# Does meditation lower blood pressure?

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**Plan of Execution**

* **How detailed is your experimental design and procedure so far?**

We plan to randomly select study participants into two groups of equal size. Each group will be given both a treatment and a control condition, but in different order, using a within-subject design. The design will implement the following:

1. Get subjects: With a goal of at least 60 participants, we plan to reach out to at least three populations to find study volunteers
   1. The San Francisco Zen Center
   2. UC Berkeley network
   3. Coworkers, Friends and Family (this will be a last resort, as it is the least independent)
2. Assign to groups:
   1. Create a spreadsheet with a row for each new subject. One column in the spreadsheet will be pre-populated with a random assignment of ‘J’ or ‘K’ using sample(rep(c("J","K"), 30), 60) in R. As new subjects are added, they are automatically assigned to a group.
3. Gather pre-experiment questionnaires: If possible capture responses to a questionnaire a few days before the experiment, to avoid any effects on the subjects from the questions asked. Include the following:
   1. Prior meditation experience and meditation style
   2. Gender
   3. Age
   4. Blood Pressure (Low, Average, High)
   5. Religious background/views on meditation as a practice
4. Execute the experiment: Either online or in person
   1. Distribute blood pressure monitors, measurement forms with subject name/ID and group
   2. Give high-level overview of what they might expect
   3. GIve instructions on blood pressure monitor use to all subjects, test monitors to ensure they work right
   4. Divide participants into J and K rooms
      1. J Room
         1. Take an initial measurement
         2. Capture pre-experiment questions (most recent meal, caffeine, sleep, activity)
         3. Provide written or oral instructions on meditation
         4. Take a pre-measurement
         5. Set a timer, start the meditation
         6. When the time has elapsed, take a post-measurement
         7. Washout - 15 minutes
         8. Distribute coloring books and pencils
         9. Provide written or oral instructions on the coloring period
         10. Take a pre-measurement
         11. Set a timer, start the coloring
         12. When the time has elapsed, take a post-measurement
         13. Ask all participants to fill in the post-experiment questions (self-assessment of meditation experience)
         14. Collect all measurement pages and monitors
         15. Thank everyone for their participation, provide follow-up materials for anyone who is interested.
      2. K Room
         1. Take an initial measurement
         2. Capture pre-experiment questions (most recent meal, caffeine, sleep, activity)
         3. Distribute coloring books and pencils
         4. Provide written or oral instructions on the coloring period
         5. Take a pre-measurement
         6. Set a timer, start the coloring
         7. When the time has elapsed, take a post-measurement
         8. Washout - 15 minutes
         9. Provide written or oral instructions on meditation
         10. Take a pre-measurement
         11. Set a timer, start the meditation
         12. When the time has elapsed, take a post-measurement
         13. Ask all participants to fill in the post-experiment questions (self-assessment of meditation experience)
         14. Collect all measurement pages and monitors
         15. Thank everyone for their participation, provide follow-up materials for anyone who is interested.
5. Capture results: Collate all results into the initial spreadsheet, including questionnaire responses, pre-experiment questions, measurements, and post-experiment questions. Make sure to back up this spreadsheet
6. Analyse results: Use R or Python to determine causal relationships. Block on group, prior blood pressure, age. The outcome measure that we care the most is the difference in pre- and post-experiment blood pressure measurement.

**Tasks:**

* **At a high level, how are you planning to execute the experiment? How will you divide up the data collection task among yourselves?**

Our team is divided geographically between the Bay Area in California, and Louisiana. Erika and Thong will run experiments in SF area while Matt runs them from Louisiana, and/or online.

We are planning to divide up tasks between team members as evenly as possible, to collect data from both treatment and control group, and work together on the analysis of the results.

* **What parts of the protocol have you not fleshed out yet?**

One of the most challenging aspects of the experiment is that different meditation styles may have a great impact on the results. For example, many people meditate to relaxing music. However, running a meditation experiment using relaxing music may measure the effects of music on study participants, rather than the meditation itself. Another concern is that people who have experience with one style of mediation may dislike a different style - a guided meditation might be uncomfortable to a Zen practitioner, for example. Options for meditation styles include:

1. Recording of a guided meditation
2. Oral instructions before a silent meditation
3. Written instructions before a silent meditation
4. Eyes open/closed
5. Mantra meditation
6. Breathing meditation

Some recorded guided meditations include:

1. Adyashanti’s ‘Allowing’: <https://www.dropbox.com/s/qqbnppeqtyk5bzm/3-03%20Allowing.mp3?dl=0>
2. <https://www.appropriateresponse.com/teachings/> there are various lengths
3. The first 4 tracks of the Deepak Chopra’s “The Soul of Healing Meditation”
4. “Gamma Meditation System: Inner Mind”

Some written guided meditations include:

1. <http://www.innerhealthstudio.com/breathing-meditation.html>
2. <http://www.the-guided-meditation-site.com/guided-meditation-script-inner-stillness.html>
3. <http://www.humanisticspirituality.org/?page=view&id=3&kind=Readings&topic=guided+meditations>

In addition to the specific style of meditation we will be implementing for the experiment, we need to write the scripts and questionnaires that we will give to subjects in treatment and control group.

* **On what questions would you like advice from the instructor?**

We have a few questions we would like help to resolve:

1. Do we still need 60 total subjects in this kind of design?
2. What would be the impact of allowing test subjects with more meditation experience to meditate for a longer period of time during the experiment?
3. How do statistical methods change in this design?
4. Should we block for online/offline participants?
5. Do we need to test the accuracy of the blood pressure devices?

* **What software (if any) needs to be written to execute the experiment? How far along are you on this?**

We plan to use R/Python to perform data analysis. We will start on this once we have the necessary data.

* **Are you hoping for a grant to help cover expenses of the experiment? If so, make sure to send the instructor a one-page email detailing your grant amount request (up to $500 per group)**

Yes - we plan to purchase blood-pressure measurement devices (20 to 30 devices at $15 to $25 per device) and possible fees to rent room(s) to run the experiments if the group size requires them