/Desktop/Spontaneous Data.csv')
data=groupedData(Globalscore ~ Time|Subject, data=as.data.frame(data))

## Warning in max(x, na.rm = TRUE): no non-missing arguments to max;
returning -Inf

plot(data)
```


ALB130
ALB 143
ALB121
ALB140
ALB122
ALB78
ALB108
ALB137
ALB110
ALB68
ALB71
ALB128
ALB73
ALB69
ALB127
ALB 142
ALB72
ALB111
ALB131
ALB152
ALB141
ALB76
ALB77
ALB107
ALB124
ALB125
ALB106
ALB112
ALB126
ALB123
ALB70
ALB135
ALB139
ALB154
ALB67
ALB133
ALB80
ALB74
ALB134
ALB79
ALB151
ALB157
ALB75
ALB136
ALB 145
ALB 144
ALB132
ALB109
ALB66
ALB65
Globalscore
Time
0
10
20
30
40
50
2040 60 80

```r
#Too many empty/missing data, maybe some rat subject just died so it's safe
to ignore them out of the analysis.
data=data[data$Subject != 'ALB130',]
data=data[data$Subject != 'ALB 143',]
data=data[data$Subject != 'ALB140',]
data=data[data$Subject != 'ALB137',]
data=data[data$Subject != 'ALB 142',]
data=data[data$Subject != 'ALB141',]
data=data[data$Subject != 'ALB135',]
data=data[data$Subject != 'ALB139',]
data=data[data$Subject != 'ALB133',]
data=data[data$Subject != 'ALB134',]
data=data[data$Subject != 'ALB136',]
data=data[data$Subject != 'ALB 145',]
data=data[data$Subject != 'ALB 144',]
data=data[data$Subject != 'ALB132',]
plot(data)
```


ALB69
ALB127
ALB121
ALB122
ALB78
ALB108
ALB76
ALB110
ALB68
ALB71
ALB128
ALB73
ALB112
ALB126
ALB72
ALB111
ALB131
ALB152
ALB67
ALB77
ALB107
ALB124
ALB125
ALB106
ALB151
ALB157
ALB75
ALB123
ALB70
ALB154
ALB109
ALB66
ALB65
ALB80
ALB74
ALB79
20 40 60 80 100
0 10 20 30 40
Globalscore
Time

```
#We observe that there's different in globalscore shape between subjects,
some rats has high globalscore and it's very active across time, some rats
has low globalscore and it's very inactive across time, we didn't observed
any upward/downward trend in globalscore across time, hinting that time is
not an important factor affecting globalscore, now we will investigate the
effect of drug, gender, time, and potentially subject.
library(tidyverse)

## Warning: package 'tidyverse' was built under R version 4.1.3

## -- Attaching packages --------------------------------------- tidyverse
1.3.2 --
## v ggplot2 3.3.6     v purrr   0.3.4
## v tibble  3.1.7     v dplyr   1.0.9
## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1

## Warning: package 'ggplot2' was built under R version 4.1.3

## Warning: package 'tibble' was built under R version 4.1.3

## Warning: package 'tidyr' was built under R version 4.1.3

## Warning: package 'readr' was built under R version 4.1.3

## Warning: package 'purrr' was built under R version 4.1.3

## Warning: package 'dplyr' was built under R version 4.1.3

## Warning: package 'stringr' was built under R version 4.1.3

## Warning: package 'forcats' was built under R version 4.1.3

## -- Conflicts ------------------------------------------
tidyverse_conflicts() --
## x dplyr::collapse() masks nlme::collapse()
## x dplyr::filter()   masks stats::filter()
## x dplyr::lag()      masks stats::lag()

data=data %>% drop_na("Globalscore")
m1=lme(Globalscore ~ Gender*Drug + Time, data, random= ~1|Subject)
anova(m1)

##             numDF denDF   F-value p-value
## (Intercept)     1   164 296.50074  <.0001
## Gender          1    32   6.38521  0.0166
## Drug            1    32  20.49369  0.0001
## Time            1   164   0.00052  0.9819
## Gender:Drug     1    32   1.22691  0.2763

#To make conclusion on the fixed effect of drug, sex, and time, the result
shows that gender and drug statistically affect the globalscore of the rats
(small p-value), means certain gender/drug does led to higher/lower
```

```
globalscore, time does not statistically affect the globalscore of the rats,
as hinting from the flat graph we observed above (high p-value). Gender has
nothing to do with drug (high p-value), meaning that having a certain
combination of gender and drug does not affect the globalscore.

#Since the model suggested that there's no interaction between gender and
drug, we proceed to refit the model for a more quality result.
m2=lme(Globalscore ~ Gender+Drug+Time, data, random= ~1|Subject)
anova(m2)

##             numDF denDF   F-value p-value
## (Intercept)     1   164 294.34051  <.0001
## Gender          1    33   6.33963  0.0168
## Drug            1    33  20.34501  0.0001
## Time            1   164   0.00054  0.9815

fixef(m2)

##  (Intercept)   GenderMale      DrugWIN         Time
## 7.8574490906 3.8928103915 6.9972491579 0.0003367135

#
# Now we investigate which gender or drug will led to higher globalscore. The
regression coefficient tell us that if the gender is male, the mean
globalscore will increase by slightly 3.89, vice versa if the gender is
female, the mean globalscore will be decrease by 3.89, hence we can conclude
that gender male has higher globalscore than gender female. Likewise, if the
drug is win then the mean globalscore will be higher than vehicle.
#
#Because the rats are randomly chosen for the experiment so there's sampling
uncertainty which caused some random effect, for the sake of simplicity I
just ignore this part as our main concern is to study the fixed effect of
drug, gender, and potentially time.
```