CSCI 2300 – Self-Experiment Designs (v1.0)

Due: March 22, 2023 (midpoint on Mar 1, analysis due Mar 15)

It's time to figure out whether small habits can put you in a better mood, and make you feel more rested! Does a period of meditation get you calmer? Does 30 minutes of jogging outdoors provide you more energy for the day?

Usually we learn what affects us from studies reported in the news, articles, and other people. Those studies are typically done on a sample population, usually through randomized controlled experiments. But everyone has different responses and sensitivities; those studies only show that there is *some* effect for *some* people. You probably already make anecdotal-based guesses about what affects you in your day-to-day life, but in this assignment, you take a more scientific approach by performing an N = 1 experiment (self-experiment) to see how changing your behavior affects you.

Before you start, skim this early article by Seth Roberts where he talks about "The unreasonable effectiveness of my self-experimentation."

1   Feb 25 (Assignment out): Trial period

First, think about what you want to change, which is a condition (independent variable) that you will do on some days, and that you will avoid on other days. You will be seeing whether that change improves your mood and readiness (energy). Choose the condition carefully: think of something that you believe will make an **immediate** and **substantial** difference on your mood and readiness, yet also has little carryover effect so its effects should only last the day. For example, if your condition is listening to relaxing music, don't make the change be listening to 5 minutes of music a day, instead listen to music for an hour during multiple times of the day so that the effect is more pronounced. Or if your condition is taking a nap or resting in bed, take a massive nap/rest instead of a small one. But make sure you're choosing a condition that is safe to do, without any negative side effects.

Check this spreadsheet to make sure no one else has chosen the condition you are thinking of, and then claim it by adding it to the spreadsheet along with your name. You cannot have the same condition as anyone else in the class, so it's first-come-first-served, but similar conditions are okay.

During this trial period, you will just be testing this for two days, one day with and without the condition. Flip a coin to determine which day is which. You'll practice logging two outcome variables: **mood**, where you can choose a scale (for example, a 5-point happiness scale, or a rating for your level of calmness), and **readiness** which you'll estimate as the "number of remaining hours you could work productively today." Depending on what condition

you choose, and your typical daily schedule, the trial period is for you to get a sense of what it's like to measure your mood and readiness during different times of the day.

Consider how you will be recording your data, and how you will remind yourself to log your two outcome (dependent) variables. For example, you may carry around a pen and notepad with you, and set alarms on your phone when you need to log your variables. Or you might schedule times on your calendar app to get reminders, and record the data on your phone. Try logging your mood and readiness many times throughout the day to get a sense of when it changes and when you won't be distracted, so you can later identify 3 times each day when you'd like to do this for the main experiment (for example, when you wake up, after lunch, and before bed). While there is a whole industry of automatic sensing devices and data collection tools, don't be too preoccupied with choice of devices and apps.

Finally, before you start your two-day trial period, come up with a causal hypothesis by guessing what you think will happen. How much of an effect there will be, and how much do you expect the measurements to vary? An example hypothesis about the effect may be: on days where you will jog for 30 minutes, your average mood will increase by 1.5 points on a 5-point happiness scale, and you will have 1 extra hour of readiness each day. Consider what are the assumptions being made and what are the possible confounds or biases.

2   Mar 1 (midpoint): Share in class your trial period

On March 1, be prepared to share in class how your trial period went, and if there are any adjustments you intend to make for your main experiment.

Afterwards, you will run your main experiment for 12 full days, either March 2 – March 13, or March 3 – March 14. At the start of each day, flip a coin to determine which condition you will do for that day. The randomization from the coin flip is important for this to be a causal experiment. Log your mood and readiness 3 times each day, at the times you determined during the trial period to be most convenient and well-distributed. You should have a record of which condition was randomly selected on each of the 12 days, along with $12 \times 3 = 36$ logs in total, with each log recording both outcome variables.

Once your main experiment is ongoing, there shouldn't be much else to do. So I suggest you start figuring out your analysis during this period, as you will be doing your own research to figure out how to do the analysis (see the next section). There's no single correct way to do it, and it's a key part of doing research to figure out how your will convey your choice of analysis to the reader.

3 Mar 15: Analysis/results to share in class

Your experiment is composed of one categorical independent variable, with 2 scalar dependent variables. There are several possible ways that you can compare and calculate the effect of the independent variable, so part of this assignment is doing some of your own research for appropriate methods. One classic approach is to simply compare a difference in means between the two conditions, and check for a significant effect with null-hypothesis testing and calculate the effect size with Cohen's d. Do this, but also one other approach for comparison, so two analyses in total.

For example, another approach is to treat the 3 data points logged on each day as *repeated measures* in a repeated measures design. Yet another approach is a Bayesian alternative where you choose a prior (an initial belief of how likely there is an effect), an do a Bayesian hypothesis test and/or calculate the credible interval. Whatever way you choose to analyze the data to come up with your results, you just need to justify it to convince the reader.

You may look for guidance in this recent article, Single-case intervention research design standards: Additional proposed upgrades and future directions or its earlier version by the same authors, Single-case intervention research design standards. Other papers that describe analysis techniques may use terms like "N-of-1 trials" or "single-case experiment design". It's okay and even encouraged to discuss analysis strategies with other students.

For class on March 15, be prepared to share the key results from one of your analyses, but you will have another week (by March 22) to write up the results.

4 Mar 22: Report due

There won't be class today, but before the usual class time (4:30pm), submit a final report no more than 3,000 words to Canvas. You may use a format similar to the reading you did on gwern.net, or something more like an academic paper which is always acceptable. Be sure to note the variables, the procedures your followed and why you chose the procedure that you did, hypothesis, assumptions and biases. Describe what results were observed, whether that was expected (why or why not), and the different types of validity of your work. The figure or table would be a good way to visualize the data.

Grading will be based on: having a clear experimental design so that someone could reproduce the steps if desired, appropriate pressentation of the results, with justification for the procedures including the analyses, and appropriate validity of the results and conclusions.