Effects of all actions on confidence and perceived usefulness

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09 November, 2023

This file contains the code for the analysis of the effects of multiple actions on confidence and perceived usefulness. Note that, due to the nature of the Bayesian t-tests, results will not always be the same for the means and standard deviations. From the output of the `print` of the result, we use the probability of the mean difference being larger and smaller than 0. From the output of the `summary` of the result, we use the mean and standard deviation values, and their 95% CIs.

```
## Loading required package: rjags
```

```
## Loading required package: coda
```

```
## Linked to JAGS 4.3.0
```

```
## Loaded modules: basemod,bugs
```

Get the confidence and perceived usefulness values before and after the whole interaction as lists.

```
# get the confidence before as a list
c_before = as.numeric(t(read.csv("~/analysis/data/c_before.csv", header = FALSE)))
# get the confidence after as a list
c_after = as.numeric(t(read.csv("~/analysis/data/c_after.csv", header = FALSE)))
# get the perceived usefulness before as a list
pu_before = as.numeric(t(read.csv("~/analysis/data/pu_before.csv", header = FALSE)))
# get the perceived usefulness after as a list
pu_after = as.numeric(t(read.csv("~/analysis/data/pu_after.csv", header = FALSE)))
```

Run a Bayesian t-test on the confidence values.

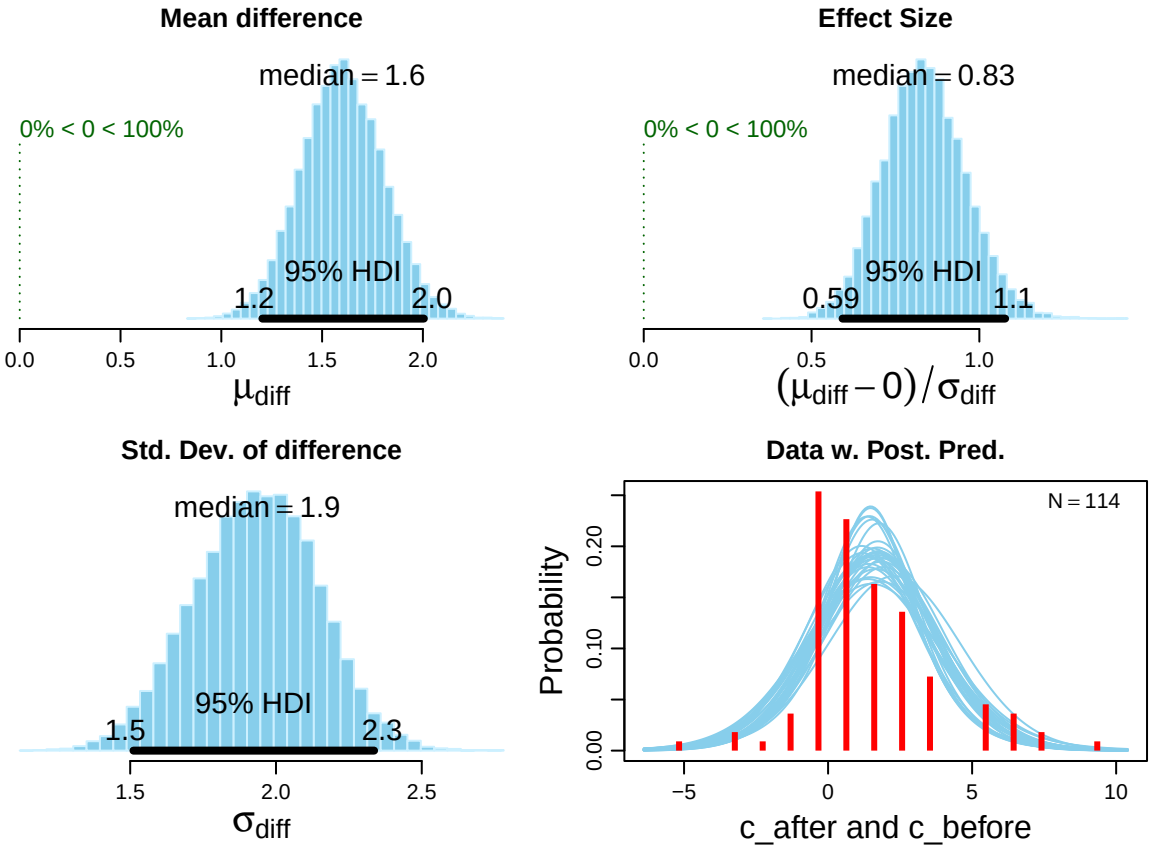
```
# run the Bayesian t-test
fit_1 = bayes.t.test(c_after, c_before, paired=TRUE)

# print the results of the test, the summary, and plot the results
print(fit_1)
```

```
##
##  Bayesian estimation supersedes the t test (BEST) - paired samples
##
## data: c_after and c_before, n = 114
##
##   Estimates [95% credible interval]
## mean paired difference: 1.6 [1.2, 2.0]
## sd of the paired differences: 1.9 [1.5, 2.3]
##
## The mean difference is more than 0 by a probability of >0.999
## and less than 0 by a probability of <0.001
```

```
summary(fit_1)
```

```
##   Data
## c_after, n = 114
## c_before, n = 114
##
##   Model parameters and generated quantities
## mu_diff: the mean pairwise difference between c_after and c_before
## sigma_diff: the scale of the pairwise difference, a consistent
##   estimate of SD when nu is large.
## nu: the degrees-of-freedom for the t distribution fitted to the pairwise difference
## eff_size: the effect size calculated as (mu_diff - 0) / sigma_diff
## diff_pred: predicted distribution for a new datapoint generated
##   as the pairwise difference between c_after and c_before
##
##   Measures
##              mean     sd  HDIlo  HDIup %<comp %>comp
## mu_diff     1.601  0.205  1.204  2.005  0.000  1.000
## sigma_diff  1.931  0.213  1.511  2.337  0.000  1.000
## nu         18.995 22.758  1.664 61.469  0.000  1.000
## eff_size    0.837  0.124  0.592  1.077  0.000  1.000
## diff_pred   1.596  2.310 -2.817  5.949  0.215  0.785
##
## '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%
## mu_diff     1.202 1.462  1.599  1.740  2.004
## sigma_diff  1.512 1.786  1.936  2.079  2.338
## nu          3.223 6.418 11.065 22.114 83.510
## eff_size    0.603 0.753  0.834  0.917  1.090
## diff_pred  -2.811 0.244  1.601  2.974  5.957
```

```
plot(fit_1)
```



Run a Bayesian *t*-test on the perceived usefulness values.

```
fit_2 = bayes.t.test(pu_after, pu_before, paired=TRUE)
print(fit_2)
```

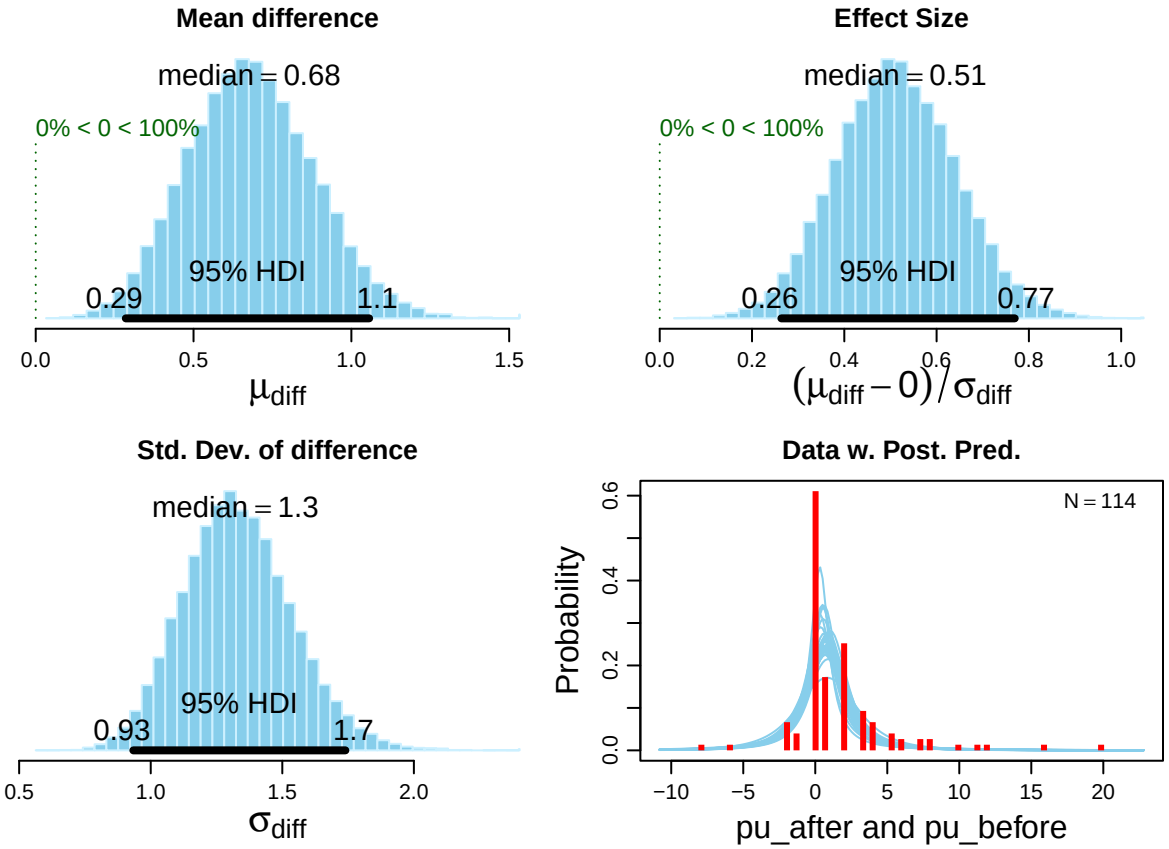
```
##
##  Bayesian estimation supersedes the t test (BEST) - paired samples
##
## data: pu_after and pu_before, n = 114
##
##   Estimates [95% credible interval]
## mean paired difference: 0.68 [0.29, 1.1]
## sd of the paired differences: 1.3 [0.93, 1.7]
##
## The mean difference is more than 0 by a probability of >0.999
## and less than 0 by a probability of <0.001
```

```
summary(fit_2)
```

```
##   Data
## pu_after, n = 114
## pu_before, n = 114
##
##   Model parameters and generated quantities
## mu_diff: the mean pairwise difference between pu_after and pu_before
## sigma_diff: the scale of the pairwise difference, a consistent
##   estimate of SD when nu is large.
## nu: the degrees-of-freedom for the t distribution fitted to the pairwise difference
```

```
## eff_size: the effect size calculated as (mu_diff - 0) / sigma_diff
## diff_pred: predicted distribution for a new datapoint generated
##   as the pairwise difference between pu_after and pu_before
##
##   Measures
##              mean     sd  HDIlo HDIup %<comp %>comp
## mu_diff     0.682  0.199  0.285 1.056  0.000  1.000
## sigma_diff 1.332  0.208  0.934 1.740  0.000  1.000
## nu          1.688  0.400  1.000 2.423  0.000  1.000
## eff_size    0.513  0.130  0.264 0.769  0.000  1.000
## diff_pred   0.645 14.022 -6.376 8.232  0.339  0.661
##
## '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%
## mu_diff      0.312  0.543  0.677 0.815  1.086
## sigma_diff   0.953  1.188  1.322 1.465  1.763
## nu           1.091  1.400  1.629 1.901  2.635
## eff_size     0.265  0.424  0.510 0.600  0.772
## diff_pred   -6.545 -0.474  0.669 1.851  8.104
```

```
plot(fit_2)
```



Calculate Cohen's d for the values of confidence and perceived usefulness before and after.

```r
# calculate Cohen's d
cohen.d(c_after, c_before)
```

```
##
## Cohen's d
##
## d estimate: 0.7533302 (medium)
## 95 percent confidence interval:
##     lower     upper
## 0.4832301 1.0234304
```

```r
cohen.d(pu_after, pu_before)
```

```
##
## Cohen's d
##
## d estimate: 0.4344207 (small)
## 95 percent confidence interval:
##     lower     upper
## 0.1703589 0.6984825
```