PSYC 529 Written Homework 9

Due 3/31/2025

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UPI: _____

Use a pencil (not a pen). Write neatly in the space provided after each problem. If you need more space, use the back of the page. Answers to a few of the problems are available so you can check your work. Unless otherwise specified you may use a calculator or use R as a calculator.

***** **Show your work for all calculations.** *****

1. The following Bayes factors are from Bayesian paired t-tests of whether four different drugs affect locomotor activity. For each of the following Bayes factors (reported as $BF_{1,0}$), do the following:

   - Determine what model/hypothesis the Bayes factor supports.
   - If the Bayes factor favors the restricted model, convert it to the form expressing support for that model (i.e. convert it to $BF_{0,1}$). Round the result to two decimal places, and **show your work.**
   - Determine what level of support the Bayes factor provides for the favored hypothesis (using the conventional labels based on thresholds of 3, 10, and 100).
   - Write a sentence summarizing the result (look at the examples in the textbook chapter I wrote). If the Bayes factor is at least "substantial", state which model/hypothesis it favors and describe it using the appropriate conventional label. Describe the supported model/hypothesis as "the drug affects locomotor activity" or "the drug does not affect locomotor activity"; technical jargon such as "null hypothesis", "full model" etc. Include the Bayes factor itself (stated in terms of support for the favored model, i.e. always > 1).

(c) [10 points] Drug C: $BF_{1,0} = 0.0042$

$BF_{0,1} = \frac{1}{0.0042} = 238.10$

There is decisive evidence in favor of M_0, the posterior on our null hypothesis, that Drug C had no effect on locomotor activity ($BF_{0,1} = 238.10$)

(d) [10 points] Drug D: $BF_{1,0} = 4.1$

There is substantial evidence that Drug D had an effect on locomotor activity in favor of our alternative hypothesis's posterior ($BF_{1,0} \neq 4.1$).

(c) [10 points] "We computed a Bayes factor that strongly favors the hypothesis that therapy has an effect ($BF_{1,0} = 20.3$). The posterior odds in favor of therapy having an effect are approximately 20:1."

There is a 20:1 ~~ratio of~~ chance of observing

The prior odds ratio represents a 1:20 chance of observing evidence against the full model (M_1), or in this case, observing that the therapy doesn't have an effect.

(d) [10 points] "While we did not find evidence for the alternative hypothesis ($BF_{1,0} = 0.01$), statistical inference does not allow us to find evidence for the null hypothesis. Therefore the result of our experiment is inconclusive."

$BF_{0,1} = \frac{1}{0.01} = 100$

Wrong

There is decisive evidence in favor of our null hypothesis ($BF_{0,1} = 100$).