* [The data](https://neuropsychology.github.io/psycho.R/2018/05/10/interpret_mixed_models.html" \l "the-data" \t "_blank)
* [Fit the model](https://neuropsychology.github.io/psycho.R/2018/05/10/interpret_mixed_models.html#fit-the-model)
* [The analyze function](https://neuropsychology.github.io/psycho.R/2018/05/10/interpret_mixed_models.html#the-analyze-function)
* [Summary](https://neuropsychology.github.io/psycho.R/2018/05/10/interpret_mixed_models.html#summary)
* [Print](https://neuropsychology.github.io/psycho.R/2018/05/10/interpret_mixed_models.html#print)
* [Credits](https://neuropsychology.github.io/psycho.R/2018/05/10/interpret_mixed_models.html#credits)

You find it time-consuming to manually format, copy and paste output values to your report or manuscript? That time is over: the [psycho](https://github.com/neuropsychology/psycho.R) package is here for you!

**The data**

Let’s take the example dataset included in the psycho package.

library(psycho)

library(tidyverse)

df <- psycho::emotion %>%

select(Participant\_ID,

Emotion\_Condition,

Subjective\_Valence,

Autobiographical\_Link)

summary(df)

Participant\_ID Emotion\_Condition Subjective\_Valence Autobiographical\_Link

10S : 48 Negative:456 Min. :-100.000 Min. : 0.00

11S : 48 Neutral :456 1st Qu.: -65.104 1st Qu.: 0.00

12S : 48 Median : -2.604 Median : 16.15

13S : 48 Mean : -18.900 Mean : 28.99

14S : 48 3rd Qu.: 7.000 3rd Qu.: 59.90

15S : 48 Max. : 100.000 Max. :100.00

(Other):624 NA's :1

Our dataframe (called df) contains data from several participants, exposed to neutral and negative pictures (the Emotion\_Condition column). Each row corresponds to a single trial. During each trial, the participant had to rate its emotional valence (Subjective\_Valence: positive – negative) experienced during the picture presentation and the amount of personal memories associated with the picture (Autobiographical\_Link).

Our dataframe contains, for each of the 48 trials, 4 variables: the **name of the participant** (Participant\_ID), the **emotion condition** (Emotion\_Condition), the **valence rating** (Subjective\_Valence) and the **Autobiographical Link** (Autobiographical\_Link).

**Fit the model**

**Let’s fit a linear mixed model to predict the autobiographical link with the condition and the subjective valence.**

library(lmerTest)

fit <- lmer(Autobiographical\_Link ~ Emotion\_Condition \* Subjective\_Valence + (1|Participant\_ID), data=df)

summary(fit)

Linear mixed model fit by REML. t-tests use Satterthwaite's method [

lmerModLmerTest]

Formula: Autobiographical\_Link ~ Emotion\_Condition \* Subjective\_Valence +

(1 | Participant\_ID)

Data: df

REML criterion at convergence: 8555.5

Scaled residuals:

Min 1Q Median 3Q Max

-2.2682 -0.6696 -0.2371 0.7052 3.2187

Random effects:

Groups Name Variance Std.Dev.

Participant\_ID (Intercept) 243.1 15.59

Residual 661.4 25.72

Number of obs: 911, groups: Participant\_ID, 19

Fixed effects:

Estimate Std. Error df

(Intercept) 25.52248 4.23991 31.49944

Emotion\_ConditionNeutral 6.13715 2.66993 895.13045

Subjective\_Valence 0.05772 0.03430 898.46616

Emotion\_ConditionNeutral:Subjective\_Valence 0.16140 0.05020 896.26695

t value Pr(>|t|)

(Intercept) 6.020 1.09e-06 \*\*\*

Emotion\_ConditionNeutral 2.299 0.02176 \*

Subjective\_Valence 1.683 0.09280 .

Emotion\_ConditionNeutral:Subjective\_Valence 3.215 0.00135 \*\*

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

(Intr) Emt\_CN Sbjc\_V

Emtn\_CndtnN -0.459

Sbjctv\_Vlnc 0.455 -0.726

Emtn\_CN:S\_V -0.308 0.301 -0.676

**The analyze function**

The analyze function, available in the psycho package, transforms a model fit object into user-friendly outputs.

results <- analyze(fit, CI = 95)

**Summary**

Summarizing an analyzed object returns a dataframe, that can be easily saved and included in reports. It also includes standardized coefficients, as well as bootstrapped confidence intervals (CI) and effect sizes.

summary(results) %>%

mutate(p = psycho::format\_p(p))

| **Variable** | **Coef** | **SE** | **t** | **df** | **Coef.std** | **SE.std** | **p** | **Effect\_Size** | **CI\_lower** | **CI\_higher** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (Intercept) | 25.52 | 4.24 | 6.02 | 31.50 | 0.00 | 0.00 | < .001\*\*\* | Very Small | 17.16 | 33.93 |
| Emotion\_ConditionNeutral | 6.14 | 2.67 | 2.30 | 895.13 | 0.10 | 0.04 | < .05\* | Very Small | 0.91 | 11.37 |
| Subjective\_Valence | 0.06 | 0.03 | 1.68 | 898.47 | 0.09 | 0.06 | = 0.09° | Very Small | -0.01 | 0.12 |
| Emotion\_ConditionNeutral:Subjective\_Valence | 0.16 | 0.05 | 3.22 | 896.27 | 0.13 | 0.04 | < .01\*\* | Very Small | 0.06 | 0.26 |

**Print**

Moreover, the print method return a nicely formatted output that can be almost directly pasted into the manuscript.

print(results)

The overall model predicting Autobiographical\_Link (formula = Autobiographical\_Link ~ Emotion\_Condition \* Subjective\_Valence + (1 | Participant\_ID)) successfully converged and explained 32.48% of the variance of the endogen (the conditional R2). The variance explained by the fixed effects was of 7.66% (the marginal R2) and the one explained by the random effects of 24.82%. The model's intercept is at 25.52 (SE = 4.24, 95% CI [17.16, 33.93]). Within this model:

- The effect of Emotion\_ConditionNeutral is significant (beta = 6.14, SE = 2.67, 95% CI [0.91, 11.37], t(895.13) = 2.30, p < .05\*) and can be considered as very small (std. beta = 0.098, std. SE = 0.043).

- The effect of Subjective\_Valence is significant (beta = 0.058, SE = 0.034, 95% CI [-0.0097, 0.12], t(898.47) = 1.68, p = 0.09°) and can be considered as very small (std. beta = 0.095, std. SE = 0.056).

- The effect of Emotion\_ConditionNeutral:Subjective\_Valence is significant (beta = 0.16, SE = 0.050, 95% CI [0.063, 0.26], t(896.27) = 3.22, p < .01\*\*) and can be considered as very small (std. beta = 0.13, std. SE = 0.041).

The intercept (the baseline level) corresponds, here, to the negative condition with subjective valence at 0 (the average, as the data is standardized). Compared to that, changing the condition from negative to neutral does not induce any significant change to the outcome. However, in the negative condition, there is a trending linear relationship between valence and autobiographical memories: the more an item is positive the more it is related to memories. Finally, the interaction is significant: the relationship between valence autobiographical memories is stronger (more positive) in the neutral condition.

**Credits**

This package helped you? You can cite [psycho](https://github.com/neuropsychology/psycho.R) as follows:

* Makowski, (2018). *The psycho Package: an Efficient and Publishing-Oriented Workflow for Psychological Science*. Journal of Open Source Software, 3(22), 470. <https://doi.org/10.21105/joss.00470>