F02_mci_emotion_pre_ratings.R

2020-09-22

```
## MCI EMO PRE-RATINGS SCRIPT ##

# Pre-ratings of cloze probability, plausibility, metaphoricity, and imageability of the context stories were conducted
# on five-point rating scales. Script computes analyses of variances testing for potential differences in these ratings
# between semantic conditions. Additionally, pairwise t-tests test differences between each pair of semantic conditions
# (violation - intuitive, MCI - intuitive, MCI - violation). The Bonferroni-Holm-correction was applied to control for
# multiple comparisons.

## SETUP ## ------------------------------------------------------------------------------------------------------------

# Load packages
library(tidyverse)    # Version 1.3.0
library(magrittr)     # Version 1.5
library(emmeans)      # version 1.4.8

# Load pre-rating data from SPSS file
pilot <- haven::read_sav("FB/gesamt_2.sav")

# Trim whitespace
pilot %<>% mutate(KonzeptNr = KonzeptNr %>% trimws() %>% as.numeric(),
                  VerbBedingung = VerbBedingung %>% trimws())

# Rename conditions
pilot %<>% mutate(semantics = factor(VerbBedingung, levels = c("neutral", "sem", "mci"),
                                     labels = c("int", "vio", "mci")))

# Summarize by participants
avgs <- pilot %>%
  group_by(VP, semantics) %>%
```

```
  summarise(clozeprob = mean(Frage1),
            plausibility = mean(Frage2),
            metaphoricity = mean(Frage3),
            imageability = mean(Frage4)) %>%
  mutate(VP = factor(VP))
```

```
## `summarise()` regrouping output by 'VP' (override with `.groups` argument)
```

```
## ANOVAs ## ------------------------------------------------------------------------------------------------------------

# Semantics is a within subjects factor; data are fully balanced

# Cloze probability
summary(anova_cloze <- aov(clozeprob ~ semantics + Error(VP/semantics), data = avgs))
```

```
##
## Error: VP
##           Df Sum Sq Mean Sq F value Pr(>F)
## Residuals 19  7.689  0.4047
##
## Error: VP:semantics
##           Df Sum Sq Mean Sq F value   Pr(>F)
## semantics  2  16.74   8.369   17.66 3.78e-06 ***
## Residuals 38  18.01   0.474
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
mean(anova_cloze$`VP:semantics`$residuals^2) # Mean squared error of the effect
```

```
## [1] 0.450286
```

```
# Plausibility
summary(anova_plausibility <- aov(plausibility ~ semantics + Error(VP/semantics), data = avgs))
```

```
##
## Error: VP
```

```
##           Df Sum Sq Mean Sq F value Pr(>F)
## Residuals 19  5.338   0.281
##
## Error: VP:semantics
##           Df Sum Sq Mean Sq F value   Pr(>F)
## semantics  2  13.55   6.777   10.74 0.000201 ***
## Residuals 38  23.98   0.631
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
mean(anova_plausibility$`VP:semantics`$residuals^2) # Mean squared error of the effect
```

```
## [1] 0.5994464
```

```
# Imageability
summary(anova_imageability <- aov(imageability ~ semantics + Error(VP/semantics), data = avgs))
```

```
##
## Error: VP
##           Df Sum Sq Mean Sq F value Pr(>F)
## Residuals 19  6.643  0.3497
##
## Error: VP:semantics
##           Df Sum Sq Mean Sq F value   Pr(>F)
## semantics  2  12.43   6.215   14.61 1.96e-05 ***
## Residuals 38  16.16   0.425
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
mean(anova_imageability$`VP:semantics`$residuals^2) # Mean squared error of the effect
```

```
## [1] 0.4041053
```

```
# Metaphoricity
summary(anova_metaphoricity <- aov(metaphoricity ~ semantics + Error(VP/semantics), data = avgs))
```

```
##
## Error: VP
##           Df Sum Sq Mean Sq F value Pr(>F)
## Residuals 19  62.24   3.276
##
## Error: VP:semantics
##           Df Sum Sq Mean Sq F value   Pr(>F)
## semantics  2  5.142  2.5712   8.988 0.000636 ***
## Residuals 38 10.870  0.2861
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
mean(anova_metaphoricity$`VP:semantics`$residuals^2) # Mean squared error of the effect
```

```
## [1] 0.2717558
```

```
## PAIRWISE TESTS ## ------------------------------------------------------------------------------------------------

# Cloze probability
(pairwise_clozeprob <- anova_cloze %>% emmeans(specs = pairwise ~ semantics) %>% summary(adjust = "holm"))
```

```
## Note: re-fitting model with sum-to-zero contrasts

## $emmeans
##  semantics emmean   SE   df lower.CL upper.CL
##  int         3.47 0.15 56.7     3.10     3.84
##  vio         2.65 0.15 56.7     2.28     3.02
##  mci         2.19 0.15 56.7     1.82     2.56
##
## Warning: EMMs are biased unless design is perfectly balanced
## Confidence level used: 0.95
## Conf-level adjustment: bonferroni method for 3 estimates
##
## $contrasts
##  contrast  estimate    SE df t.ratio p.value
##  int - vio    0.814 0.218 38 3.739   0.0012
##  int - mci    1.278 0.218 38 5.870   <.0001
```

```
##  vio - mci    0.464 0.218 38 2.131   0.0396
##
## P value adjustment: holm method for 3 tests
```

```
# Plausibility
(pairwise_plausibility <- anova_plausibility %>% emmeans(specs = pairwise ~ semantics) %>% summary(adjust = "holm"))
```

```
## Note: re-fitting model with sum-to-zero contrasts

## $emmeans
##  semantics emmean   SE   df lower.CL upper.CL
##  int         2.84 0.16 51.7     2.44     3.24
##  vio         2.13 0.16 51.7     1.73     2.53
##  mci         1.69 0.16 51.7     1.29     2.08
##
## Warning: EMMs are biased unless design is perfectly balanced
## Confidence level used: 0.95
## Conf-level adjustment: bonferroni method for 3 estimates
##
## $contrasts
##  contrast  estimate    SE df t.ratio p.value
##  int - vio    0.710 0.251 38 2.826   0.0150
##  int - mci    1.154 0.251 38 4.594   0.0001
##  vio - mci    0.444 0.251 38 1.769   0.0850
##
## P value adjustment: holm method for 3 tests
```

```
# Imageability
(pairwise_imageability <- anova_imageability %>% emmeans(specs = pairwise ~ semantics) %>% summary(adjust = "holm"))
```

```
## Note: re-fitting model with sum-to-zero contrasts

## $emmeans
##  semantics emmean    SE   df lower.CL upper.CL
##  int         3.65 0.141 56.5     3.30     4.00
##  vio         2.99 0.141 56.5     2.64     3.34
##  mci         2.54 0.141 56.5     2.19     2.89
```

```
##
## Warning: EMMs are biased unless design is perfectly balanced
## Confidence level used: 0.95
## Conf-level adjustment: bonferroni method for 3 estimates
##
## $contrasts
##  contrast  estimate    SE df t.ratio p.value
##  int - vio    0.660 0.206 38 3.199   0.0056
##  int - mci    1.108 0.206 38 5.373   <.0001
##  vio - mci    0.448 0.206 38 2.174   0.0360
##
## P value adjustment: holm method for 3 tests
```

```
# Metaphoricity
(pairwise_metaphoricity <- anova_metaphoricity %>% emmeans(specs = pairwise ~ semantics) %>% summary(adjust = "holm"))
```

```
## Note: re-fitting model with sum-to-zero contrasts

## $emmeans
##  semantics emmean    SE   df lower.CL upper.CL
##  int         2.30 0.253 25.8     1.65     2.95
##  vio         2.49 0.253 25.8     1.84     3.13
##  mci         2.99 0.253 25.8     2.34     3.64
##
## Warning: EMMs are biased unless design is perfectly balanced
## Confidence level used: 0.95
## Conf-level adjustment: bonferroni method for 3 estimates
##
## $contrasts
##  contrast  estimate    SE df t.ratio p.value
##  int - vio   -0.189 0.169 38 -1.115  0.2720
##  int - mci   -0.693 0.169 38 -4.100  0.0006
##  vio - mci   -0.505 0.169 38 -2.985  0.0099
##
## P value adjustment: holm method for 3 tests
```

```r
# System specs and package versions
sessionInfo()
```

```
## R version 4.0.2 (2020-06-22)
## Platform: x86_64-apple-darwin17.0 (64-bit)
## Running under: macOS Catalina 10.15.6
##
## Matrix products: default
## BLAS:   /System/Library/Frameworks/Accelerate.framework/Versions/A/Frameworks/vecLib.framework/Versions/A/libBLAS.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats     graphics  grDevices datasets  utils     methods   base
##
## other attached packages:
##  [1] emmeans_1.4.8   magrittr_1.5    forcats_0.5.0   stringr_1.4.0   dplyr_1.0.0     purrr_0.3.4     readr_1.3.1     tidyr_1.1.0     ti
## [10] ggplot2_3.3.2   tidyverse_1.3.0
##
## loaded via a namespace (and not attached):
##  [1] tidyselect_1.1.0 xfun_0.16        haven_2.3.1      colorspace_1.4-1 vctrs_0.3.2      generics_0.0.2   htmltools_0.5.0  yaml_2.2.1
## [10] rlang_0.4.7      pillar_1.4.6     glue_1.4.1       withr_2.2.0      DBI_1.1.0        dbplyr_1.4.4     modelr_0.1.8     readxl_1.3.
## [19] lifecycle_0.2.0  munsell_0.5.0    gtable_0.3.0     cellranger_1.1.0 rvest_0.3.5      mvtnorm_1.1-1    evaluate_0.14    knitr_1.29
## [28] highr_0.8        broom_0.7.0.9001 Rcpp_1.0.5       xtable_1.8-4     renv_0.12.0      scales_1.1.1     backports_1.1.8  jsonlite_1.
## [37] hms_0.5.3        digest_0.6.25    stringi_1.4.6    grid_4.0.2       cli_2.0.2        tools_4.0.2      crayon_1.3.4     pkgconfig_2
## [46] xml2_1.3.2       estimability_1.3 reprex_0.3.0     lubridate_1.7.9  assertthat_0.2.1 rmarkdown_2.3    httr_1.4.2       rstudioapi_
## [55] compiler_4.0.2
```