Light exposure related behavior and their influence on memory, concentration, chronotype, mood and sleep quality

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Abstract

One or two sentences providing a **basic introduction** to the field, comprehensible to a scientist in any discipline.

Two to three sentences of **more detailed background**, comprehensible to scientists in related disciplines.

One sentence clearly stating the **general problem** being addressed by this particular study.

One sentence summarizing the main result (with the words “**here we show**” or their equivalent).

Two or three sentences explaining what the **main result** reveals in direct comparison to what was thought to be the case previously, or how the main result adds to previous knowledge.

One or two sentences to put the results into a more **general context**.

Two or three sentences to provide a **broader perspective**, readily comprehensible to a scientist in any discipline.

Keywords: keywords

Word count: X

Light exposure related behavior and their influence on memory, concentration, chronotype, mood and sleep quality

##Objectives: 1. To explore the current light consumption pattern. 2. To investigate whether light exposure related behaviours can predict Trouble in concentration, trouble in memory Chronotype and sleep quality Mood.

Hypothesis

Light exposure related behaviour will successfully predict: Trouble in Concentration and memory Chronotype and Sleep quality Mood

Methods

A priori power analysis was done to determine adequate sample sizes with G*Power 3.0 (Faul, Erdfelder, Lang, & Buchner, 2007). To achieve a medium effect size (partial $\eta 2 = 0.14$)(Cohen, 1988) and 80% statistical power for liner multiple regression with seven predictors will need a total sample of 85 individuals. In our online survey we collected 124 participants data. 17 data were excluded due to incomplete data.

Participants

A online survey on 124 participants was conducted in September,2022 to understand the local people's light exposure related behavior. The survey was anonymous and a gift voucher of RM 10 was given to the fist 100 participants.

Material

Karolinska Sleepiness Scale. Subjective alertness wase evaluated with the Karolinska Sleepiness Scale (Åkerstedt & Gillberg, 1990). It is a self-reported subjective assessment that uses a 10-point Likert-type scale, ranging from extremely sleepy (10 points) to extremely alert (1 point). This scale has been highly correlated with the actual workplace performance and the objective measures of fatigue.

PANAS. The positive and negative affect (PANAS) (Watson, Clark, & Tellegen, 1988) was used to measure positive and negative affects. PANAS is comprised of 20 items, 10 items measuring positive affects and 10 items measuring negative affects. PANAS has a high internal consistency coefficient alpha (.87) and sufficient structural validity(Watson et al., 1988).

Office light Survey. We used office light survey (Eklund & Boyce, 1996) to measure light satisfaction, trouble in concentration, trouble in memory and light's influence on different physiological discomfort including fatigue, clumsiness, and weakness. ### Harvard Light Exposure Assessment. To measure individual's average daily light exposure in lux from subjective reporting use was Harvard light exposure assessment (H-LEA) (Bajaj, Rosner, Lockley, & Schernhammer, 2011). H-LEA is a reliable tool to assess daily light exposure as it showed significantly strong correlation ($r = .72$, $p < .001$) with actual photopic light measures. However, one challenge we need to deal with was the absence of estimated corneal illuminance for LED luminaires. To address this issue, we take 10 random readings of illuminance at different position and averaged them.

Pittsburgh Sleep Quality Index. The Pittsburgh Sleep Quality Index (Buysse, Reynolds C. F., Monk, Berman, & Kupfer, 1989) is a useful instrument used to measure sleep quality and sleep patterns. It measures seven domains of sleep to differentiate "poor" from "good" sleep. Scores range from zero to three on a Likert Scale, whereby 3 reflects the negative extreme on the Likert Scale. A sum of scores equal to or greater than five indicates poor sleep quality. The PSQI has internal consistency and a reliability coefficient (Cronbach's alpha) of 0.83 for its seven components. Scores also exhibit a strong correlation with related sleep construct indicating high validity of the scale

Morningness-Eveningness Questionnaire. Morningness-Eveningness questionnaire (Horne & Ostberg, 1976) is consist of 19 questions. The scores range from 16 to 86. The higher scores indicate more morning propensity. Its internal consistency in a New Zealand version was, Cronbach α coefficient=0.83. In the Original study in student population (18-32 years) scores were validated with oral temperature curves. ### Light exposure behavior assessment (LEBA). There was no suitable tool to measure behaviors that may lead to different light exposure. As a result, we in conjunction with a team based on University of Basel developed a tool to characterise different light exposure-related behaviours in people. A robust panel of expert created 48 pertaining items that captures different light exposure related behaviors. Our contribution towards the development of this scale was to conduct formal psychometric analysis. Our exploratory factor analysis revealed five factor with 25 items. In our CFA analysis we obtain a best fit with a five factor model consisting 23 items (CFI =.97; TLI = .96; RMSEA = .05

$$.04 - .06, 90$$

, SRMR = .09) The internal consistency reliability coefficients were .93, .80, .61, .72, .45 respectively indicating satisfactory reliability for F1, F2 and F4 . The manuscript of the development of LEBA is still a work in progress and will be submitted to a reputed Q1 journal.

Internal Consistency Indices for the scales

Name

Internal Consistency

Original Sample

Internal Consistency

Our Sample

PANAS

.87

r apa(PANAS_IC.raw,2,T)

PSQI

.83

r apa(PSQI_IC.raw,2,T)

MEQ

.83

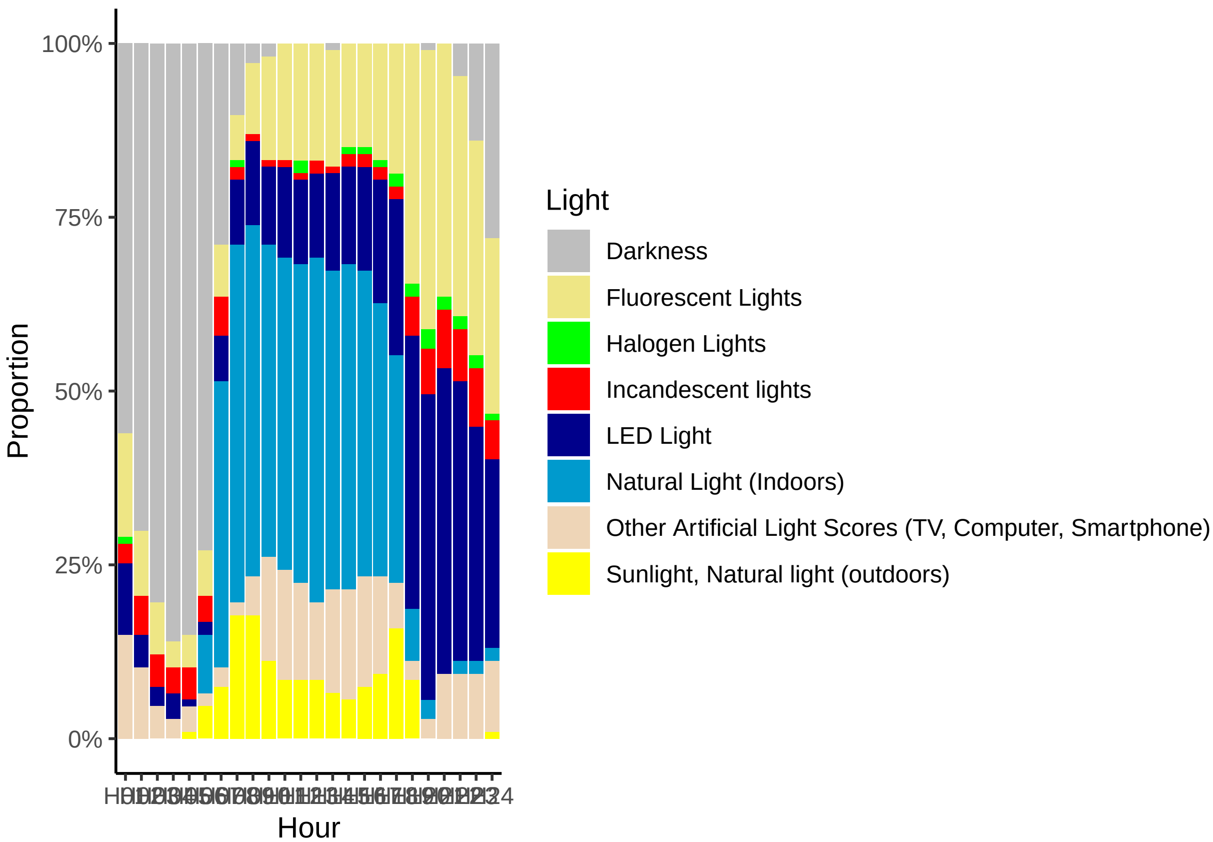
r apa(MEQ_IC.alpha.raw,2,T)

LEBA

: Internal Consistency Indices for the scales

Procedure

Data analysis

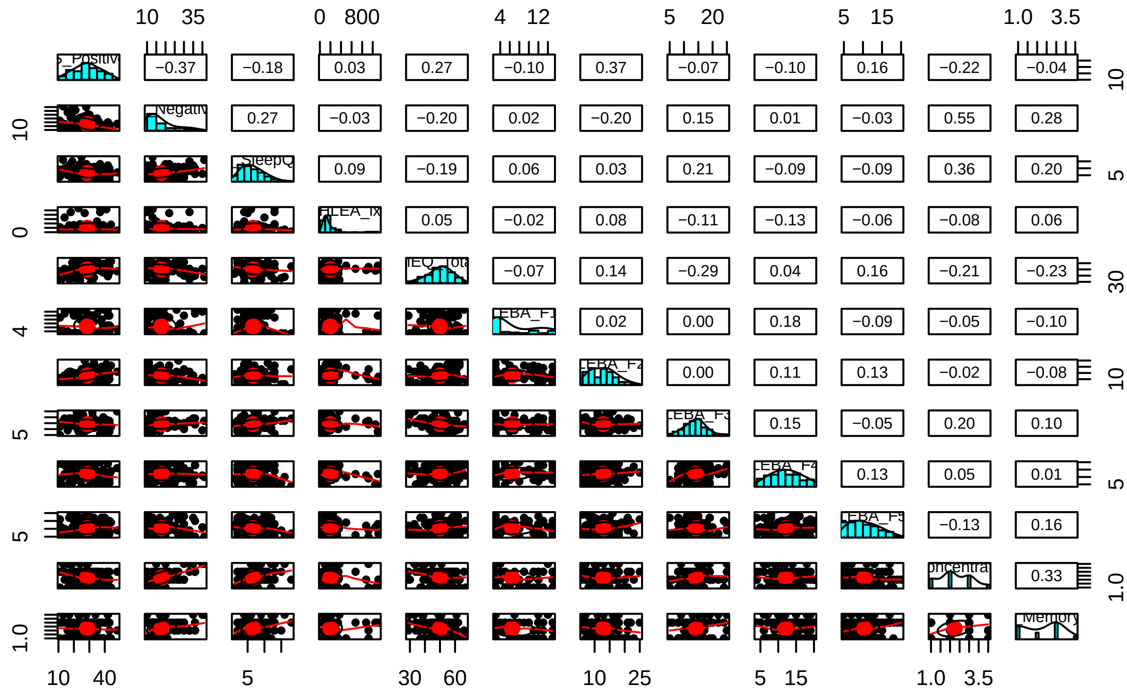



```
## corx::corx(data = LMR, caption = "Correlation Matrix")
##
## Correlation Matrix
## -------------------------------------------------------------------------
##                       PANAS_PositiveAffect PANAS_NegativeAffect
## -------------------------------------------------------------------------
## PANAS_PositiveAffect                     -                -.37*
## PANAS_NegativeAffect                 -.37*                    -
## PSQI_SleepQuality                     -.18                 .27*
## HLEA_lx                                .03                 -.03
```

```
## MEQ_Total                                  .27*                -.20*
## LEBA_F1                                  -.10                  .02
## LEBA_F2                                  .37*                -.20*
## LEBA_F3                                  -.07                  .15
## LEBA_F4                                  -.10                  .01
## LEBA_F5                                   .16                 -.03
## OLS_Concentration_rec                   -.22*                 .55*
## OLS_Memory_rec                           -.04                 .28*
##                       PSQI_SleepQuality HLEA_lx MEQ_Total LEBA_F1 LEBA_F2
## PANAS_PositiveAffect               -.18     .03      .27*    -.10    .37*
## PANAS_NegativeAffect               .27*    -.03     -.20*     .02   -.20*
## PSQI_SleepQuality                     -     .09      -.19     .06     .03
## HLEA_lx                             .09       -       .05    -.02     .08
## MEQ_Total                          -.19     .05         -    -.07     .14
## LEBA_F1                             .06    -.02      -.07       -     .02
## LEBA_F2                             .03     .08       .14     .02       -
## LEBA_F3                            .21*    -.11     -.29*     .00     .00
## LEBA_F4                            -.09    -.13       .04     .18     .11
## LEBA_F5                            -.09    -.06       .16    -.09     .13
## OLS_Concentration_rec              .36*    -.08     -.21*    -.05    -.02
## OLS_Memory_rec                     .20*     .06     -.23*    -.10    -.08
##                       LEBA_F3 LEBA_F4 LEBA_F5 OLS_Concentration_rec
## PANAS_PositiveAffect     -.07    -.10     .16                 -.22*
## PANAS_NegativeAffect      .15     .01    -.03                  .55*
## PSQI_SleepQuality        .21*    -.09    -.09                  .36*
## HLEA_lx                  -.11    -.13    -.06                  -.08
## MEQ_Total               -.29*     .04     .16                 -.21*
```

```
## LEBA_F1                  .00     .18    -.09                      -.05
## LEBA_F2                  .00     .11     .13                      -.02
## LEBA_F3                   -      .15    -.05                      .20*
## LEBA_F4                  .15      -      .13                       .05
## LEBA_F5                 -.05     .13      -                       -.13
## OLS_Concentration_rec   .20*     .05    -.13                        -
## OLS_Memory_rec           .10     .01     .16                      .33*
##                       OLS_Memory_rec
## PANAS_PositiveAffect             -.04
## PANAS_NegativeAffect             .28*
## PSQI_SleepQuality                .20*
## HLEA_lx                           .06
## MEQ_Total                       -.23*
## LEBA_F1                          -.10
## LEBA_F2                          -.08
## LEBA_F3                           .10
## LEBA_F4                           .01
## LEBA_F5                           .16
## OLS_Concentration_rec            .33*
## OLS_Memory_rec                     -
## ------------------------------------------------------------------------
## Note. * p < 0.05
```

Scatterplot Matix



OLS_Concentration_rec

OLS_Concentration_rec

Coeffcient

Estimates

std. Beta

p

Estimates

std. Beta

p

(Intercept)

1.93(0.00)

0.00(-0.19 – 0.19)

<0.001

1.90(0.00)

0.00(-0.19 – 0.19)

<0.001

LEBA_F1

-0.01(-0.06)

-0.06(-0.26 – 0.13)

0.516

LEBA_F2

-0.00(-0.01)

-0.01(-0.20 – 0.19)

0.954

LEBA_F3

0.04(0.19)

0.19(-0.00 – 0.38)

0.055

0.04(0.20)

0.20(0.01 – 0.39)

0.041

LEBA_F4

0.01(0.05)

0.05(-0.15 – 0.25)

0.647

LEBA_F5

-0.03(-0.13)

-0.13(-0.32 – 0.07)

0.196

-0.03(-0.12)

-0.12(-0.31 – 0.07)

0.220

Observations

107

107

R2 / R2 adjusted

0.060 / 0.014

0.055 / 0.037

AIC

287.253

281.824

log-Likelihood

-136.626

-136.912

OLS_Memory_rec

OLS_Memory_rec

Coeffcient

Estimates

std. Beta

p

Estimates

std. Beta

p

(Intercept)

1.83(-0.00)

-0.00(-0.19 – 0.19)

0.001

1.81(0.00)

0.00(-0.19 – 0.19)

<0.001

LEBA_F1

-0.02(-0.08)

-0.08(-0.28 – 0.11)

0.395

LEBA_F2

-0.02(-0.10)

-0.10(-0.30 – 0.09)

0.290

LEBA_F3

0.03(0.11)

0.11(-0.09 – 0.30)

0.272

LEBA_F4

-0.00(-0.00)

-0.00(-0.20 – 0.20)

0.991

LEBA_F5

0.05(0.18)

0.18(-0.02 – 0.37)

0.079

0.04(0.16)

0.16(-0.03 – 0.35)

0.092

Observations

107

107

R2 / R2 adjusted

0.057 / 0.010

0.027 / 0.018

AIC

310.575

305.927

log-Likelihood

-148.287

-149.964

PSQI_SleepQuality

PSQI_SleepQuality

Coeffcient

Estimates

std. Beta

p

Estimates

std. Beta

p

(Intercept)

4.85(0.00)

0.00(-0.19 – 0.19)

0.013

5.07(0.00)

0.00(-0.19 – 0.19)

0.001

LEBA_F1

0.06(0.07)

0.07(-0.12 – 0.27)

0.449

LEBA_F2

0.04(0.05)

0.05(-0.14 – 0.24)

0.609

LEBA_F3

0.20(0.23)

0.23(0.04 – 0.42)

0.020

0.20(0.23)

0.23(0.04 – 0.42)

0.018

LEBA_F4

-0.11(-0.13)

-0.13(-0.33 – 0.07)

0.185

-0.10(-0.12)

-0.12(-0.31 – 0.07)

0.204

LEBA_F5

-0.05(-0.06)

-0.06(-0.25 – 0.14)

0.554

Observations

107

107

R2 / R2 adjusted

0.071 / 0.025

0.060 / 0.042

AIC

572.836

568.153

log-Likelihood

-279.418

-280.076

PANAS_PositiveAffect

PANAS_PositiveAffect

Coeffcient

Estimates

std. Beta

p

Estimates

std. Beta

p

(Intercept)

21.97(0.00)

0.00(-0.18 – 0.18)

<0.001

21.21(0.00)

0.00(-0.18 – 0.18)

<0.001

LEBA_F1

-0.13(-0.07)

-0.07(-0.26 – 0.11)

0.434

LEBA_F2

0.74(0.37)

0.37(0.19 – 0.55)

<0.001

0.73(0.37)

0.37(0.19 – 0.55)

<0.001

LEBA_F3

-0.10(-0.05)

-0.05(-0.23 – 0.14)

0.621

-0.09(-0.04)

-0.04(-0.22 – 0.14)

0.642

LEBA_F4

-0.28(-0.14)

-0.14(-0.33 – 0.05)

0.144

-0.31(-0.15)

-0.15(-0.34 – 0.03)

0.100

LEBA_F5

0.27(0.12)

0.12(-0.06 – 0.30)

0.194

0.29(0.13)

0.13(-0.05 – 0.31)

0.162

Observations

107

107

R2 / R2 adjusted

0.182 / 0.142

0.177 / 0.145

AIC

752.005

750.656

log-Likelihood

-369.003

-369.328

PANAS_NegativeAffect

PANAS_NegativeAffect

Coeffcient

Estimates

std. Beta

p

Estimates

std. Beta

p

(Intercept)

17.78(-0.00)

-0.00(-0.19 – 0.19)

<0.001

18.19(-0.00)

-0.00(-0.19 – 0.19)

<0.001

LEBA_F1

0.05(0.03)

0.03(-0.17 – 0.22)

0.789

LEBA_F2

-0.37(-0.20)

-0.20(-0.39 – -0.01)

0.043

-0.36(-0.20)

-0.20(-0.39 – -0.01)

0.039

LEBA_F3

0.30(0.16)

0.16(-0.04 – 0.35)

0.113

0.30(0.16)

0.16(-0.03 – 0.34)

0.105

LEBA_F4

-0.00(-0.00)

-0.00(-0.20 – 0.20)

0.984

LEBA_F5

0.02(0.01)

0.01(-0.19 – 0.20)

0.934

Observations

107

107

R2

0.064

0.063 / 0.045

AIC

750.325

744.406

log-Likelihood

-368.162

-368.203

MEQ_Total

MEQ_Total

Coeffcient

Estimates

std. Beta

p

Estimates

std. Beta

p

(Intercept)

52.02(0.00)

0.00(-0.18 – 0.18)

<0.001

51.24(0.00)

0.00(-0.18 – 0.18)

<0.001

LEBA_F1

-0.14(-0.08)

-0.08(-0.26 – 0.11)

0.424

LEBA_F2

0.23(0.12)

0.12(-0.07 – 0.30)

0.213

0.22(0.12)

0.12(-0.07 – 0.30)

0.218

LEBA_F3

-0.59(-0.29)

-0.29(-0.48 – -0.11)

0.002

-0.59(-0.29)

-0.29(-0.48 – -0.10)

0.003

LEBA_F4

0.14(0.07)

0.07(-0.12 – 0.27)

0.451

0.11(0.06)

0.06(-0.13 – 0.25)

0.541

LEBA_F5

0.26(0.12)

0.12(-0.07 – 0.31)

0.212

0.28(0.13)

0.13(-0.06 – 0.32)

0.177

Observations

107

107

R2 / R2 adjusted

0.128 / 0.085

0.123 / 0.088

AIC

752.026

750.705

log-Likelihood

-369.013

-369.353

Durbin-Watson test is a test for a particular type of (lack of) independence; namely, 1st-order autocorrelation, which means that adjacent observations (specifically, their errors) are correlated (i.e., not independent) (Draper & Smith, 1998). D-W statistics less than 1 or greater than 3 should definitely raise alarm bells. The closer to 2 that the value is, the better.

If the largest VIF is greater than 10 then there is cause for concern (Bowerman &O'Connell, 1990; Myers, 1990).

If the average VIF is substantially greater than 1 then the regression may be biased (Bowerman & O'Connell, 1990).

Tolerance below 0.1 indicates a serious problem. Tolerance below 0.2 indicates a potential problem (Menard, 1995).

```
##  lag Autocorrelation D-W Statistic p-value
##    1      0.05772839      1.882874   0.552
##  Alternative hypothesis: rho != 0
```

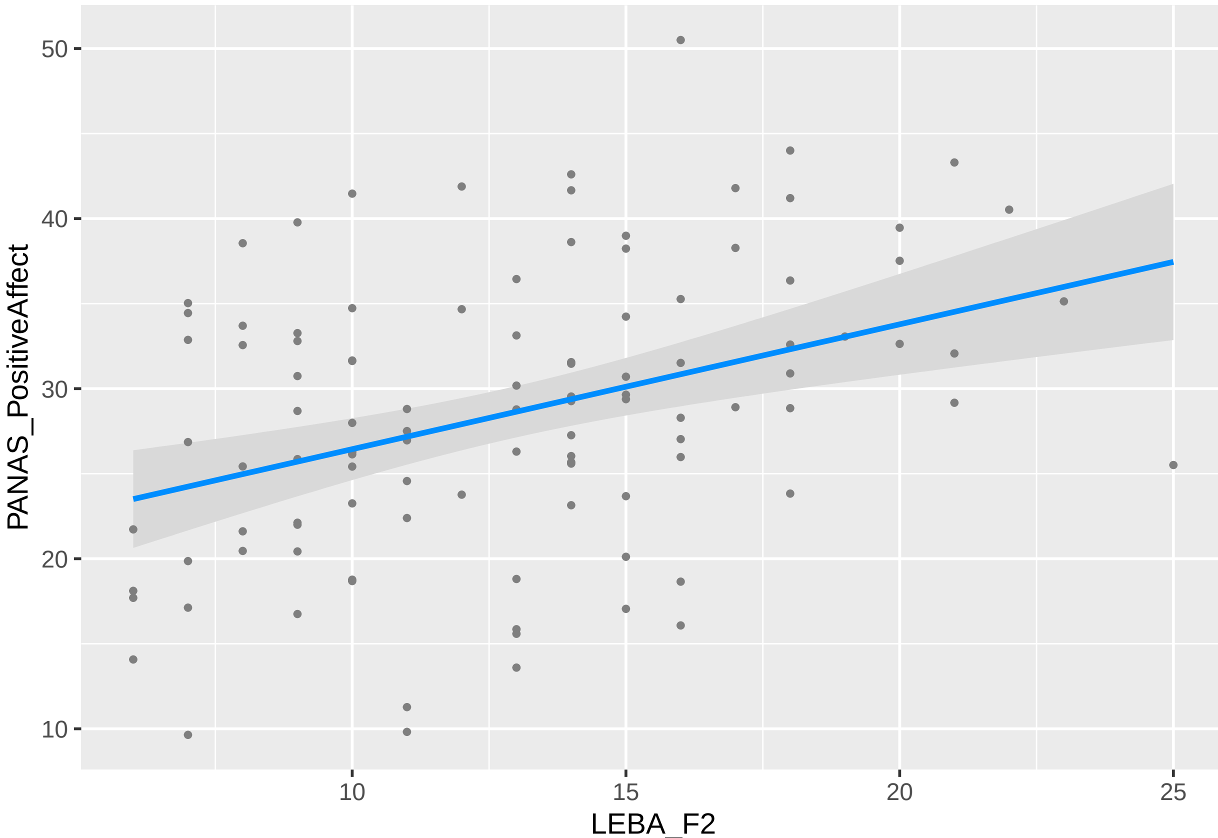
```
##  lag Autocorrelation D-W Statistic p-value
##    1     0.007636486      1.982434    0.93
##  Alternative hypothesis: rho != 0
```

```
##  lag Autocorrelation D-W Statistic p-value
##    1      0.04662594       1.89612   0.528
##  Alternative hypothesis: rho != 0
```

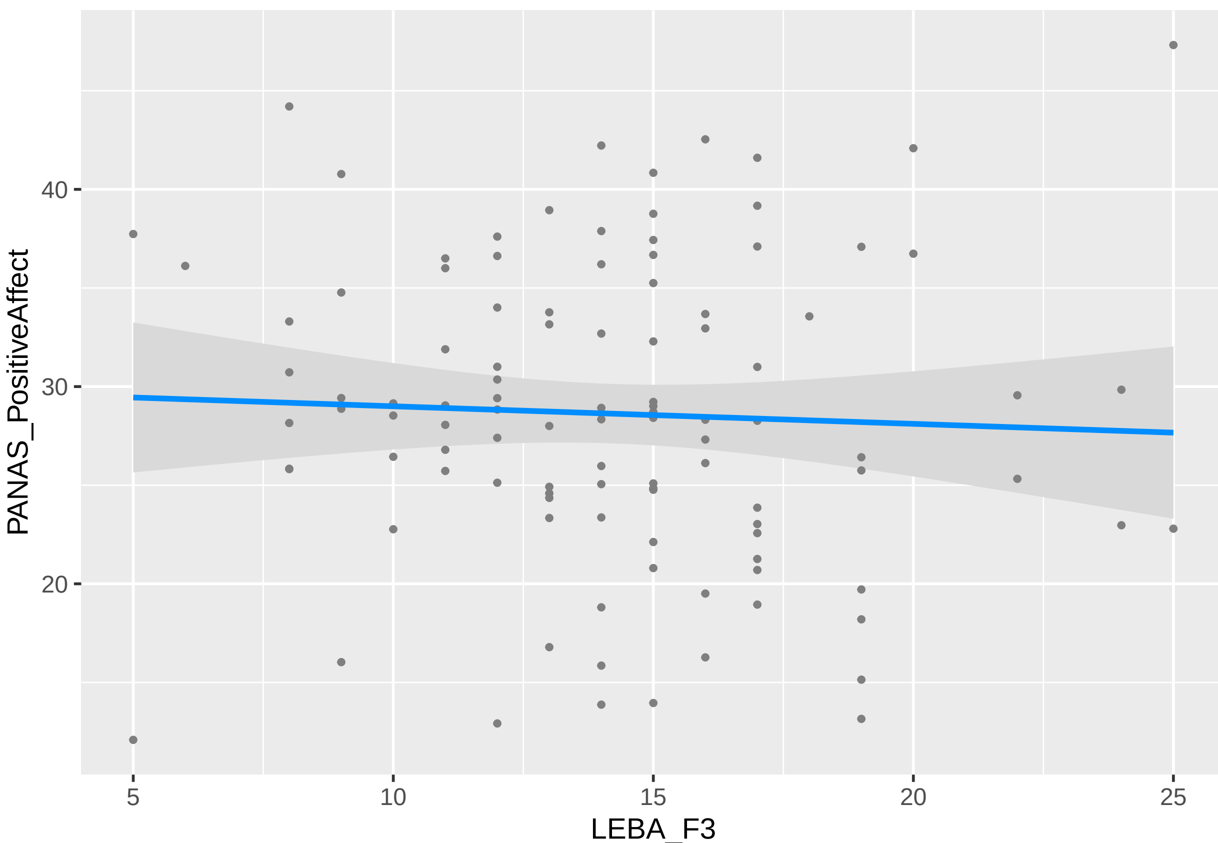
```
##  lag Autocorrelation D-W Statistic p-value
##    1    -0.005715252      2.006302   0.958
##  Alternative hypothesis: rho != 0
```

```
##  lag Autocorrelation D-W Statistic p-value
##    1      -0.0192388      2.026411   0.904
##  Alternative hypothesis: rho != 0
```

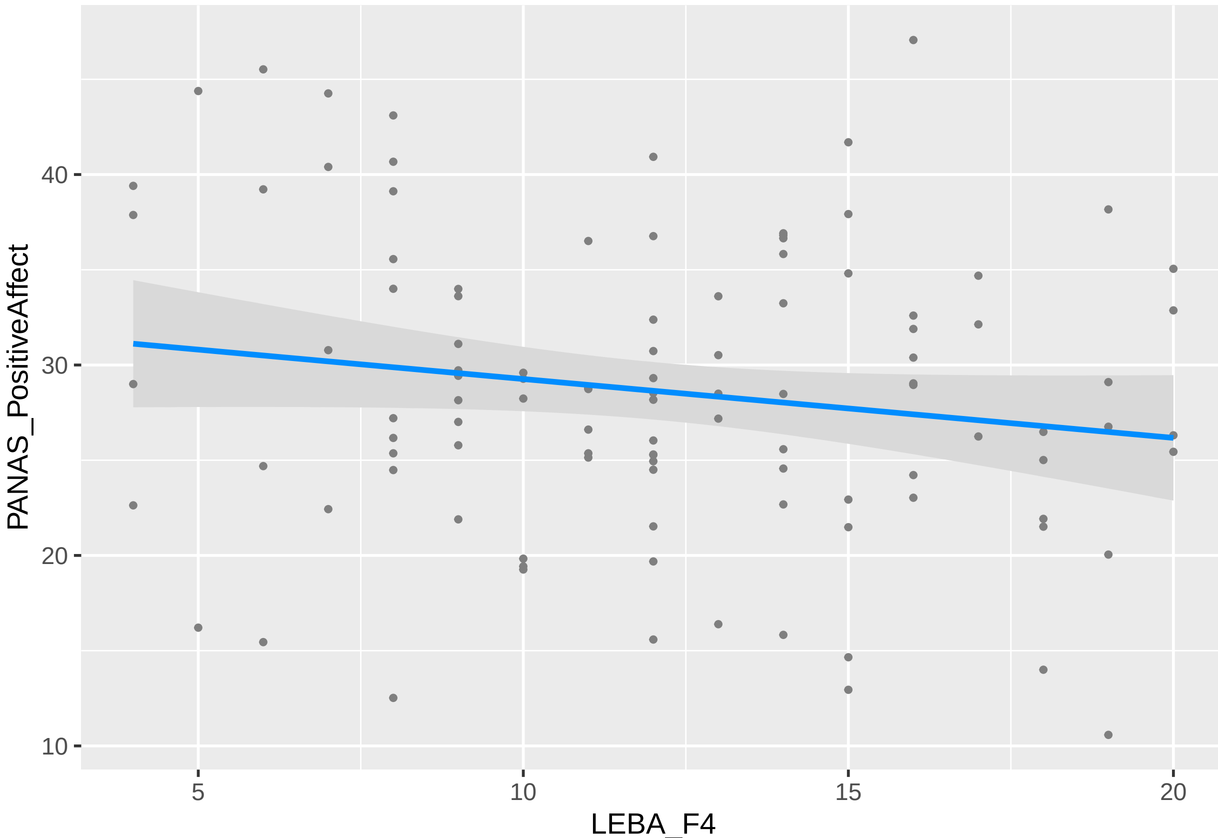
```
##  lag Autocorrelation D-W Statistic p-value
##    1      0.05187488      1.858637   0.458
##  Alternative hypothesis: rho != 0

##  LEBA_F3  LEBA_F5
## 1.002201 1.002201

## [1] 1.002201

##  LEBA_F3  LEBA_F4
## 1.023181 1.023181

## [1] 1.023181

##  LEBA_F2  LEBA_F3  LEBA_F4  LEBA_F5
## 1.026575 1.027925 1.052119 1.036737

## [1] 1.035839

##  LEBA_F2  LEBA_F3  LEBA_F4  LEBA_F5
## 1.026575 1.027925 1.052119 1.036737

## [1] 1.035839

##  LEBA_F2  LEBA_F3
## 1.000015 1.000015

## [1] 1.000015

## [[1]]
```



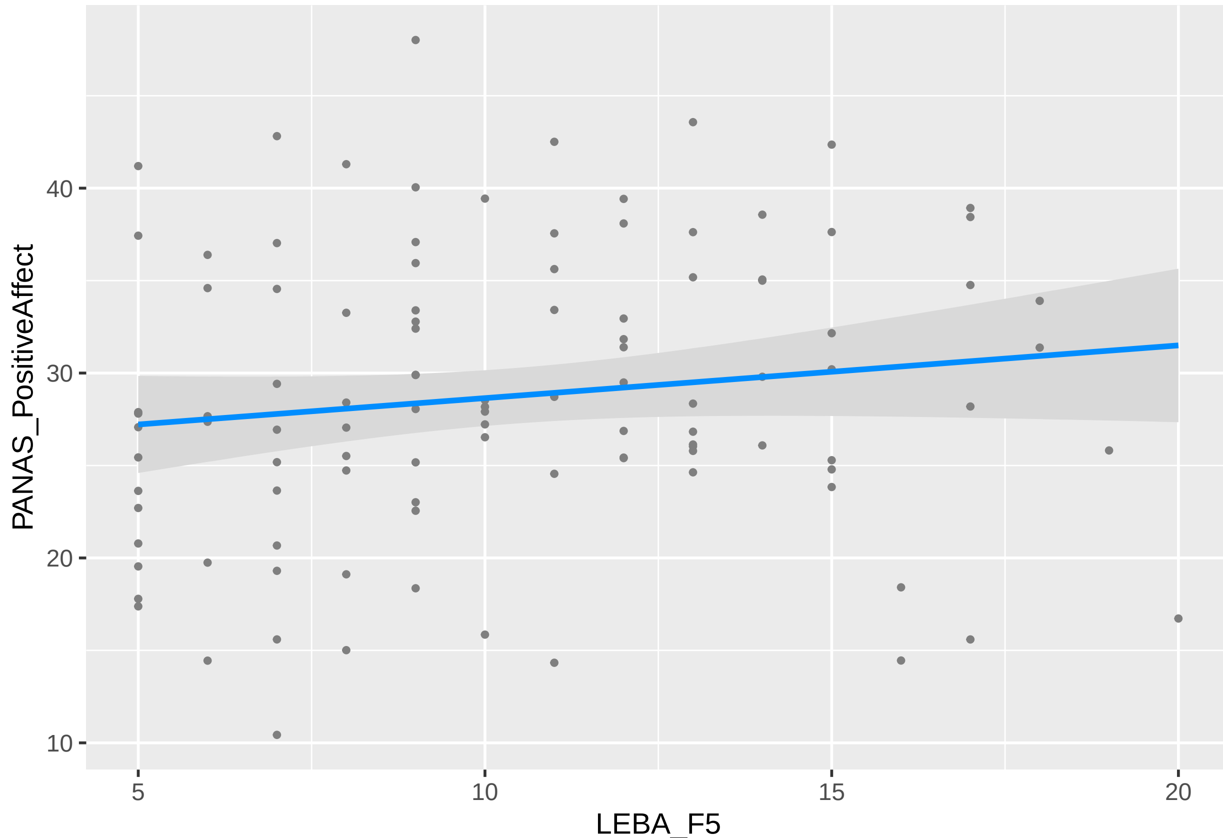

```
##
## [[2]]
```

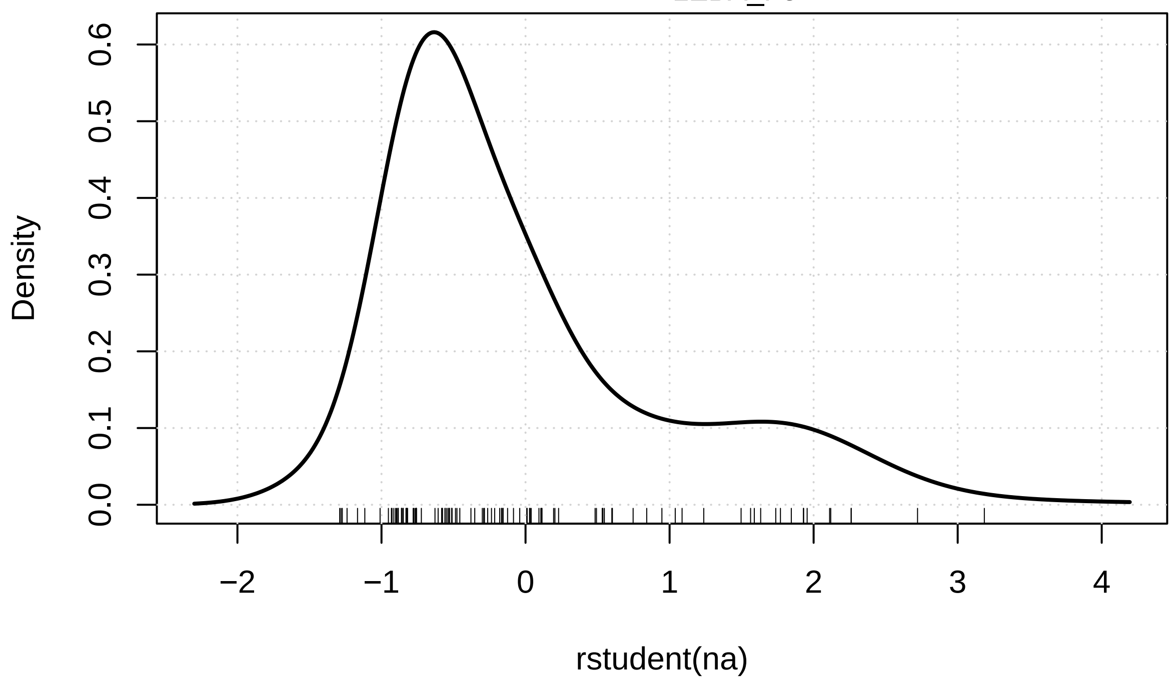


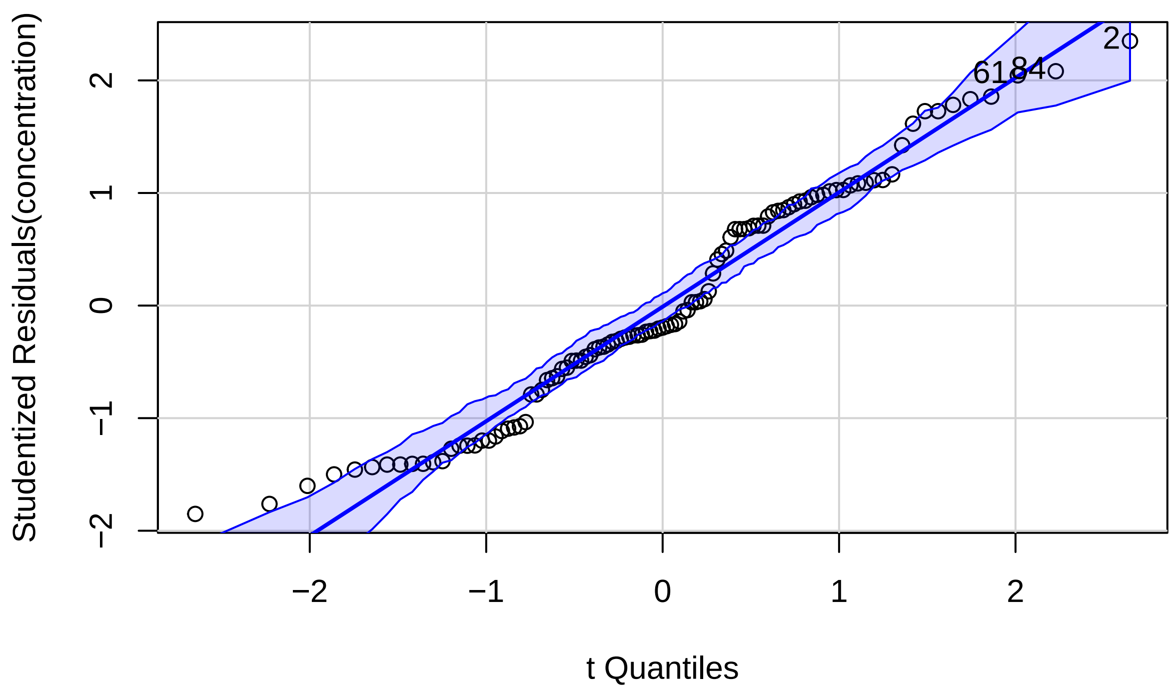

```
##
## [[3]]
```



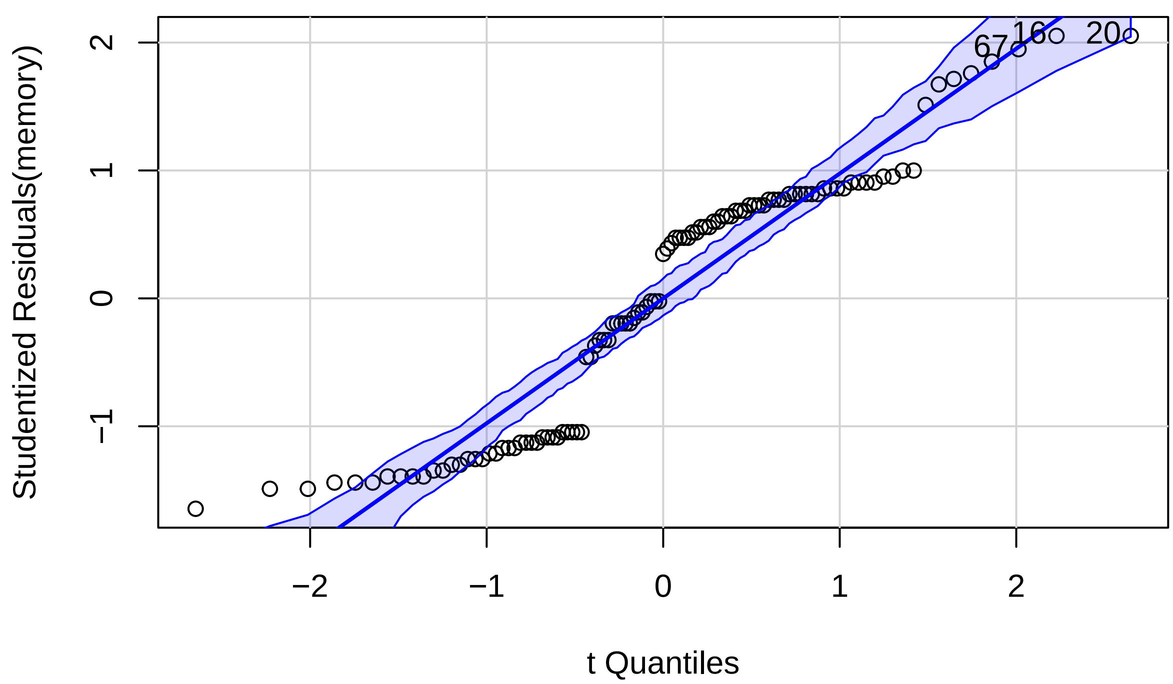

```
##
## [[4]]
```


PANAS_PositiveAffect
LEBA_F5
40
30
20
10
5
10
15
20

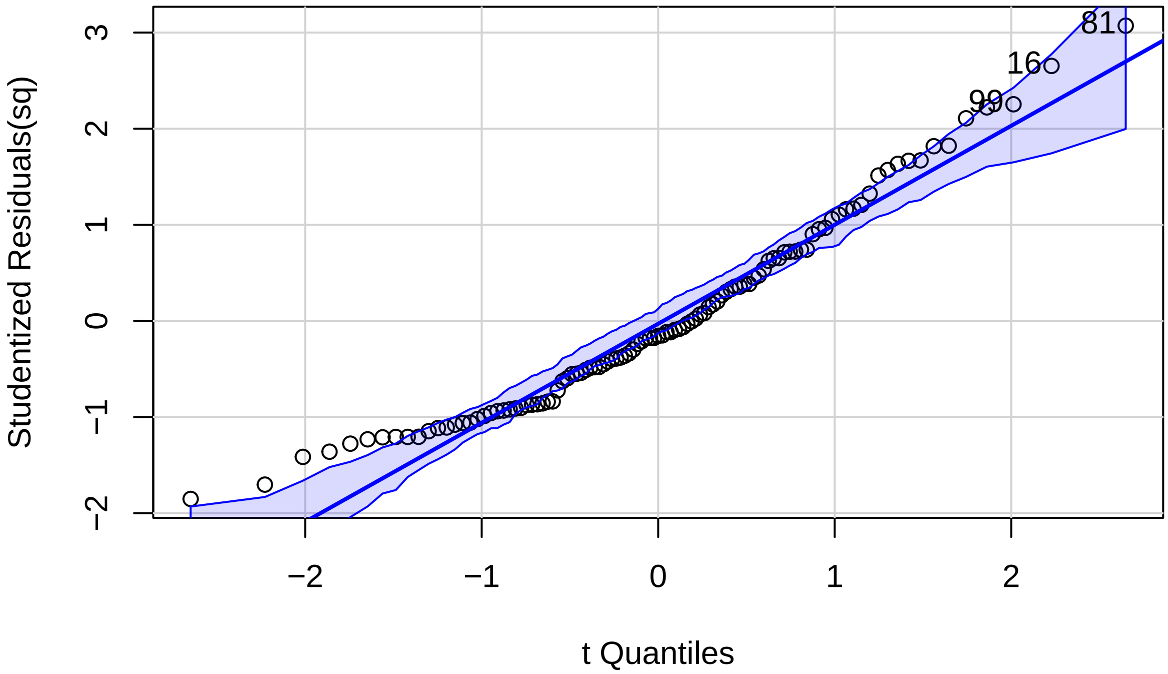

Density
rstudent(na)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
−2
−1
0
1
2
3
4



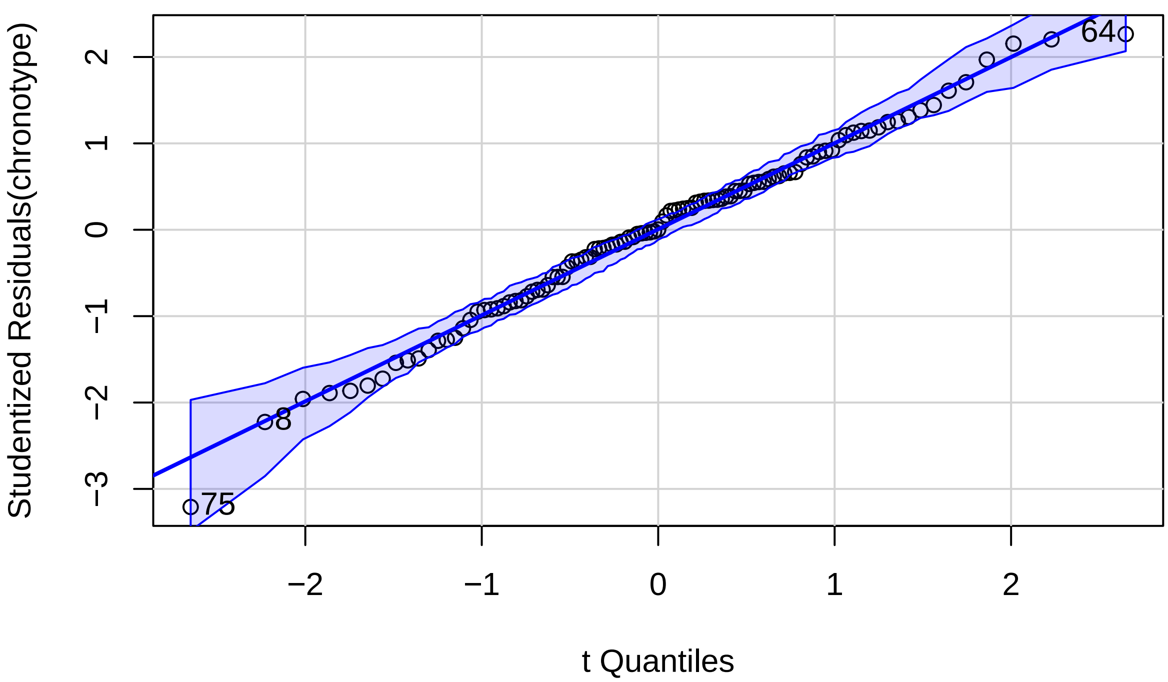

```
## [1]  2 61 84
```



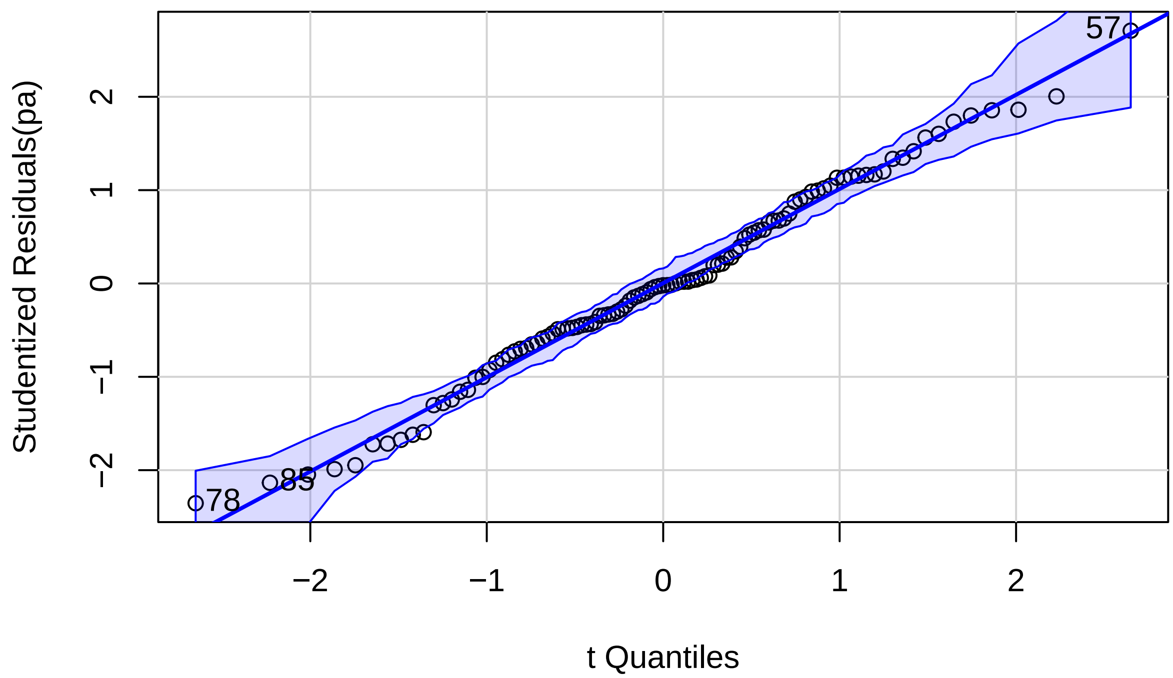

```
## [1] 16 20 67
```



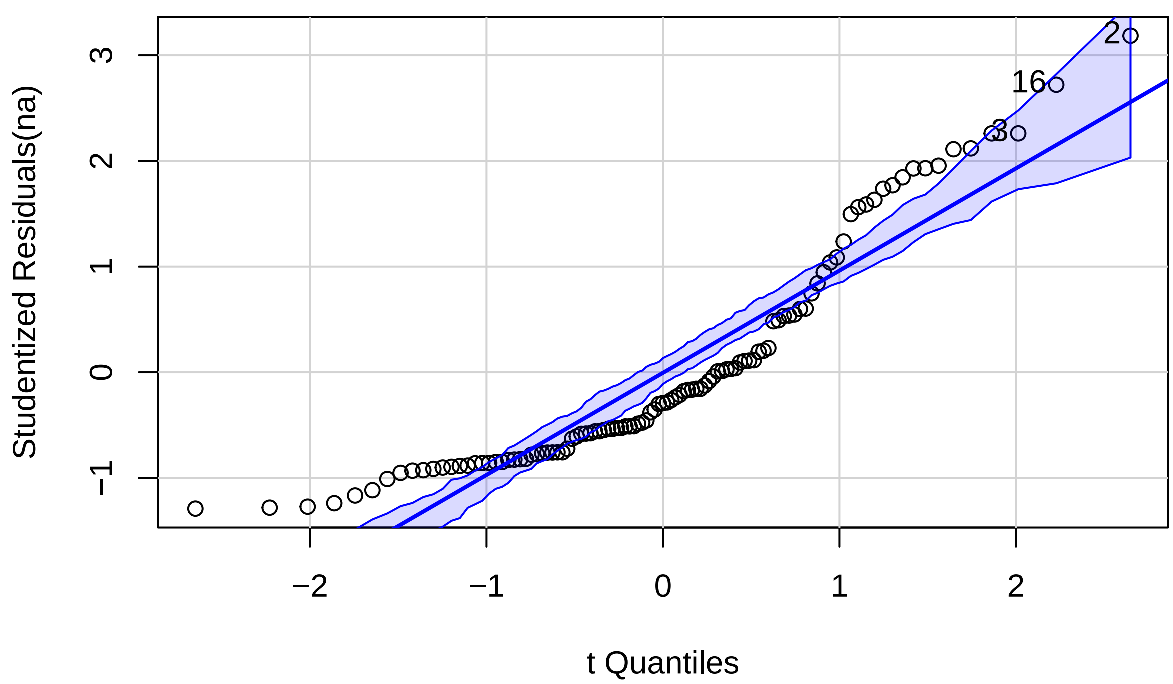
[1] 16 81 99



[1] 8 64 75



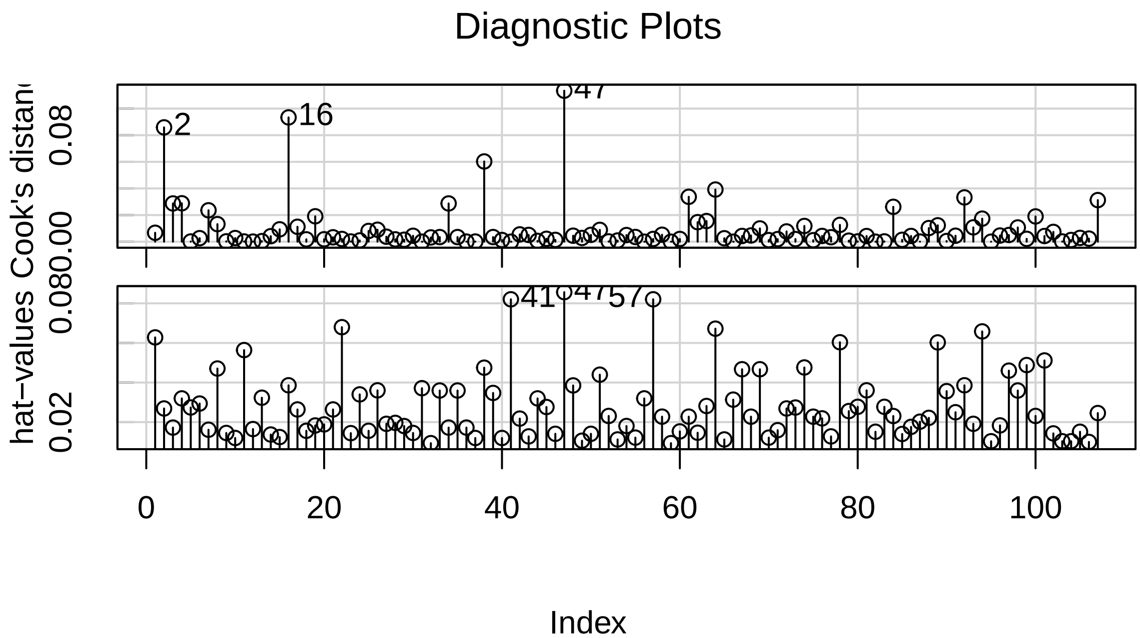

```
## [1] 57 78 85
```

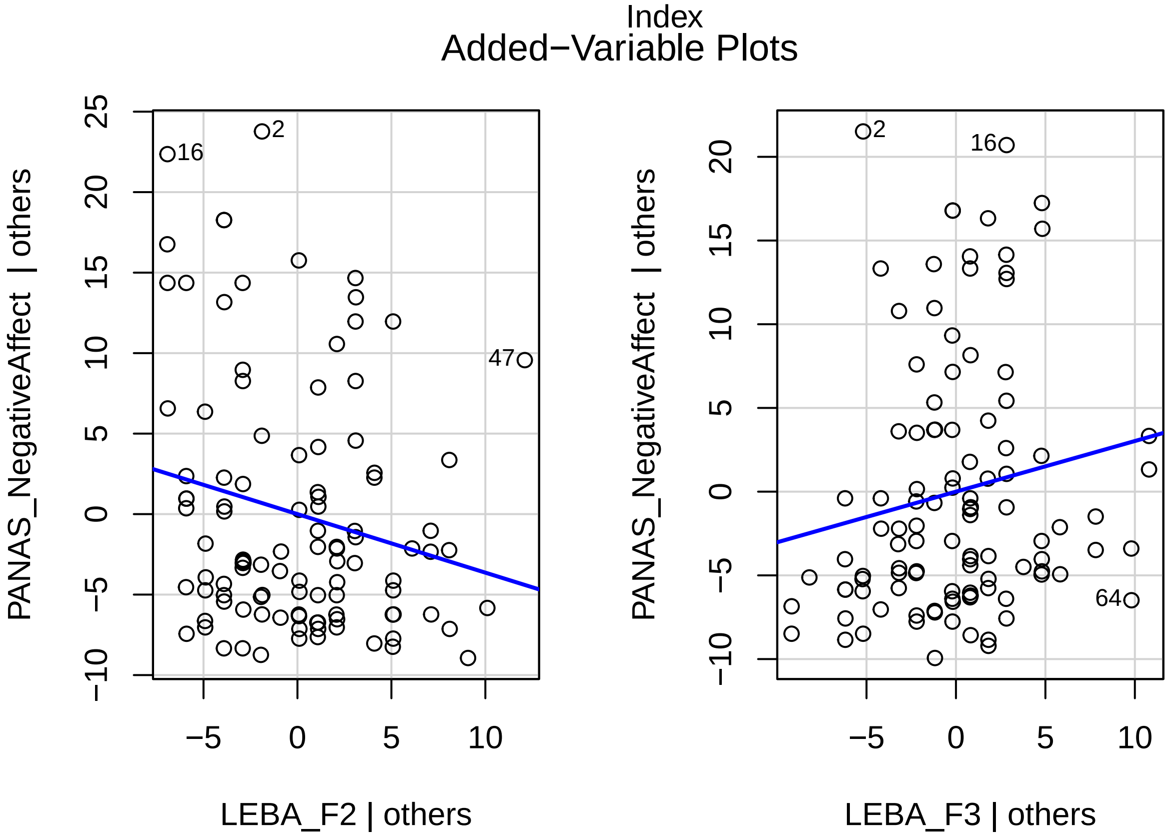


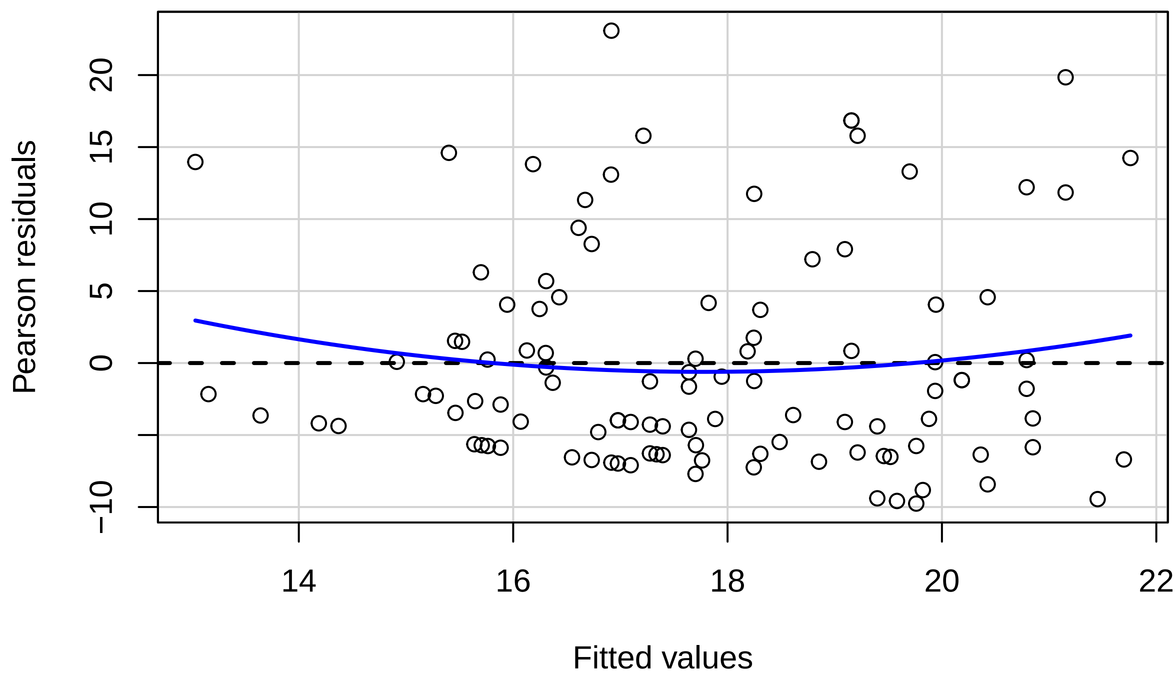

```
## [1]  2  3 16
```

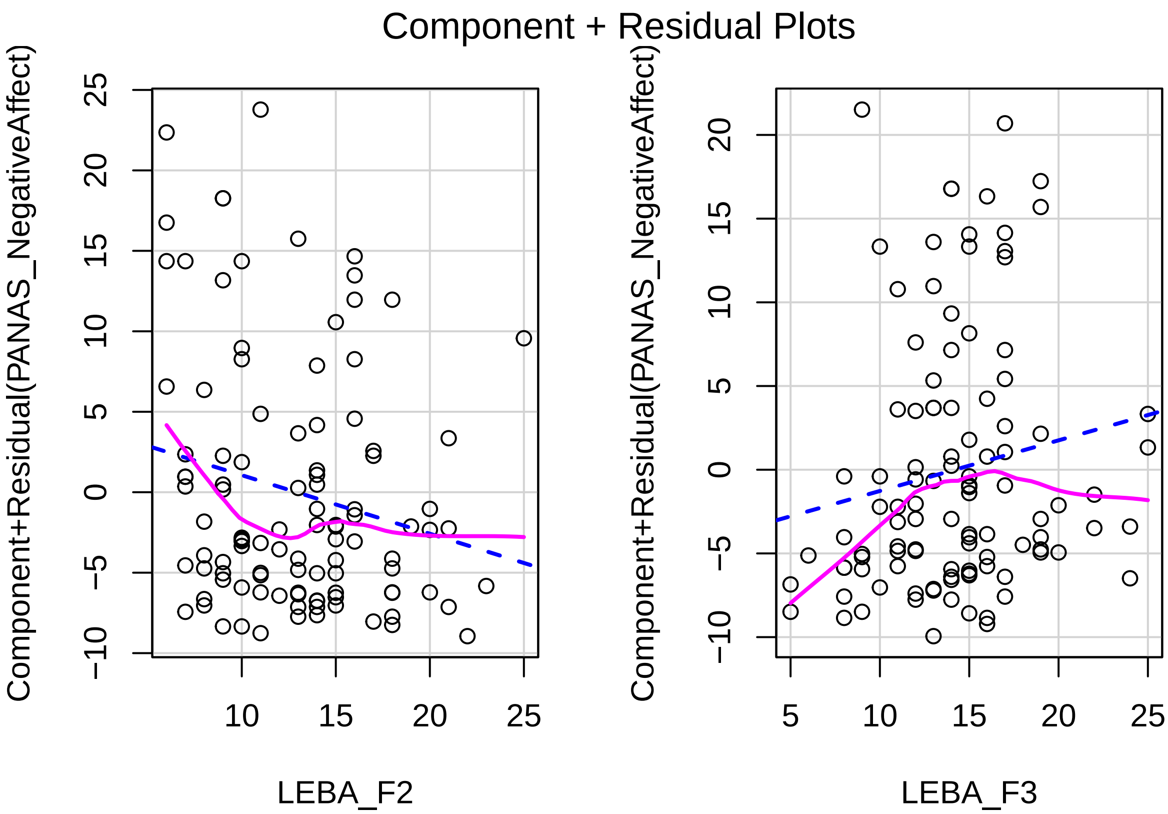
```
## Non-constant Variance Score Test
```

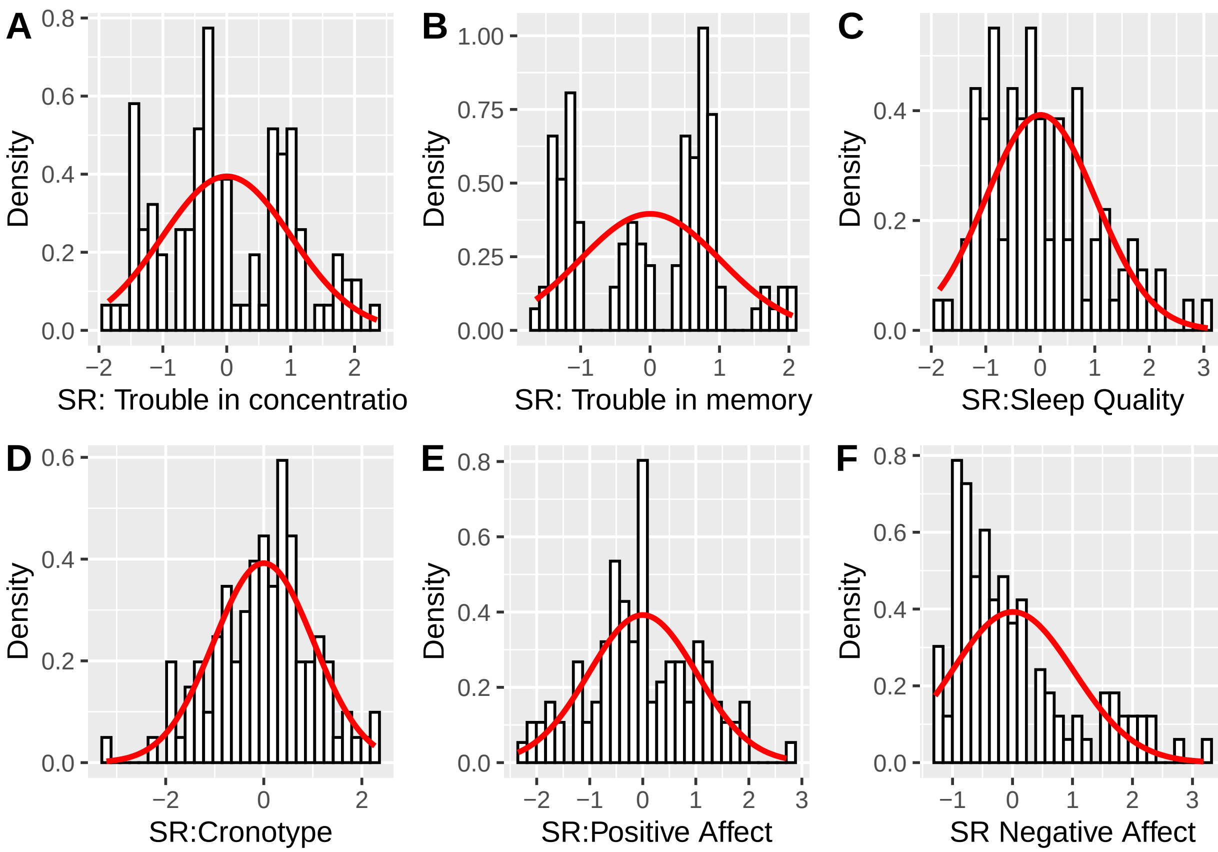
```
## Variance formula: ~ fitted.values
## Chisquare = 0.02201793, Df = 1, p = 0.88204

## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 0.422668, Df = 1, p = 0.51561

## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 1.729402, Df = 1, p = 0.18849

## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 3.390299, Df = 1, p = 0.065581

## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 0.001335325, Df = 1, p = 0.97085

## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 3.098381, Df = 1, p = 0.07837

## No Studentized residuals with Bonferroni p < 0.05
## Largest |rstudent|:
##    rstudent unadjusted p-value Bonferroni p
## 57 2.708363          0.0079428      0.84988
```

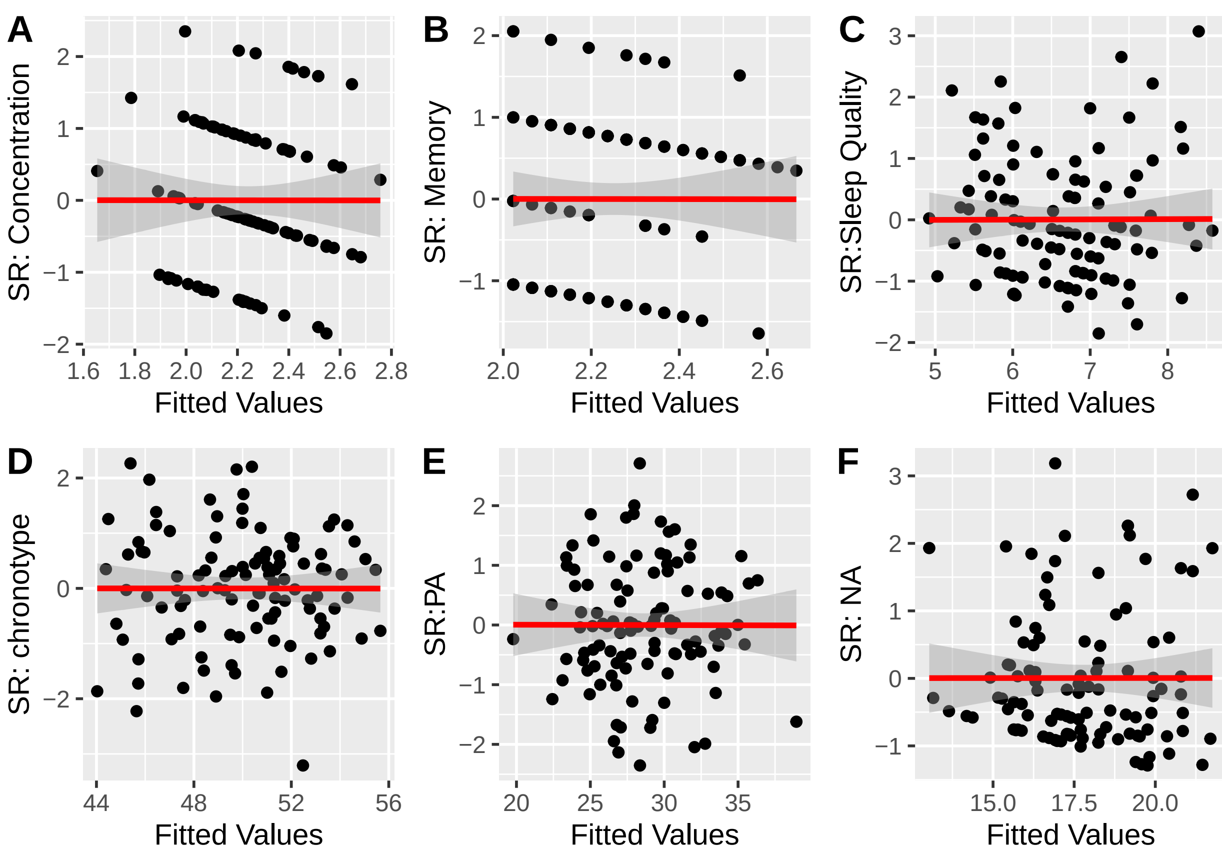

Diagnostic Plots
Cook's distance
hat−values
0.00
0.08
0.02
0.08
2
16
47
41
47
57
0
20
40
60
80
100
Index


Added−Variable Plots
PANAS_NegativeAffect | others
LEBA_F2 | others
LEBA_F3 | others
16
2
47
64
−10
−5
0
5
10
15
20
25


Pearson residuals
Fitted values
-10
0
5
10
15
20
14
16
18
20
22


Component + Residual Plots
Component+Residual(PANAS_NegativeAffect)
LEBA_F2
LEBA_F3
-10
-5
0
5
10
15
20
25


A
Density
SR: Trouble in concentratio
B
Density
SR: Trouble in memory
C
Density
SR:Sleep Quality
D
Density
SR:Cronotype
E
Density
SR:Positive Affect
F
Density
SR Negative Affect


A
SR: Concentration
Fitted Values
B
SR: Memory
Fitted Values
C
SR:Sleep Quality
Fitted Values
D
SR: chronotype
Fitted Values
E
SR:PA
Fitted Values
F
SR: NA
Fitted Values

We used R [Version 4.1.2; R Core Team (2021)] and the R-packages *}apaTables* [@}R-apaTables], *boot* [Version 1.3.28; Davison and Hinkley (1997)], *car* [Version 3.0.12; Fox and Weisberg (2019); Fox, Weisberg, and Price (2020)], *carData* [Version 3.0.4; Fox et al. (2020)], *dlookr* [Version 0.5.1; Ryu (2021)], *dplyr* [Version 1.0.7; Wickham, François, Henry, and Müller (2021)], *forcats* [Version 0.5.1; Wickham (2021a)], *ggplot2* [Version 3.3.5; Wickham (2016)], *gtExtras* [Version 0.2.18; Mock (2021)], *gtsummary* [Version 1.4.2; Sjoberg et al. (2021)], *kableExtra* [Version 1.3.4; Zhu (2021)], *likert* [Version 1.3.5; Bryer (2019)], *MOTE* [Version 1.0.2; Buchanan, Gillenwaters, Scofield, and Valentine (2019)], *packrat* (Ushey, McPherson, Cheng, Atkins, & Allaire, 2021), *papaja* [Version 0.1.0.9997; Aust and Barth (2020)], *plotly* [Version 4.9.4.1; Sievert (2020)], *psych* [Version 2.1.9; Revelle (2021)], *purrr* [Version 0.3.4; Henry and Wickham (2020)], *readr* [Version 2.0.2; Wickham and Hester (2021)], *scales* [Version 1.1.1; Wickham and Seidel (2020)], *shiny* [Version 1.7.1; Chang et al. (2021)], *sjstats* [Version 0.18.1; Lüdecke (2021)], *stringr* [Version 1.4.0; Wickham (2019)], *tibble* [Version 3.1.6; Müller and Wickham (2021)], *tidyr* [Version 1.1.4; Wickham (2021b)], *tidyverse* [Version 1.3.1; Wickham et al. (2019)], *visreg* [Version 2.7.0; Breheny and Burchett (2017)], and *xtable* [Version 1.8.4; Dahl, Scott, Roosen, Magnusson, and Swinton (2019)] for all our analyses.

Results

Discussion

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Table 1

Dempgraphics

Characteristic	**Female**, N = 71	**Male**, N = 36
Age	33 (9)	35 (14)
Religion		
Atheist	6 (8.5%)	3 (8.3%)
Buddhist	18 (25%)	13 (36%)
Christian	16 (23%)	6 (17%)
Hindu	13 (18%)	6 (17%)
Muslim	18 (25%)	8 (22%)
Ethnicity		
Malaysian Chinese	30 (42%)	16 (44%)
Malaysian Indian	11 (15%)	7 (19%)
Malaysian Malay	10 (14%)	1 (2.8%)
Others	20 (28%)	12 (33%)
Your marital status		
Divorced	1 (1.4%)	0 (0%)
Married	27 (38%)	18 (50%)
Single	43 (61%)	18 (50%)
Please state your current level of education - Selected Choice		
Bachelor’s degree	20 (28%)	10 (28%)
Diploma	0 (0%)	2 (5.6%)
Doctor of Philosophy (PhD)	32 (45%)	8 (22%)
Master’s degree	18 (25%)	15 (42%)
Pre-university	0 (0%)	1 (2.8%)

Characteristic	**Female**, N = 71	**Male**, N = 36
Secondary School	1 (1.4%)	0 (0%)
Community_Stance	7.20 (1.92)	6.83 (1.99)
Time_of_ Day		
afternoon	46 (65%)	26 (72%)
evening	15 (21%)	6 (17%)
morning	5 (7.0%)	1 (2.8%)
night	5 (7.0%)	3 (8.3%)
Positive_Affect	29 (9)	28 (8)
Negative_Affect	18 (8)	18 (8)
PSQI	6.7 (3.4)	6.6 (3.6)
Sleep_Quality		
Good Sleep	23 (32%)	12 (33%)
Poor Sleep	48 (68%)	24 (67%)
Sleep_Environment	4.6 (4.4)	7.4 (5.5)
Avg_Corneal_Illuminance	206 (241)	185 (171)
MEQ	50 (8)	50 (8)
Chronotype		
Definite Evening	2 (2.8%)	1 (2.8%)
Intermediate	47 (66%)	26 (72%)
Moderate Evening	10 (14%)	4 (11%)
Moderate Morning	12 (17%)	5 (14%)
LEBA1	6.7 (4.5)	6.0 (4.6)
LEBA2	12.9 (4.4)	12.8 (4.0)
LEBA3	13.8 (4.1)	15.0 (3.7)
LEBA4	12.1 (4.2)	12.3 (4.3)

Characteristic	**Female**, N = 71	**Male**, N = 36
LEBA5	10.5 (3.7)	10.1 (4.1)
Cups_of_Coffee(Weekday)	0.80 (1.06)	0.94 (1.39)
Cups_of Coffee(Weekend)	0.72 (1.01)	0.81 (1.33)
Your working /school/university shift		
Day Shift	52 (73%)	28 (78%)
Mixed shift work (Both Night and day in alternating way)	16 (23%)	3 (8.3%)
Night Shift	0 (0%)	1 (2.8%)
Off Work	3 (4.2%)	4 (11%)
Subjective_Alertness	3.49 (1.96)	4.28 (2.22)
Currently, How much are you bothered by: - 2. Trouble concentrating or thinking clearly		
Absent	17 (24%)	7 (19%)
Moderate	20 (28%)	12 (33%)
Severe	6 (8.5%)	3 (8.3%)
Slight	28 (39%)	14 (39%)
Currently, How much are you bothered by: - 5. Trouble with memory		
Absent	26 (37%)	9 (25%)
Moderate	12 (17%)	6 (17%)
Severe	5 (7.0%)	3 (8.3%)
Slight	28 (39%)	18 (50%)