Cendy Lin
W241-1
2/9/17

Essay 2: Do Phone Notifications Increase Stress?

Introduction

In our fast-paced, technologically-driven society, our screens connect us to the world around us, but it also gives the world access to us. Marketers and developers are constantly coming up with tactics to increase our interaction with their application, so that there is more opportunity for us to engage with the content and thus ads on their app. One way of reminding us to use their application is through phone notifications, and preferably push notifications -- notifications that the user receives in real-time, usually through a message, a blinking light, a buzz, and and a ring, hitting three senses at once.

Notifications are designed to make a person's life easier, providing users with direct access to the information most useful to them, live in real-time. It may be a driving factor for our screen addiction. While these little reminders are useful for some apps, they often prove to be a distraction, with notifications going off when we are in a meeting or trying to do focused work. Worse, they can be a distraction for other people as well. And while technology has allowed us to be more efficient -- we can check and respond to emails anytime anywhere -- it also may make us more frazzled. There are always messages to read or respond to, and an impossible number of ways a person can be reached. In my own life, I have observed that when I make a make a conscientious choice to silence my phone for a few hours, I feel generally more productive and less stressed. I have also noticed that most notifications are not as urgent as they appear; most emails and text messages can be responded to at a later time with no consequence. Turning off notifications allows *us* to control the notifications, as opposed to notifications controlling us.

The Question

Observing these benefits in my own life, I would like to understand if and to what extent notifications impact our stress levels today across a broader population. If it is found that notifications do cause an increase in stress levels, this information might give users pause before accepting the "notifications on" setting in their apps.

Cendy Lin
W241-1
2/9/17

An Ideal Experiment

The ideal way to test the causal relationship between phone notifications and stress levels is to randomly sample a group of people across the country, old and young, who are relatively smartphone-savvy. We'd like to study people who are comfortable with their phones so that we do not pick up noise from users who are not tech-literate and thereby additionally stressed by learning how to use a phone. One way to find subjects might be to contact telecommunication service providers such as T-Mobile, Verizon, Sprint, etc. and sample from users who have signed up for at least 2 GB of data per month. The data usage informs us of how smartphone-literate they are; we assume those individuals requiring at least 2 GB of data are also more likely to have applications with notifications on their phones.

We would then split the group in half, with one group getting treatment and the other assigned to control. The treatment group would have their push notifications turned off for a varying number of applications, and the control group would have no change to their notification settings. In order to determine effect on stress levels, we would conduct psychological and physiological exams before, during, and after the study that would include a questionnaire on perceived stress levels, and blood pressure and cortisol levels as biomarkers. Ideally the experiment would run for a month with weekly check-ins to track potential changes in stress over time. We expect that the impact of turning off notifications would be immediately felt, but a study duration of a month would help to ease any initial shock and give subjects time to become accustomed to it. Follow-ups would be conducted a few months later to see if treatment had a lasting impact on subjects.

A Practical Approach

In order to conduct a more feasible and time-sensitive study, we would need to recruit individuals who would like to participate, rather than going to telecom companies directly, as they will be unable or unwilling to share their users' contact information. We could either recruit through Mechanical Turk or on Facebook for individuals who use their smartphones daily and are willing to participate in the study. A group of 120, with 90 in the treatment group (30 for each of three treatment levels) and 30 in control might be a good sample size to shoot for.

Cendy Lin
W241-1
2/9/17

Blocking

Once we have at least 60 participants, we can use software like R to randomize the group into one of the two groups. Before we do this, it might be a good idea to block on demographic information, such as age. This is because different generations might have different usage patterns, and we want to ensure that each of these generations are represented equally in treatment and control.

Treatment and Control

The group that is assigned to treatment will be asked to turn off push notifications on their phones. To vary the treatment, we will split treatment into three subgroups:

- The first would shut off all notifications from **all** applications
- The second group would shut off everything **except text and email**
- The last group would shut off everything **except text, email, and social media.**

By varying treatment in this way, we can look to see if the *type* of application affects levels of stress (e.g. shutting off notifications for social media apps might result in a larger decrease in stress levels than shutting of notifications for email and text). As for control, in order to satisfy the exclusion requirement, we will ask them also to turn off notifications for one application, one they are least likely to use (a stock app or their carrier app).

Data Collection

Before the study starts, we would want to collect demographic information such as age, gender, location, educational attainment, ethnicity, profession), information on how often they use their phones (e.g. check phone less than once per hour, once per hour, two to five times per hour, or more), and how many applications they have push notifications for. We also want to ask questions on how stressed they feel daily, and how easy or difficult they feel it is to stay focused and on task currently. Factors like job title, hours worked, or number of children in their household might also be good indicators of stress levels. This is so we have an understanding of their baseline stress levels in the event further blocking is required.

Because it is unlikely that we will be able to obtain biological indicators of stress (blood pressure and cortisol levels), we will have to settle for self-reported questionnaires that help indicate how a participant feels. If there is time sensitivity, it is possible to shorten the experiment to two weeks, with twice weekly check-ins on stress levels.

Cendy Lin
W241-1
2/9/17

Analysis

Our statistical analysis will include paired t-tests to observe the change in stress levels in the control and treatment groups. Our hypothesis is that the treatment group will have decreased levels of stress when compared to the control group. We could run t-tests for every check-in point to see if the ATE changes over time.

Concerns

Because we would be reaching out to Mechanical Turk and friends and family to request participation in the study, there is a concern that the group that chooses to participate already perceives phone notifications in a negative light. What we'd really like to study is how notifications affects the general public. It is likely that our findings will be overly pronounced because of this.

Another major concern is our lack of control over these apps. We have no way of knowing whether our subjects are staying on task and keeping notifications turned off. It is easy to imagine a scenario where a majority of subjects decide to turn on email and text notifications because they cannot live without it, especially if they are a working professional. Because we have no control over the apps directly, we would have to trust that our subjects are either vigilant in their self-discipline, or honest in their self reporting.

Pilot Study

A pilot study can be conducted by recruiting ten people initially -- perhaps friends and family as they would provide more honest feedback -- where we can test to see how likely it is that people will keep notifications for the specified apps turned off. We could also use the pilot study to gather feedback on experiment design and determine whether aspects of the experiment need to be adjusted.