

lme_mods

Jacob Salminen

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Packages & Setup

```
# install.packages(c("tidyverse", "purrr", "R.matlab", "readxl", "dplyr"))
library(readxl);
library(purrr)
library(tidyverse);
```

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.4      v readr      2.1.5
## v forcats    1.0.0      v stringr   1.5.1
## v ggplot2    3.5.0      v tibble    3.2.1
## v lubridate  1.9.3      v tidyr     1.3.1
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(tibble)
library(knitr);
library(gtsummary)
library(kableExtra)
```

```
##
## Attaching package: 'kableExtra'
##
## The following object is masked from 'package:dplyr':
##
##     group_rows
```

```
library(lme4)
```

```
## Loading required package: Matrix
##
## Attaching package: 'Matrix'
##
## The following objects are masked from 'package:tidyr':
##
##     expand, pack, unpack
```

GTSUMMARY THEME

```
# my_theme <-
#   list(
#     "tbl_summary-str:default_con_type" = "continuous2",
#     "tbl_summary-str:continuous_stat" = c(
#       "{median} ({p25} - {p75})",
#       "{mean} ({sd})",
#       "{min} - {max}"
#     ),
#     "tbl_summary-str:categorical_stat" = "{n} / {N} ({p}%)",
#     "style_number-arg:big.mark" = "",
#     "tbl_summary-fn:percent_fun" = function(x) style_percent(x, digits = 3)
#   )
# my_theme <-
#   list()
# gtsummary::set_gtsummary_theme(my_theme)
gtsummary::set_gtsummary_theme(theme_gtsummary_journal("jama"))
```

```
## Setting theme 'JAMA'
## Setting theme 'JAMA'
```

```
# reset_gtsummary_theme()
```

load table

```
# excel_dir <-"M:/jsalminen/GitHub/par_EEGProcessing/src/_data/MIM_dataset/_studies/04162024_MIM_YA0AN8"
excel_dir <-"M:/jsalminen/GitHub/par_EEGProcessing/src/_data/MIM_dataset/_studies/04232024_MIM_YA0AN89"
eegt <- read_excel(excel_dir,sheet="Sheet1")
```

get unique entries

```
clusters = unique(eegt$cluster_id);
subjects = unique(eegt$subj_char);
groups = unique(eegt$group_char);
kin_measures = c('mean_APexc_COV', 'mean_APexc_mean', 'mean_MLexc_COV', 'mean_MLexc_mean', 'mean_StepDur', 'r', 'r2');
eeg_measures = c('theta_avg_power', 'alpha_avg_power', 'beta_avg_power', 'aperiodic_exp', 'aperiodic_offset');
```

get speeds only

```
eegt <- filter_at(eegt,vars('cond_char'), any_vars(. %in% c('0.25','0.5','0.75','1.0')))  
flat_speeds = unique(eegt$cond_char)  
eegt$cond_char <- as.numeric(eegt$cond_char)  
eegt$speed_cond_num <- as.numeric(eegt$cond_char)  
eegt <- mutate(eegt,across(c('subj_char'), factor))
```

Cluster:	3								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.48 (0.15 to 0.81)	0.004	0.007	4.7 (4.0 to 5.5)	<0.001	<0.001	2.6 (2.2 to 3.0)	<0.001	<0.001
speed_cond_num	-0.09 (-0.25 to 0.06)	0.24	0.24	-0.49 (-0.74 to -0.23)	<0.001	<0.001	-0.22 (-0.35 to -0.09)	<0.001	0.001
group_char		<0.001	<0.001		0.035	0.035		0.004	0.004
H1000's	—			—			—		
H2000's	0.57 (0.10 to 1.0)			-1.3 (-2.5 to -0.25)			-0.76 (-1.3 to -0.18)		
H3000's	1.1 (0.68 to 1.6)			-1.1 (-2.1 to -0.02)			-0.89 (-1.4 to -0.33)		
subj_char.sd (Intercept)	0.82 (NA to NA)			1.9 (NA to NA)			1.0 (NA to NA)		
Residual.sd Observation	0.38 (NA to NA)			0.63 (NA to NA)			0.32 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

get terrains only (if applicable)

```
# eegt <- filter_at(eegt,vars('cond_char'), any_vars(. %in% c('flat','low','med','high'))))
# eegt <- filter_at(eegt,vars('cond_char'), any_vars(. %in% c('high'))))
# eegt$terr_ord_speed <- cut(eegt$speed_ms, 4, ordered = TRUE)
```

convert speeds to ordered & groups to factors

```
eegt <- mutate(eegt,across(c('group_char'), factor))
eegt$speed_ord <- cut(eegt$cond_char, 4, ordered = TRUE)
eegt <- mutate(eegt,across(c('cond_char'), factor))
head(eegt)
```

```
## # A tibble: 6 x 139
##   speed_ms subj_id subj_cl_ind subj_char comp_id design_id cond_id cond_char
##   <dbl> <chr>      <dbl> <fct>      <dbl> <chr>      <chr> <fct>
## 1     0.87 1          1 H1004        3 2          1     0.25
## 2     0.91 2          2 H1007        3 2          1     0.25
## 3     0.67 3          3 H1009        4 2          1     0.25
## 4     0.78 4          4 H1010        4 2          1     0.25
## 5     1.2 5          5 H1011        5 2          1     0.25
## 6     0.7 6          6 H1012        8 2          1     0.25
## # i 131 more variables: group_id <chr>, cluster_id <chr>, aperiodic_exp <dbl>,
## #   aperiodic_offset <dbl>, central_freq_1 <dbl>, central_freq_2 <dbl>,
## #   central_freq_3 <dbl>, power_1 <dbl>, power_2 <dbl>, power_3 <dbl>,
## #   r_squared <dbl>, theta_avg_power <dbl>, alpha_avg_power <dbl>,
## #   beta_avg_power <dbl>, theta_1 <dbl>, theta_2 <dbl>, theta_3 <dbl>,
## #   theta_4 <dbl>, theta_5 <dbl>, theta_6 <dbl>, theta_7 <dbl>, theta_8 <dbl>,
## #   'alpha_ 1' <dbl>, 'alpha_ 2' <dbl>, 'alpha_ 3' <dbl>, 'alpha_ 4' <dbl>, ...
```

```
eegt$group_speed_code = paste(eegt$group_char,eegt$cond_char,sep="_")
```

LME EEG ~ 1+speed+group

LME KIN ~ 1+speed+group+speed:group

Cluster:	4								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.37 (0.16 to 0.59)	<0.001	0.002	3.7 (2.8 to 4.6)	<0.001	<0.001	2.6 (1.9 to 3.2)	<0.001	<0.001
speed_cond_num	0.09 (-0.01 to 0.19)	0.093	0.093	-0.44 (-0.67 to -0.21)	<0.001	<0.001	-0.36 (-0.49 to -0.22)	<0.001	<0.001
group_char		0.070	0.093		0.55	0.55		0.11	0.11
H1000's	—			—			—		
H2000's	-0.25 (-0.56 to 0.06)			-0.46 (-1.9 to 0.98)			0.41 (-0.53 to 1.3)		
H3000's	-0.33 (-0.63 to -0.04)			-0.76 (-2.1 to 0.60)			0.95 (0.07 to 1.8)		
subj_char.sd__ (Intercept)	0.51 (NA to NA)			2.4 (NA to NA)			1.6 (NA to NA)		
Residual.sd__ Observation	0.25 (NA to NA)			0.54 (NA to NA)			0.32 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	5								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.03 (-0.24 to 0.30)	0.82	0.82	2.6 (1.6 to 3.5)	<0.001	<0.001	1.2 (0.75 to 1.6)	<0.001	<0.001
speed_cond_num	0.30 (0.15 to 0.46)	<0.001	<0.001	-0.26 (-0.56 to 0.03)	0.079	0.12	-0.08 (-0.20 to 0.05)	0.24	0.24
group_char		0.10	0.15		0.62	0.62		0.11	0.17
H1000's	—			—			—		
H2000's	0.31 (-0.20 to 0.83)			-0.32 (-2.1 to 1.5)			0.39 (-0.48 to 1.3)		
H3000's	0.45 (0.02 to 0.87)			-0.74 (-2.2 to 0.75)			-0.56 (-1.3 to 0.16)		
subj_char.sd__ (Intercept)	0.62 (NA to NA)			2.2 (NA to NA)			1.1 (NA to NA)		
Residual.sd__ Observation	0.30 (NA to NA)			0.57 (NA to NA)			0.24 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	6								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	1.3 (0.94 to 1.7)	<0.001	<0.001	0.78 (0.40 to 1.2)	<0.001	<0.001	1.4 (0.90 to 1.8)	<0.001	<0.001
speed_cond_num	0.18 (0.04 to 0.32)	0.012	0.018	-0.03 (-0.18 to 0.13)	0.71	0.93	-0.25 (-0.34 to -0.15)	<0.001	<0.001
group_char		0.037	0.037		0.93	0.93		0.12	0.12
H1000's	—			—			—		
H2000's	-0.72 (-1.3 to -0.12)			-0.09 (-0.68 to 0.50)			0.70 (-0.01 to 1.4)		
H3000's	-0.54 (-1.1 to 0.03)			-0.10 (-0.67 to 0.46)			0.51 (-0.16 to 1.2)		
subj_char.sd__ (Intercept)	0.93 (NA to NA)			0.93 (NA to NA)			1.1 (NA to NA)		
Residual.sd__ Observation	0.31 (NA to NA)			0.34 (NA to NA)			0.21 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	7								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.32 (0.06 to 0.58)	0.015	0.022	2.8 (1.8 to 3.9)	<0.001	<0.001	2.7 (2.0 to 3.4)	<0.001	<0.001
speed_cond_num	0.23 (0.13 to 0.32)	<0.001	<0.001	-0.50 (-0.79 to -0.20)	<0.001	0.001	-0.47 (-0.63 to -0.31)	<0.001	<0.001
group_char		0.063	0.063		0.85	0.85		0.063	0.063
H1000's	—			—			—		
H2000's	-0.44 (-0.85 to -0.04)			-0.44 (-2.1 to 1.2)			0.71 (-0.39 to 1.8)		
H3000's	-0.33 (-0.68 to 0.03)			-0.01 (-1.5 to 1.5)			1.1 (0.18 to 2.1)		
subj_char.sd__ (Intercept)	0.64 (NA to NA)			2.6 (NA to NA)			1.7 (NA to NA)		
Residual.sd__ Observation	0.23 (NA to NA)			0.69 (NA to NA)			0.38 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	8								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.42 (0.11 to 0.72)	0.007	0.011	4.1 (3.2 to 5.0)	<0.001	<0.001	2.5 (2.0 to 3.0)	<0.001	<0.001
speed_cond_num	0.15 (0.06 to 0.24)	<0.001	0.003	-0.21 (-0.45 to 0.03)	0.088	0.13	-0.18 (-0.30 to -0.05)	0.005	0.008
group_char		0.57	0.57		0.82	0.82		0.73	0.73
H1000's	—			—			—		
H2000's	-0.20 (-0.67 to 0.27)			-0.36 (-1.8 to 1.1)			0.29 (-0.47 to 1.0)		
H3000's	0.06 (-0.40 to 0.52)			-0.40 (-1.8 to 1.0)			0.22 (-0.52 to 0.95)		
subj_char.sd__ (Intercept)	0.83 (NA to NA)			2.5 (NA to NA)			1.3 (NA to NA)		
Residual.sd__ Observation	0.22 (NA to NA)			0.59 (NA to NA)			0.30 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	9								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.49 (0.12 to 0.87)	0.009	0.014	0.71 (-0.08 to 1.5)	0.076	0.076	0.88 (0.47 to 1.3)	<0.001	<0.001
speed_cond_num	0.26 (0.10 to 0.42)	0.002	0.005	-0.22 (-0.46 to 0.02)	0.075	0.076	-0.14 (-0.25 to -0.02)	0.021	0.031
group_char		0.54	0.54		0.029	0.076		0.15	0.15
H1000's	—			—			—		
H2000's	0.19 (-0.34 to 0.72)			1.5 (0.35 to 2.6)			-0.18 (-0.78 to 0.43)		
H3000's	-0.10 (-0.59 to 0.39)			1.0 (-0.04 to 2.1)			-0.54 (-1.1 to 0.02)		
subj_char.sd (Intercept)	0.64 (NA to NA)			1.4 (NA to NA)			0.75 (NA to NA)		
Residual.sd Observation	0.28 (NA to NA)			0.43 (NA to NA)			0.21 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	10								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.57 (0.25 to 0.88)	<0.001	0.001	1.9 (1.0 to 2.8)	<0.001	<0.001	0.99 (0.55 to 1.4)	<0.001	<0.001
speed_cond_num	0.00 (-0.13 to 0.13)	0.97	0.97	-0.46 (-0.72 to -0.19)	<0.001	0.001	-0.17 (-0.28 to -0.06)	0.002	0.003
group_char		0.90	0.97		0.013	0.013		0.63	0.63
H1000's	—			—			—		
H2000's	0.06 (-0.43 to 0.55)			2.1 (0.66 to 3.5)			-0.02 (-0.72 to 0.68)		
H3000's	-0.06 (-0.48 to 0.37)			1.2 (-0.04 to 2.4)			-0.28 (-0.89 to 0.34)		
subj_char.sd (Intercept)	0.63 (NA to NA)			1.8 (NA to NA)			0.92 (NA to NA)		
Residual.sd Observation	0.25 (NA to NA)			0.52 (NA to NA)			0.21 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	11								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.94 (0.57 to 1.3)	<0.001	<0.001	1.4 (0.82 to 2.0)	<0.001	<0.001	0.88 (0.42 to 1.3)	<0.001	<0.001
speed_cond_num	0.37 (0.24 to 0.49)	<0.001	<0.001	-0.20 (-0.44 to 0.03)	0.090	0.13	-0.24 (-0.35 to -0.12)	<0.001	<0.001
group_char		0.012	0.012		0.34	0.34		0.052	0.052
H1000's	—			—			—		
H2000's	-0.71 (-1.2 to -0.18)			-0.04 (-0.85 to 0.76)			0.58 (-0.08 to 1.2)		
H3000's	-0.66 (-1.2 to -0.13)			0.51 (-0.30 to 1.3)			0.78 (0.12 to 1.4)		
subj_char.sd (Intercept)	0.83 (NA to NA)			1.3 (NA to NA)			1.1 (NA to NA)		
Residual.sd Observation	0.27 (NA to NA)			0.52 (NA to NA)			0.24 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	12								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.72 (0.38 to 1.1)	<0.001	<0.001	1.3 (0.41 to 2.2)	0.004	0.013	1.7 (0.93 to 2.5)	<0.001	<0.001
speed_cond_num	0.27 (0.12 to 0.42)	<0.001	<0.001	-0.08 (-0.28 to 0.13)	0.47	0.71	-0.24 (-0.37 to -0.10)	<0.001	<0.001
group_char		0.10	0.10		0.80	0.80		0.087	0.087
H1000's	—			—			—		
H2000's	-0.28 (-0.77 to 0.21)			-0.08 (-1.4 to 1.2)			0.62 (-0.55 to 1.8)		
H3000's	-0.50 (-0.96 to -0.04)			0.32 (-0.90 to 1.5)			1.2 (0.14 to 2.3)		
subj_char.sd (Intercept)	0.75 (NA to NA)			2.0 (NA to NA)			1.8 (NA to NA)		
Residual.sd Observation	0.33 (NA to NA)			0.46 (NA to NA)			0.30 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	13								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.57 (0.17 to 0.97)	0.005	0.016	4.0 (2.9 to 5.1)	<0.001	<0.001	2.0 (1.5 to 2.6)	<0.001	<0.001
speed_cond_num	0.00 (-0.14 to 0.14)	>0.99	>0.99	-0.66 (-0.99 to -0.33)	<0.001	<0.001	-0.38 (-0.54 to -0.22)	<0.001	<0.001
group_char		0.15	0.22		0.95	0.95		0.33	0.33
H1000's	—			—			—		
H2000's	-0.36 (-0.99 to 0.26)			-0.26 (-2.0 to 1.4)			0.26 (-0.57 to 1.1)		
H3000's	0.29 (-0.30 to 0.88)			-0.20 (-1.8 to 1.4)			-0.39 (-1.2 to 0.39)		
subj_char.sd (Intercept)	0.89 (NA to NA)			2.4 (NA to NA)			1.2 (NA to NA)		
Residual.sd Observation	0.27 (NA to NA)			0.66 (NA to NA)			0.31 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

Cluster:	4								
Characteristic	EEG Theta			EEG Alpha			EEG Beta		
	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value	Beta (95% CI)	p-value	q-value
(Intercept)	0.49 (0.12 to 0.87)	0.009	0.014	0.71 (-0.08 to 1.5)	0.076	0.076	0.88 (0.47 to 1.3)	<0.001	<0.001
speed_cond_num	0.26 (0.10 to 0.42)	0.002	0.005	-0.22 (-0.46 to 0.02)	0.075	0.076	-0.14 (-0.25 to -0.02)	0.021	0.031
group_char		0.54	0.54		0.029	0.076		0.15	0.15
H1000's	—			—			—		
H2000's	0.19 (-0.34 to 0.72)			1.5 (0.35 to 2.6)			-0.18 (-0.78 to 0.43)		
H3000's	-0.10 (-0.59 to 0.39)			1.0 (-0.04 to 2.1)			-0.54 (-1.1 to 0.02)		
subj_char.sd (Intercept)	0.64 (NA to NA)			1.4 (NA to NA)			0.75 (NA to NA)		
Residual.sd Observation	0.28 (NA to NA)			0.43 (NA to NA)			0.21 (NA to NA)		

¹ CI = Confidence Interval

² False discovery rate correction for multiple testing

