



PROJECT PROPOSAL

Learning and Memory PSY306-Winter 2021

GROUP NUMBER: 4

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Instructions:

- Please think of an original idea related to any area of Learning and Memory and plan a short study to experimentally test that idea. You may refer to the studies that we've been discussing in the course, the course books and relevant papers for examples to come up with your own idea. You may look at a list of credible sources for scholarly papers here: **Conferences_Journals_CognitiveScienceIIITD.pdf (attached)**. Please note that the list is not exhaustive and IIITD does not have subscription to most of them. You may have to refer to the articles which are free to download or hosted by authors on pre-print servers (ArXiv, bioRxiv, PsyArXiv, etc.) or other portals, such as Research Gate.
- Based on the demands of your research questions you may choose a human/non-human experimental system to test your hypotheses. Elaborate your study and its plan under various heads in the document below so that it is comprehensible and coherent. Instructions with each head briefly describes what is expected in each section. You may append extra sheets at the end of each section. Word counts are indicative and less may be written.
- Please cite your sources (within the body of text and the provide a reference list at the end) in the APA citation format (<https://www.mendeley.com/guides/apa-citation-guide>).
- Please use only this MS-WORD template and write the proposal in single-spaced, font type Arial 10 or 11 on a word processor. Figures/Illustrations created manually or digitally may be inserted wherever necessary but they should be original to the extent possible. For example, if an illustration is trying to show a testable process occurring in the brain, you may use a template of the brain from freely available images (with reference) but the rest of the illustration should be originally created.
- **Strict deadline for submission is 11:30 PM (25th March, Thursday). Each group is required to submit ONLY ONE PROPOSAL.** Please note that submissions **after this deadline will not be evaluated and will score ZERO (all group members of the submission).**
- **Please DO NOT PLAGIARISE any part of this submission. It will be dealt strictly as per IIIT-D policies. The expectation is to produce an original written piece.**
- A separate announcement about presenting the project proposal will be made in due time.

Lockdown Effects on Mental Health and Memory

Aims:

Background

The COVID-19 pandemic and the preventive measures enforced by the government, like lockdown, exposed people across the globe to worsening cognition and mental health. Ever since the lockdown, we have found it hard to remember to email someone, summing up the word we need. Also, it has been hard to remember our friends' birthdays or any remainders and essential work that has to be done on time. When we were in college, we paid attention to every small thing, whether we were navigating our way through a college campus or around a city, all those happening to give us time to anchor our memories. Now, as we are taking online classes from home, every online discussion feels quite similar to every other online discussion because we tend to sit in exactly the same place in front of exactly the same screen. We have lost that extra stimulation that comes from finding our way around. Therefore there is less to tag our memories to help us differentiate them.

According to a study conducted on the lockdown effect in Italy (Fiorenzato et al., 2021), Under government regulations, cognitive complaints were mostly perceived in routine tasks involving attention, temporal orientation, and executive functions.

Numerous studies have found that long-term social isolation is also associated with cognitive decline. For example, a study was conducted in 2013 (Aparna Shankar et al.) over a group of more than 6000 individuals that were taking part in the English Longitudinal Study of Ageing (ELSA) in which cognitive function was measured at two times instances. At the beginning of the study, people with reportedly fewer social interactions and activities as found by the researchers showed a more significant decline in cognitive function, as measured by communication fluency and memory tasks such as recalling, after four years.

Lockdown has also resulted in mental health disorders such as depression and anxiety, which are known to impact memory. We know that a lack of social interaction or social isolation adversely affects the brain, and this effect is most severe in people who already have memory difficulties. For those with Alzheimer's disease, loneliness levels also predict the course of the disease. Not everyone experiences loneliness during an outbreak. For some of them, social distancing has made them recognize the importance of their relationship, which influences health and mortality. The brain area related to learning and memory - the Hippocampus - is sensitive to stress and is smaller in those who suffer from depression. "Diminished hippocampal volume could explain poor recollection," says Daniel Dillon, assistant professor of psychiatry at Harvard University.

The Hippocampus is also needed to be engaged in order to recall or remember new information. Veronique Bohbot, a neuroscientist at McGill University in Canada, has found that if people's lives become more confined and repetitive as they age, the use of the Hippocampus decreases. This explains the impact of lockdown on our memory abilities.

Specific Aim 1:

To determine if lockdown has affected the mental health of an individual.

Specific Aim 2:

To determine if the mental health issues arising from lockdown have affected the memory of an individual.

Proposed Methodology:

Firstly, we will conduct a survey to analyze the difference observed in the daily executive functions of an individual pre and during a lockdown. The survey is being conducted on both types of people- those already suffering from mental health issues and those that aren't.

Our questions are framed such that it gives us insight on the before and after a mental state of the person.

We would ask the people to answer the questions on a scale of 1-10.

For example, some of the questions will be as follows-

“How would you rate your mental health during the lockdown as compared to pre lockdown?”

(1 -worst during a lockdown, 10- best during a lockdown, 5-same)

“How often do you experience feelings of anger” and “how often did you experience feelings of anger during lockdown” (and similarly, for the feelings of sadness, calm and euphoria.)

(1-most during lockdown,10-least during lockdown,5-same)

“Does your health limit you in doing daily activities now as compared to pre lockdown?”

(1-highly limiting,10- least limiting during the lockdown,5-same)

“How is your quality of sleep during the lockdown as compared to pre lockdown.”

(1 -worst during a lockdown, 10- best during a lockdown, 5-same)

“How often do you feel positive about life as compared to pre lockdown.”

(1 -worst during a lockdown, 10- best during a lockdown, 5-same)

These questions will help us in getting an insight into the fact whether the lockdown has increased the mental health issues for the people or not, which we talk about in our Aim 1.

Using the data that we collect from the survey for the people who have got mental health issues, we further go on to perform the N-back test on these people to determine whether having mental health issues due to lockdown has affected the memory of an individual.

The N- back test is used to test the temporal memory, which is controlled by the hippocampus, and as mentioned in our background, the hippocampus is the center of the brain that is responsible for learning and memory, which is also sensitive to stress, depression etc. Though the n-back tests have different approaches, We are going for the visual approach for it since, according to studies conducted, visual memory surpasses auditory memory.

Analysis from Experiment 1:

All the questions are to be responded in a point-based system format. Our experiment further analyzes that data and filters out some participants. Most of these participants are expected to be having mental health issues.

Breaking down the Experiment:

Every participant has to answer all the questions given in the list. Every question is unique from each other and collects data from the participants from a point-based system on a scale of (1-10). After collecting all the responses from the participants, we calculate the mean of all the responses for each individual question and call it the **question score** of that question.

Every question also has a median expected value. If the participants rate their response below the median expected value, then they are more prone to be highly affected by the lockdown. If they rate their response above the median expected value, they are less prone to be highly affected by the stimuli.

After the participants answer all the questions, the mean of the response points is calculated from all the questions(let's call this **mean score** of each participant). If the **mean score** is above the threshold value (median expected value for a normal participant(5) after answering all questions), then the participant is not considered to be having mental health issues.

N-Back test is carried out on all the participants participating in the experiment.

Now we take bottommost 25% of the participants according to the mean score and call it Group1, the rest of the participants belong to Group2.

Working of N-back test:

In our experiment, we are considering N=2. Each and every participant (people above the threshold from experiment 1) are presented with a number (all of the black color)—the task to decide if the current number is the same as the number 2 trials before.

To conduct the experiment, a number flashes one at a time on the screen. The participant is expected to respond if they have seen this number, two trials before, in the experiment by pressing the spacebar, which indicates a “yes” and “no” otherwise.

The experiment is divided into blocks, with each block containing 30 trials with a specific number of ‘targets’ and ‘non-targets’ (Targets are the numbers that have appeared in two trials before which you are expected to respond yes to).

There will be 3 such blocks.

Anticipated outcomes:

We are expecting the average score for each question(**question score**) to be less than 5, which indicates that the lockdown has adversely affected the mental health of the individuals in the group.

This shows that lockdown has indeed affected the mental health of an individual and also shows that sudden lockdown has affected the daily working of an individual.

On the basis of the evidence suggesting that mental health and depression etc. affects the memory of an individual, we hypothesize that those with mental health issues(the bottom-most 25% of the participants) will show poor performance on the n-back test, indicating a decline in the memory performance.

We compare the group 1 participant (25% of all participants who were worst affected according to the survey) N-back data (mean correct score) to that of group 2 participants using a t-test.

We are expecting the **p-value** (probability score of rejecting our hypothesis) of **the t-test** to be less than **0.05** (which will show that the data is statistically significant) and **r value** to be negative(which will show a negative association between the n-back performance of Group1 and Group2 participants).

If the r-value is negative and the p-value is < 0.05 , this will be along the lines of our hypothesis and shows that mental health issues arising due to lockdown have affected the memory of an individual.

This will prove that the people who are mentally affected by lockdown in the worst manner, their memory, too, has been affected.

References:

1. Bland AR, .Roiser JP, Mehta MA, Sahakian BJ, Robbins TW, Elliott R (2020). COVID-19 induced social isolation; implications for understanding social cognition in mental health. *Psychological Medicine* 1–2. [https:// doi.org/10.1017/S0033291720004006](https://doi.org/10.1017/S0033291720004006)
2. Wetsman, N. (n.d.). *Depression's impact on memory*. BrainFacts. <https://www.brainfacts.org/Diseases-and-Disorders/Mental-Health/2019/Depressions-Impact-on-Memory-022119>
3. *Beginning of the pandemic: COVID-19-Elicited anxiety as a predictor of working memory performance*. (n.d.). Frontiers. <https://www.frontiersin.org/articles/10.3389/fpsyg.2020.576466/full#h4>
4. *Top 20 mental health survey questions for questionnaire + sample template*. (n.d.). Free Online Survey Software and Tools | QuestionPro®. <https://www.questionpro.com/survey-templates/mental-health/>
5. Hammond, C. (n.d.). *Lockdown has affected your memory – here's why*. BBCpage. <https://www.bbc.com/future/article/20201113-covid-19-affecting-memory>