Bayesian Analysis of Correlations with Stage of Change

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Contents

This file is meant to reproduce our results on correlations between the Transtheoretical Model (TTM)-stage for becoming physically active on the one hand and the change in self-efficacy between the pre- and post-measurement, motivational impact ratings for the generic and the personalized examples, and the acceptance on the other hand. These results are displayed in Table 7 in the Appendix.

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Required files

The following files are required: Data/df_se.csv, Data/df_ratings.csv, and Data/df_acceptance.csv.

Load packages

First, we load the packages that we need.

```
library(BayesianFirstAid)  # For Bayesian correlations
library(formatR)  # To wrap lines
library(pander)  # For table
```

Load data

Now we load the pre-processed data.

```
# self-efficacy data
df_se <- read.csv(file = 'Data/df_se.csv')
# motivation ratings data
df_ratings <- read.csv(file = 'Data/df_ratings.csv')
# acceptance questions data
df_acceptance <- read.csv(file = 'Data/df_acceptance.csv')
```

And we reverse the scale for the TTM-stage such that a higher value is associated with a higher stage of change.

```
df_se$ttm_pa = abs(df_se$ttm_pa - 6)
df_ratings$ttm_pa = abs(df_ratings$ttm_pa - 6)
df_acceptance$ttm_pa = abs(df_acceptance$ttm_pa - 6)
```

Correlations

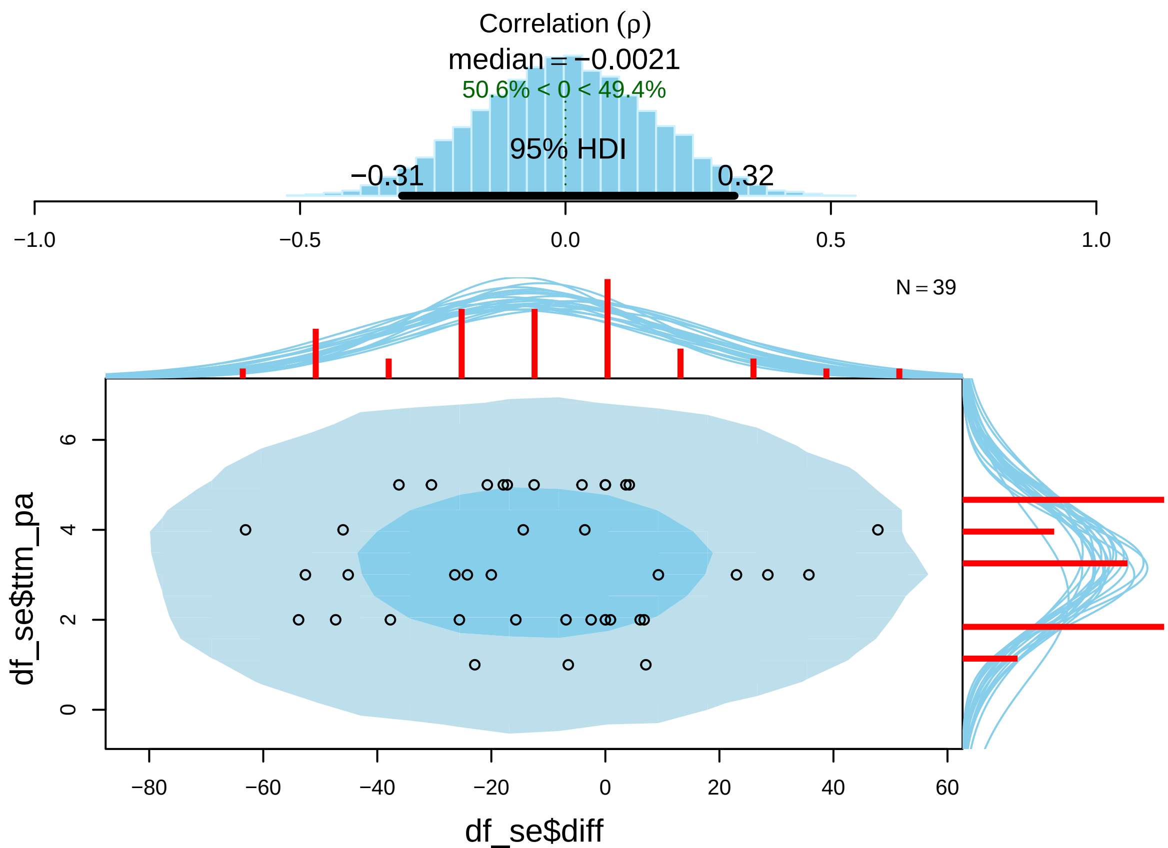
First we compute the correlation between the change in self-efficacy between the pre- and post-measurement and the TTM-stage for becoming physically active.

```
set.seed(18)  # For reproducibility
fit = bayes.cor.test(df_se$diff, df_se$ttm_pa)

print(summary(fit))
```

```
##   Data
## df_se$diff and df_se$ttm_pa, n = 39
##
##   Model parameters
## rho: the correlation between df_se$diff and df_se$ttm_pa
## mu[1]: the mean of df_se$diff
## sigma[1]: the scale of df_se$diff , a consistent
##   estimate of SD when nu is large.
## mu[2]: the mean of df_se$ttm_pa
## sigma[2]: the scale of df_se$ttm_pa
## nu: the degrees-of-freedom for the bivariate t distribution
## xy_pred[1]: the posterior predictive distribution of df_se$diff
## xy_pred[2]: the posterior predictive distribution of df_se$ttm_pa
##
##   Measures
##                mean     sd   HDIlo   HDIup %<comp %>comp
## rho          -0.002  0.161  -0.308   0.318  0.506  0.494
## mu[1]       -12.416  4.240 -20.853  -4.099  0.998  0.002
## mu[2]         3.256  0.237   2.796   3.739  0.000  1.000
## sigma[1]     25.589  3.285  19.749  32.416  0.000  1.000
## sigma[2]      1.412  0.175   1.091   1.755  0.000  1.000
## nu           48.324 32.747   5.272 112.373  0.000  1.000
## xy_pred[1] -12.695 26.866 -67.378  37.970  0.692  0.308
## xy_pred[2]    3.255  1.468   0.408   6.199  0.015  0.985
##
## 'HDIlo' and 'HDIup' are the limits of a 95% HDI credible interval.
## '%<comp' and '%>comp' are the probabilities of the respective parameter being
## smaller or larger than 0.
##
##   Quantiles
##               q2.5%    q25%  median    q75%  q97.5%
## rho          -0.315  -0.112  -0.002  0.109   0.312
## mu[1]       -20.854 -15.126 -12.408 -9.669  -4.101
## mu[2]         2.780   3.100   3.256  3.414   3.727
## sigma[1]     20.051  23.310  25.253 27.526  32.981
## sigma[2]      1.117   1.289   1.396  1.516   1.801
## nu           10.298  24.779  39.855 63.228 133.140
```

```
## xy_pred[1] -65.371 -29.938 -12.831  4.727  40.073
## xy_pred[2]   0.348   2.287   3.252  4.213   6.147
##                    mean         sd HDI% comp       HDIlo       HDIup
## rho         -0.001835462  0.1612468   95    0  -0.3077267   0.3183315
## mu[1]      -12.416033420  4.2401962   95    0 -20.8531963  -4.0989168
## mu[2]        3.255542150  0.2371679   95    0   2.7963492   3.7391802
## sigma[1]    25.589027399  3.2854456   95    0  19.7493544  32.4158332
## sigma[2]     1.412252075  0.1749537   95    0   1.0914515   1.7553266
## nu          48.324182843 32.7465029   95    0   5.2715194 112.3727505
## xy_pred[1] -12.694537044 26.8655011   95    0 -67.3784003  37.9700436
## xy_pred[2]   3.254960391  1.4684840   95    0   0.4081745   6.1987592
##                 %>comp       %<comp       q2.5%        q25%        median
## rho        0.494467404 5.055326e-01  -0.3152487  -0.1124296  -0.002107981
## mu[1]      0.002133049 9.978670e-01 -20.8536149 -15.1259552 -12.408261231
## mu[2]      0.999933342 6.665778e-05   2.7798535   3.1000518   3.256049172
## sigma[1]   0.999933342 6.665778e-05  20.0506560  23.3097309  25.253192086
## sigma[2]   0.999933342 6.665778e-05   1.1168288   1.2894648   1.396118656
## nu         0.999933342 6.665778e-05  10.2981097  24.7787421  39.854658990
## xy_pred[1] 0.308425543 6.915745e-01 -65.3710014 -29.9376203 -12.831018958
## xy_pred[2] 0.985268631 1.473137e-02   0.3479952   2.2873882   3.251785237
##                  q75%      q97.5%     mcmc_se      Rhat n_eff
## rho         0.1087044   0.3124496 0.001668934 1.0003439  9406
## mu[1]      -9.6685499  -4.1011464 0.044965153 0.9999956  8949
## mu[2]       3.4136618   3.7269721 0.002551661 1.0022543  8645
## sigma[1]   27.5261616  32.9805501 0.038654618 1.0019553  7386
## sigma[2]    1.5158370   1.8006102 0.002047686 1.0000710  7304
## nu         63.2283333 133.1397685 0.535405569 0.9999234  3764
## xy_pred[1]  4.7271656  40.0725202 0.221532527 1.0002670 14712
## xy_pred[2]  4.2127889   6.1471187 0.012147135 1.0000706 14634
```

```
plot(fit)
```




```
# Mean, SD, CI
se_mean <- fit$stats[1, 1]
se_SD <- fit$stats[1, 2]
se_ci_low <- fit$stats[1, 5]
se_ci_high <- fit$stats[1, 6]

# Posterior probability that correlation is greater than 0
post_prob_se <- fit$stats[1, 7]

print(paste("Posterior probability that the correlation is greater than 0:", round(post_prob_se, 2)))
```

```
## [1] "Posterior probability that the correlation is greater than 0: 0.49"
```

This posterior probability can be evaluated based on the guidelines from (Chechile (2020)) and their extension to posterior probabilities below 0.5 by (Andraszewicz et al. (2015)).

```
if (post_prob_se < 0.0005){
  evaluation_se = "Nearing certainty against"
}else if (post_prob_se < 0.005){
  evaluation_se = "Very strong bet against"
}else if (post_prob_se < 0.01){
  evaluation_se = "Strong bet against - irresponsible to avoid"
}else if (post_prob_se < 0.1){
  evaluation_se = "A promising but risky bet against"
}else if (post_prob_se < 0.25){
  evaluation_se = "Only a casual bet against"
}else if (post_prob_se < 0.5){
  evaluation_se = "Not worth betting against"
```

```r
}else if (post_prob_se < 0.75){
  evaluation_se = "Not worth betting on"
}else if (post_prob_se < 0.9){
  evaluation_se = "Only a casual bet"
}else if (post_prob_se < 0.95){
  evaluation_se = "A promising but risky bet"
}else if (post_prob_se < 0.99){
  evaluation_se = "Good bet - too good to disregard"
}else if (post_prob_se < 0.995){
  evaluation_se = "Strong bet - irresponsible to avoid"
}else if (post_prob_se < 0.9995){
  evaluation_se = "Very strong bet"
}else if (post_prob_se < 0.99995){
  evaluation_se = "Nearing certainty"
}else{
  evaluation_se = "Virtually certain"
}

evaluation_se
```

```
## [1] "Not worth betting against"
```

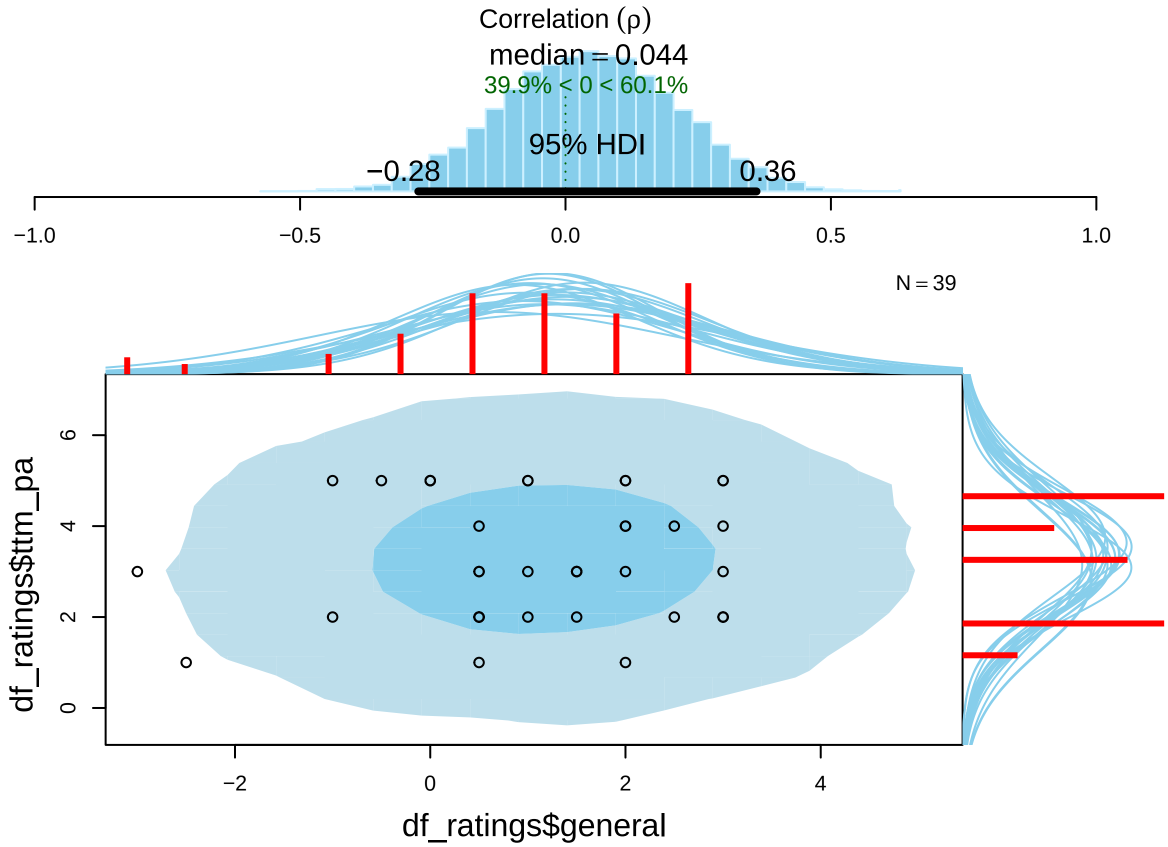
Now we calculate the correlation between the motivational impact rating for the generic examples and the TTM-stage for becoming physically active.

```r
set.seed(18)  # For reproducibility
fit = bayes.cor.test(df_ratings$general, df_ratings$ttm_pa)

print(summary(fit))
```

```
##   Data
## df_ratings$general and df_ratings$ttm_pa, n = 39
##
##   Model parameters
## rho: the correlation between df_ratings$general and df_ratings$ttm_pa
## mu[1]: the mean of df_ratings$general
## sigma[1]: the scale of df_ratings$general , a consistent
##   estimate of SD when nu is large.
## mu[2]: the mean of df_ratings$ttm_pa
## sigma[2]: the scale of df_ratings$ttm_pa
## nu: the degrees-of-freedom for the bivariate t distribution
## xy_pred[1]: the posterior predictive distribution of df_ratings$general
## xy_pred[2]: the posterior predictive distribution of df_ratings$ttm_pa
##
##   Measures
##               mean     sd  HDIlo   HDIup %<comp %>comp
## rho          0.043  0.165 -0.277   0.360  0.399  0.601
## mu[1]        1.170  0.250  0.668   1.649  0.000  1.000
## mu[2]        3.258  0.233  2.819   3.730  0.000  1.000
## sigma[1]     1.474  0.194  1.109   1.852  0.000  1.000
## sigma[2]     1.400  0.180  1.072   1.758  0.000  1.000
## nu          40.503 30.760  3.980 103.814  0.000  1.000
## xy_pred[1]   1.164  1.584 -2.011   4.290  0.223  0.777
## xy_pred[2]   3.247  1.505  0.256   6.213  0.018  0.982
##
```

```
## 'HDIlo' and 'HDIup' are the limits of a 95% HDI credible interval.
## '%<comp' and '%>comp' are the probabilities of the respective parameter being
## smaller or larger than 0.
##
##   Quantiles
##             q2.5%   q25% median   q75%  q97.5%
## rho        -0.276 -0.070  0.044  0.156   0.362
## mu[1]       0.669  1.005  1.171  1.337   1.653
## mu[2]       2.809  3.101  3.257  3.411   3.726
## sigma[1]    1.144  1.337  1.457  1.591   1.900
## sigma[2]    1.100  1.274  1.381  1.506   1.796
## nu          6.774 18.408 31.805 53.563 121.913
## xy_pred[1] -1.969  0.154  1.171  2.164   4.333
## xy_pred[2]  0.268  2.293  3.253  4.201   6.230
##                   mean         sd HDI% comp      HDIlo       HDIup    %>comp
## rho         0.04333615  0.1647501   95    0 -0.2772335   0.3598297 0.6010532
## mu[1]       1.16965837  0.2495627   95    0  0.6678476   1.6494806 0.9999333
## mu[2]       3.25807642  0.2330602   95    0  2.8185499   3.7302383 0.9999333
## sigma[1]    1.47386096  0.1935823   95    0  1.1089421   1.8522526 0.9999333
## sigma[2]    1.39961065  0.1797884   95    0  1.0715070   1.7583037 0.9999333
## nu         40.50257539 30.7604779   95    0  3.9800393 103.8137059 0.9999333
## xy_pred[1]  1.16356770  1.5842565   95    0 -2.0110351   4.2897457 0.7765631
## xy_pred[2]  3.24743215  1.5048192   95    0  0.2559503   6.2133701 0.9820024
##                 %<comp      q2.5%         q25%     median       q75%
## rho        3.989468e-01 -0.2757545 -0.07040037  0.0437215  0.1562794
## mu[1]      6.665778e-05  0.6689865  1.00476100  1.1708738  1.3372788
## mu[2]      6.665778e-05  2.8093185  3.10065330  3.2570778  3.4110518
## sigma[1]   6.665778e-05  1.1436720  1.33673895  1.4571341  1.5913656
## sigma[2]   6.665778e-05  1.0997664  1.27396644  1.3810024  1.5055549
## nu         6.665778e-05  6.7744150 18.40811272 31.8052140 53.5631829
## xy_pred[1] 2.234369e-01 -1.9687267  0.15371196  1.1713598  2.1637887
## xy_pred[2] 1.799760e-02  0.2677949  2.29274316  3.2526863  4.2011555
##                  q97.5%     mcmc_se     Rhat n_eff
## rho          0.3615855 0.001774651 1.000128  8656
## mu[1]        1.6527325 0.002759052 1.000924  8182
## mu[2]        3.7256385 0.002598019 1.001541  8051
## sigma[1]     1.9000160 0.002404633 1.000539  6526
## sigma[2]     1.7963724 0.002194896 1.001712  6732
## nu         121.9125109 0.517838478 1.001270  3528
## xy_pred[1]   4.3333047 0.013209776 1.000348 14413
## xy_pred[2]   6.2304142 0.012448669 1.000207 14648
```

```
plot(fit)
```




```r
# Mean, SD, CI
rat_gen_mean <- fit$stats[1, 1]
rat_gen_SD <- fit$stats[1, 2]
rat_gen_ci_low <- fit$stats[1, 5]
rat_gen_ci_high <- fit$stats[1, 6]

# Posterior probability that correlation is greater than 0
post_prob_rat_gen <- fit$stats[1, 7]

print(paste("Posterior probability that the correlation is greater than 0:", round(post_prob_rat_gen, 2
```

```
## [1] "Posterior probability that the correlation is greater than 0: 0.6"
```

This posterior probability can be evaluated based on the guidelines from (Chechile (2020)) and their extension to posterior probabilities below 0.5 by (Andraszewicz et al. (2015)).

```r
if (post_prob_rat_gen < 0.0005){
  evaluation_rat_gen = "Nearing certainty against"
}else if (post_prob_rat_gen < 0.005){
  evaluation_rat_gen = "Very strong bet against"
}else if (post_prob_rat_gen < 0.01){
  evaluation_rat_gen = "Strong bet against - irresponsible to avoid"
}else if (post_prob_rat_gen < 0.1){
  evaluation_rat_gen = "A promising but risky bet against"
}else if (post_prob_rat_gen < 0.25){
  evaluation_rat_gen = "Only a casual bet against"
}else if (post_prob_rat_gen < 0.5){
  evaluation_rat_gen = "Not worth betting against"
```

```r
}else if (post_prob_rat_gen < 0.75){
  evaluation_rat_gen = "Not worth betting on"
}else if (post_prob_rat_gen < 0.9){
  evaluation_rat_gen = "Only a casual bet"
}else if (post_prob_rat_gen < 0.95){
  evaluation_rat_gen = "A promising but risky bet"
}else if (post_prob_rat_gen < 0.99){
  evaluation_rat_gen = "Good bet - too good to disregard"
}else if (post_prob_rat_gen < 0.995){
  evaluation_rat_gen = "Strong bet - irresponsible to avoid"
}else if (post_prob_rat_gen < 0.9995){
  evaluation_rat_gen = "Very strong bet"
}else if (post_prob_rat_gen < 0.99995){
  evaluation_rat_gen = "Nearing certainty"
}else{
  evaluation_rat_gen = "Virtually certain"
}

evaluation_rat_gen
```

```
## [1] "Not worth betting on"
```

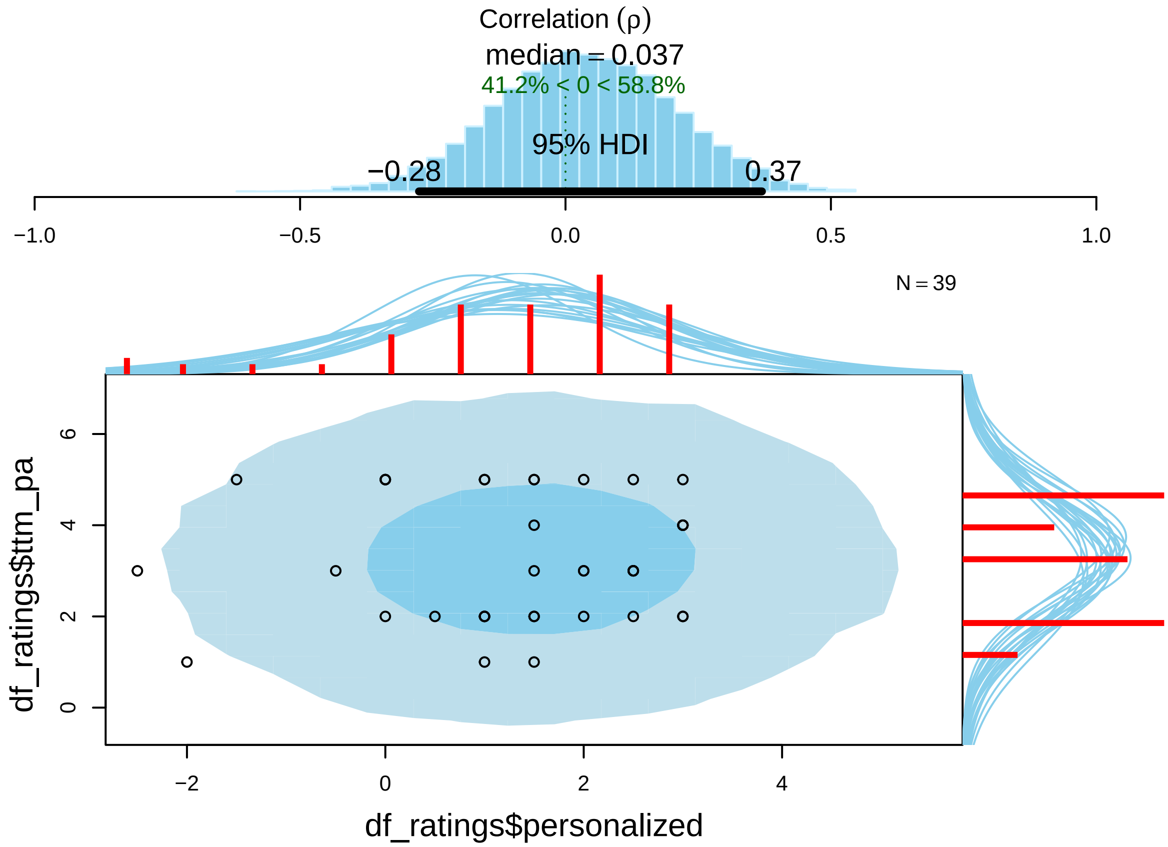
Next we calculate the correlation between the motivational impact rating for the personalized examples and the TTM-stage for becoming physically active.

```r
set.seed(18)  # For reproducibility
fit = bayes.cor.test(df_ratings$personalized, df_ratings$ttm_pa)

print(summary(fit))
```

```
##   Data
## df_ratings$personalized and df_ratings$ttm_pa, n = 39
##
##   Model parameters
## rho: the correlation between df_ratings$personalized and df_ratings$ttm_pa
## mu[1]: the mean of df_ratings$personalized
## sigma[1]: the scale of df_ratings$personalized , a consistent
##   estimate of SD when nu is large.
## mu[2]: the mean of df_ratings$ttm_pa
## sigma[2]: the scale of df_ratings$ttm_pa
## nu: the degrees-of-freedom for the bivariate t distribution
## xy_pred[1]: the posterior predictive distribution of df_ratings$personalized
## xy_pred[2]: the posterior predictive distribution of df_ratings$ttm_pa
##
##   Measures
##                mean     sd  HDIlo  HDIup %<comp %>comp
## rho           0.038  0.166 -0.276  0.370  0.412  0.588
## mu[1]         1.461  0.238  1.008  1.953  0.000  1.000
## mu[2]         3.254  0.234  2.809  3.746  0.000  1.000
## sigma[1]      1.401  0.185  1.055  1.774  0.000  1.000
## sigma[2]      1.399  0.179  1.060  1.757  0.000  1.000
## nu           38.757 29.206  3.230 96.733  0.000  1.000
## xy_pred[1]    1.481  1.504 -1.570  4.387  0.156  0.844
## xy_pred[2]    3.251  1.496  0.239  6.114  0.017  0.983
##
```

```
## 'HDIlo' and 'HDIup' are the limits of a 95% HDI credible interval.
## '%<comp' and '%>comp' are the probabilities of the respective parameter being
## smaller or larger than 0.
##
##   Quantiles
##              q2.5%   q25% median   q75%  q97.5%
## rho        -0.288 -0.077  0.037  0.152   0.359
## mu[1]       0.988  1.305  1.461  1.618   1.936
## mu[2]       2.788  3.098  3.255  3.407   3.726
## sigma[1]    1.077  1.273  1.387  1.512   1.807
## sigma[2]    1.093  1.274  1.381  1.508   1.800
## nu          6.677 18.081 30.777 51.103 116.473
## xy_pred[1] -1.517  0.524  1.470  2.444   4.465
## xy_pred[2]  0.281  2.303  3.243  4.216   6.174
##                  mean         sd HDI% comp      HDIlo      HDIup    %>comp
## rho         0.0375357  0.1658904   95    0 -0.2758743  0.3700189 0.5878550
## mu[1]       1.4613122  0.2382760   95    0  1.0081916  1.9526140 0.9999333
## mu[2]       3.2542234  0.2342290   95    0  2.8087074  3.7457039 0.9999333
## sigma[1]    1.4007176  0.1854746   95    0  1.0552129  1.7743443 0.9999333
## sigma[2]    1.3987058  0.1792815   95    0  1.0601064  1.7565116 0.9999333
## nu         38.7572451 29.2063312   95    0  3.2298356 96.7332709 0.9999333
## xy_pred[1]  1.4808496  1.5041713   95    0 -1.5698369  4.3870784 0.8438208
## xy_pred[2]  3.2511127  1.4962439   95    0  0.2391788  6.1135252 0.9828690
##                  %<comp      q2.5%      q25%     median       q75%      q97.5%
## rho        4.121450e-01 -0.2882551 -0.076516  0.0365048  0.1523033   0.3585485
## mu[1]      6.665778e-05  0.9879020  1.305063  1.4607357  1.6175040   1.9355964
## mu[2]      6.665778e-05  2.7879091  3.098214  3.2545570  3.4074934   3.7260810
## sigma[1]   6.665778e-05  1.0767309  1.272922  1.3870796  1.5120997   1.8072638
## sigma[2]   6.665778e-05  1.0931504  1.273646  1.3810272  1.5078599   1.7996117
## nu         6.665778e-05  6.6769314 18.081185 30.7766655 51.1032186 116.4726793
## xy_pred[1] 1.561792e-01 -1.5174963  0.523788  1.4702864  2.4439678   4.4645395
## xy_pred[2] 1.713105e-02  0.2814674  2.303293  3.2431481  4.2160270   6.1742120
##                mcmc_se      Rhat n_eff
## rho        0.001727009 1.0005793  9312
## mu[1]      0.002711806 1.0007556  7731
## mu[2]      0.002551339 1.0000716  8432
## sigma[1]   0.002312666 1.0003558  6448
## sigma[2]   0.002128627 1.0000397  7093
## nu         0.550290549 1.0016025  2997
## xy_pred[1] 0.012395052 1.0001222 14732
## xy_pred[2] 0.012217011 0.9999368 15000
```

```
plot(fit)
```




```
# Mean, SD, CI
rat_pers_mean <- fit$stats[1, 1]
rat_pers_SD <- fit$stats[1, 2]
rat_pers_ci_low <- fit$stats[1, 5]
rat_pers_ci_high <- fit$stats[1, 6]

# Posterior probability that correlation is greater than 0
post_prob_rat_pers <- fit$stats[1, 7]

print(paste("Posterior probability that the correlation is greater than 0:", round(post_prob_rat_pers, 2
```

```
## [1] "Posterior probability that the correlation is greater than 0: 0.59"
```

This posterior probability can be evaluated based on the guidelines from (Chechile (2020)) and their extension to posterior probabilities below 0.5 by (Andraszewicz et al. (2015)).

```
if (post_prob_rat_pers < 0.0005){
  evaluation_rat_pers = "Nearing certainty against"
}else if (post_prob_rat_pers < 0.005){
  evaluation_rat_pers = "Very strong bet against"
}else if (post_prob_rat_pers < 0.01){
  evaluation_rat_pers = "Strong bet against - irresponsible to avoid"
}else if (post_prob_rat_pers < 0.1){
  evaluation_rat_pers = "A promising but risky bet against"
}else if (post_prob_rat_pers < 0.25){
  evaluation_rat_pers = "Only a casual bet against"
}else if (post_prob_rat_pers < 0.5){
  evaluation_rat_pers = "Not worth betting against"
```

```r
}else if (post_prob_rat_pers < 0.75){
  evaluation_rat_pers = "Not worth betting on"
}else if (post_prob_rat_pers < 0.9){
  evaluation_rat_pers = "Only a casual bet"
}else if (post_prob_rat_pers < 0.95){
  evaluation_rat_pers = "A promising but risky bet"
}else if (post_prob_rat_pers < 0.99){
  evaluation_rat_pers = "Good bet - too good to disregard"
}else if (post_prob_rat_pers < 0.995){
  evaluation_rat_pers = "Strong bet - irresponsible to avoid"
}else if (post_prob_rat_pers < 0.9995){
  evaluation_rat_pers = "Very strong bet"
}else if (post_prob_rat_pers < 0.99995){
  evaluation_rat_pers = "Nearing certainty"
}else{
  evaluation_rat_pers = "Virtually certain"
}

evaluation_rat_pers
```

```
## [1] "Not worth betting on"
```

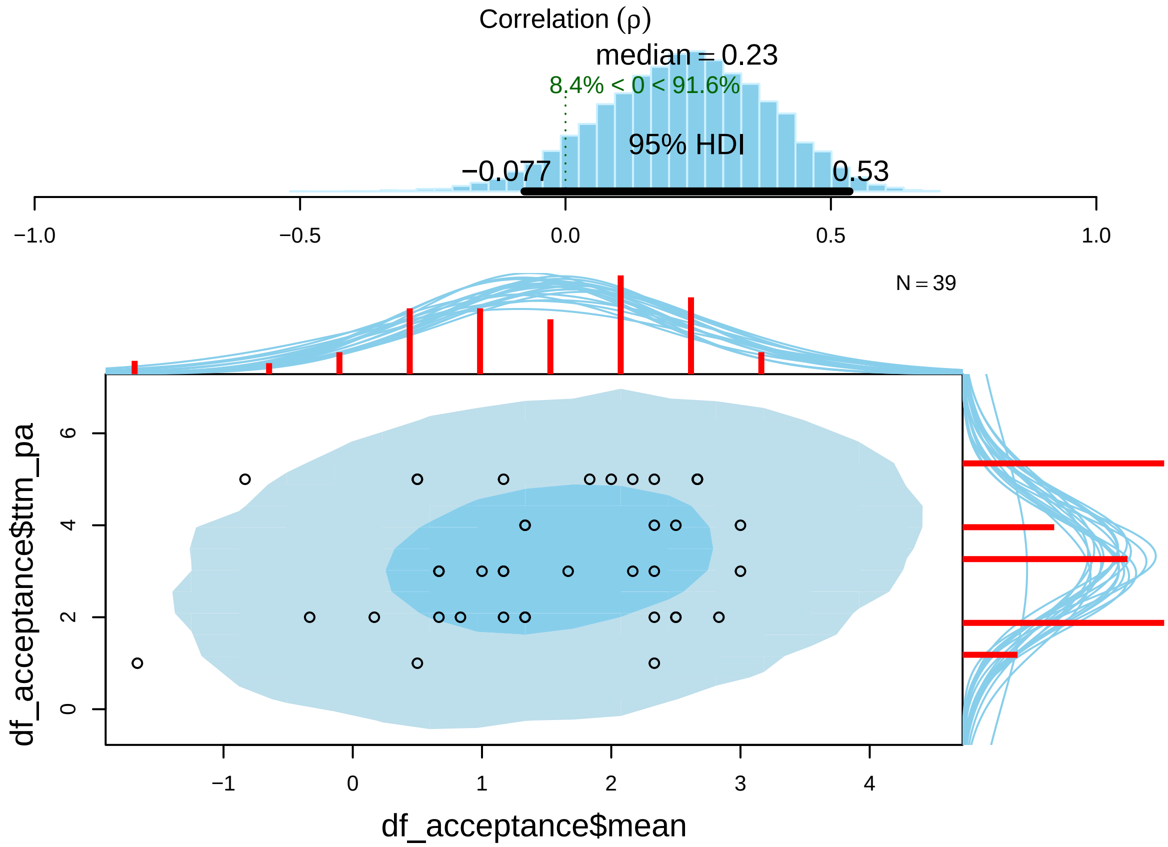
Finally, we calculate the correlation between the mean acceptance rating and the TTM-stage for becoming physically active.

```r
# Compute mean acceptance rating
df_acceptance$mean = (df_acceptance$acceptance_1 + df_acceptance$acceptance_2 + df_acceptance$acceptanc

set.seed(18)  # For reproducibility
fit = bayes.cor.test(df_acceptance$mean, df_acceptance$ttm_pa)

print(summary(fit))
```

```
##   Data
## df_acceptance$mean and df_acceptance$ttm_pa, n = 39
##
##   Model parameters
## rho: the correlation between df_acceptance$mean and df_acceptance$ttm_pa
## mu[1]: the mean of df_acceptance$mean
## sigma[1]: the scale of df_acceptance$mean , a consistent
##   estimate of SD when nu is large.
## mu[2]: the mean of df_acceptance$ttm_pa
## sigma[2]: the scale of df_acceptance$ttm_pa
## nu: the degrees-of-freedom for the bivariate t distribution
## xy_pred[1]: the posterior predictive distribution of df_acceptance$mean
## xy_pred[2]: the posterior predictive distribution of df_acceptance$ttm_pa
##
##   Measures
##               mean     sd  HDIlo  HDIup %<comp %>comp
## rho          0.223  0.158 -0.077  0.535  0.084  0.916
## mu[1]        1.529  0.183  1.181  1.898  0.000  1.000
## mu[2]        3.264  0.232  2.801  3.709  0.000  1.000
## sigma[1]     1.088  0.142  0.826  1.378  0.000  1.000
## sigma[2]     1.387  0.178  1.075  1.743  0.000  1.000
## nu          38.899 29.566  3.433 97.383  0.000  1.000
```

```
## xy_pred[1]  1.538  1.159 -0.741  3.881  0.086  0.914
## xy_pred[2]  3.256  1.496  0.395  6.258  0.017  0.983
##
## 'HDIlo' and 'HDIup' are the limits of a 95% HDI credible interval.
## '%<comp' and '%>comp' are the probabilities of the respective parameter being
## smaller or larger than 0.
##
##   Quantiles
##              q2.5%   q25% median   q75%  q97.5%
## rho         -0.100  0.118  0.229  0.334   0.516
## mu[1]        1.164  1.410  1.529  1.650   1.887
## mu[2]        2.809  3.110  3.266  3.420   3.718
## sigma[1]     0.844  0.990  1.077  1.174   1.405
## sigma[2]     1.089  1.264  1.370  1.495   1.766
## nu           6.626 17.699 30.554 51.243 115.901
## xy_pred[1] -0.758  0.795  1.538  2.279   3.873
## xy_pred[2]  0.333  2.303  3.244  4.215   6.204
##                  mean         sd HDI% comp       HDIlo      HDIup    %>comp
## rho         0.2232205  0.1580734   95    0 -0.07722339  0.5349316 0.9156779
## mu[1]       1.5290689  0.1826225   95    0  1.18059062  1.8976009 0.9999333
## mu[2]       3.2643080  0.2318841   95    0  2.80143179  3.7090112 0.9999333
## sigma[1]    1.0882272  0.1422360   95    0  0.82559764  1.3780535 0.9999333
## sigma[2]    1.3871585  0.1778934   95    0  1.07455134  1.7428477 0.9999333
## nu         38.8994140 29.5664223   95    0  3.43304156 97.3832492 0.9999333
## xy_pred[1]  1.5381323  1.1588837   95    0 -0.74097966  3.8806061 0.9136782
## xy_pred[2]  3.2560230  1.4961742   95    0  0.39482592  6.2583476 0.9834022
##                  %<comp      q2.5%        q25%     median       q75%       q97.5%
## rho        8.432209e-02 -0.1000032  0.1184219  0.2287848  0.3343109   0.5156122
## mu[1]      6.665778e-05  1.1642693  1.4097444  1.5289843  1.6500413   1.8868859
## mu[2]      6.665778e-05  2.8088995  3.1103198  3.2657175  3.4198292   3.7177158
## sigma[1]   6.665778e-05  0.8438772  0.9900189  1.0765948  1.1736230   1.4047606
## sigma[2]   6.665778e-05  1.0890326  1.2637805  1.3695946  1.4946546   1.7660591
## nu         6.665778e-05  6.6257110 17.6988018 30.5536666 51.2428280 115.9009873
## xy_pred[1] 8.632182e-02 -0.7575072  0.7945306  1.5380671  2.2785431   3.8731838
## xy_pred[2] 1.659779e-02  0.3328805  2.3028570  3.2441583  4.2152614   6.2036044
##                 mcmc_se      Rhat n_eff
## rho        0.001689726 1.0006546  8782
## mu[1]      0.002059826 1.0002671  7873
## mu[2]      0.002510608 1.0000598  8566
## sigma[1]   0.001766301 1.0000143  6499
## sigma[2]   0.002422104 1.0003611  6107
## nu         0.521889591 1.0049685  3263
## xy_pred[1] 0.009603114 1.0006149 14650
## xy_pred[2] 0.012409244 0.9999461 14543
```

```
plot(fit)
```




```
# Mean, SD, CI
acc_mean <- fit$stats[1, 1]
acc_SD <- fit$stats[1, 2]
acc_ci_low <- fit$stats[1, 5]
acc_ci_high <- fit$stats[1, 6]

# Posterior probability that correlation is greater than 0
post_prob_acc <- fit$stats[1, 7]

print(paste("Posterior probability that the correlation is greater than 0:", round(post_prob_acc, 2)))
```

```
## [1] "Posterior probability that the correlation is greater than 0: 0.92"
```

This posterior probability can be evaluated based on the guidelines from (Chechile (2020)) and their extension to posterior probabilities below 0.5 by (Andraszewicz et al. (2015)).

```
if (post_prob_acc < 0.0005){
  evaluation_acc = "Nearing certainty against"
}else if (post_prob_acc < 0.005){
  evaluation_acc = "Very strong bet against"
}else if (post_prob_acc < 0.01){
  evaluation_acc = "Strong bet against - irresponsible to avoid"
}else if (post_prob_acc < 0.1){
  evaluation_acc = "A promising but risky bet against"
}else if (post_prob_acc < 0.25){
  evaluation_acc = "Only a casual bet against"
}else if (post_prob_acc < 0.5){
  evaluation_acc = "Not worth betting against"
```

```r
}else if (post_prob_acc < 0.75){
  evaluation_acc = "Not worth betting on"
}else if (post_prob_acc < 0.9){
  evaluation_acc = "Only a casual bet"
}else if (post_prob_acc < 0.95){
  evaluation_acc = "A promising but risky bet"
}else if (post_prob_acc < 0.99){
  evaluation_acc = "Good bet - too good to disregard"
}else if (post_prob_acc < 0.995){
  evaluation_acc = "Strong bet - irresponsible to avoid"
}else if (post_prob_acc < 0.9995){
  evaluation_acc = "Very strong bet"
}else if (post_prob_acc < 0.99995){
  evaluation_acc = "Nearing certainty"
}else{
  evaluation_acc = "Virtually certain"
}

evaluation_acc
```

```
## [1] "A promising but risky bet"
```

Summary

Below we print a summary, which reproduces Table 7 from the Appendix of the paper.

```r
tab <- rbind(c("Change in self-efficacy", paste(round(se_mean,
    2), "(", round(se_SD, 2), ")"), paste("[", round(se_ci_low,
    2), ",", round(se_ci_high, 2), "]"), round(post_prob_se,
    2), evaluation_se))

tab <- rbind(tab, c("Motivational impact generic examples", paste(round(rat_gen_mean,
    2), "(", round(rat_gen_SD, 2), ")"), paste("[", round(rat_gen_ci_low,
    2), ",", round(rat_gen_ci_high, 2), "]"), round(post_prob_rat_gen,
    2), evaluation_rat_gen))

tab <- rbind(tab, c("Motivational impact personalized examples",
    paste(round(rat_pers_mean, 2), "(", round(rat_pers_SD, 2),
        ")"), paste("[", round(rat_pers_ci_low, 2), ",", round(rat_pers_ci_high,
        2), "]"), round(post_prob_rat_pers, 2), evaluation_rat_pers))

tab <- rbind(tab, c("Acceptance", paste(round(acc_mean, 2), "(",
    round(acc_SD, 2), ")"), paste("[", round(acc_ci_low, 2),
    ",", round(acc_ci_high, 2), "]"), round(post_prob_acc, 2),
    evaluation_acc))

colnames(tab) = c("Outcome Measure", "Mean (SD)", "95% CI", "Post > 0",
    "Evaluation")

pander(tab, caption = "Results of Bayesian analyses of Pearson correlations between the TTM-stage for b
```

Table 1: Results of Bayesian analyses of Pearson correlations between the TTM-stage for becoming physically active on the one hand and the outcome measures of change in self-efficacy between the pre- and post-measurement, motivational impact ratings for the two types of examples, and the acceptance on the other hand. (continued below)

Outcome Measure	Mean (SD)	95% CI	Post > 0
Change in self-efficacy	0 (0.16)	[-0.31 , 0.32]	0.49
Motivational impact generic examples	0.04 (0.16)	[-0.28 , 0.36]	0.6
Motivational impact personalized examples	0.04 (0.17)	[-0.28 , 0.37]	0.59
Acceptance	0.22 (0.16)	[-0.08 , 0.53]	0.92

Evaluation
Not worth betting against
Not worth betting on
Not worth betting on
A promising but risky bet

References

Andraszewicz, Sandra, Benjamin Scheibehenne, Jörg Rieskamp, Raoul Grasman, Josine Verhagen, and Eric-Jan Wagenmakers. 2015. "An Introduction to Bayesian Hypothesis Testing for Management Research." *Journal of Management* 41 (2): 521–43.

Chechile, Richard A. 2020. *Bayesian Statistics for Experimental Scientists: A General Introduction Using Distribution-Free Methods.* MIT Press.