Therapeutic Touch

Machine Learning for Health Informatics 2019, Florian Endel

Therapeutic Touch (TT) is claimed to be an alternative medical treatment technique rooted in mysticism. Rosa et al. [1] described and investigated this nursing practice.

Summarizing, therapists apply TT by placing and moving their hands in a small distance to the patient's body. They believe to sense and manipulate a hardly defined "human energy field" and, as a result, are able to detect and resolve medical issues.

In [1] the presumed sensation of the energy field, a major claim of TT, is tested and retested on 21 experienced practitioners of TT. It is assumed, that the manual detection of a person from a short distance without direct contact can be reproduced in a controlled environment. The therapist sat with both hands extended behind a cardboard screen, inhibiting the view of the own hands and the experimenter. On each trial, the opposing but unseen experimenter holds her hand above one of the practitioner's hands in a perfect random order. Presumably sensing the human energy field, the therapist ought to tell which hand has been randomly chosen.

Each of the 21 practitioners of TT where tested 10 times in one session and 7 where tested for a second time, resulting in 280 dichotomous outcomes. Because the retests where counted as separate trials, there are 28 test subjects counted. Fig.1 shows the distribution of the number of correct guesses out of 10 trials for all 28 subjects. To guess the right hand by chance (null hypothesis) is 5 out of 10 trials per person or 50%.
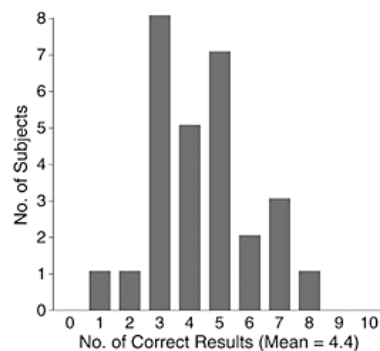

Fig.1: Distribution of test results. [1]

[1] L. Rosa, "A Close Look at Therapeutic Touch," JAMA, vol. 279, no. 13, p. 1005, Apr. 1998, doi:10.1001/jama.279.13.1005

[2] Kruschke, J. K. Doing Bayesian data analysis: a tutorial with R, JAGS, and Stan. (Academic Press, 2015)

Tasks:

1) Read at least Abstract, Methods and Results sections of [1]
2) Download the data from the github repository or dl.endel.at/TherapeuticTouchData.csv and load it in your python notebook
   a. Variable "y" equals the outcome of trial, variable "s" is the subject's identifier
3) Create a histogram of the observed distribution, similar to the bar chart in Fig.1

Bayesian Estimation (required)

4) Model the expected results and credible intervals for
   a. all single trials
   b. the combined results of each subject

   using PyMC3

   c. Present, interpret and explain your models and results in detail.

Advanced statistical analysis: hierarchical modeling (optional)

5) We would like to combine the estimation of the single trials, each individual and get an idea of their conjunction. Build a hierarchical model, describe and interpret the results in detail.
   a. Further details can be found in [2]