

Undergraduate Thesis Prospectus

Managing Anxiety through Mobile Application Training Suites
(technical research project in Computer Science)

The Function of Mobile Device Use in Modern Child Development
(STS research project)

by

Brady Page


November 23, 2019

technical project collaborators:

Everett Adams
Yong Jun Cho
Jeffrey Gerken
Danielle Newman
William Ngu
Jacob Pacheco
Daniel Zarco

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

signed:  _____ date: 12/9/19

approved:  _____ date: Dec 9, 2019
Peter Norton, Department of Engineering and Society

approved:  _____ date: 11/24/19
Ahmed Ibrahim, Department of Computer Science

General Research Problem

How can mobile devices promote individual wellbeing? According to the World Health Organization, “the burden of depression and other mental health conditions is on the rise globally,” and “fewer than half of those affected in the world receive [effective] treatment” (WHO, 2018). Over the last decade, mobile device use has increased among all age demographics. In 2013, 24% of U.S. adults said that smartphones were their primary means of going online. This rate has increased to 37% in 2019 (Anderson, 2019). As mobile devices have become more ubiquitous, their influence on their users has grown. Mobile devices’ influence can be applied to combat rising mental health condition rates and promote individual wellbeing.

Managing Anxiety through Mobile Application Training Suites

How can a mobile application training suite relieve the user’s anxiety? Our capstone team will be working on this project under Professor Ahmed Ibrahim of the Computer Science Department. We will work with MindTrails, a UVA research initiative, to create an application that can collect data from the user’s phone through accelerometers, GPS, and heart rate sensors. This data will be combined with the existing data collected by MindTrails to create trainings that prepare the user to better handle their anxiety. MindTrails provides cognitive bias modification interventions in order to relieve a patient’s anxiety. According to MindTrails, cognitive bias is the tendency to “pay attention to, remember, and interpret things differently when processing information tied to your emotional responses” (MindTrails, 2019). By setting up a suite with small training sessions, participants can change their cognitive biases to help prevent anxious thoughts. The American Psychological Association analyzed the effectiveness of short training sessions on anxiety and found that “after just eight 15-minute sessions... 72 percent of patients

in the treatment group no longer met diagnostic criteria for social anxiety disorder, compared with 11 percent of patients in the control group” (Weir, 2011).

Currently, MindTrails offers their training sessions through a website platform. While the MindTrails team has had success with getting users to register for the study, they have faced problems retaining users until the end of the study. They have tried to fix this by sending email and text reminders and by offering gift card rewards for completing multiple sessions. While this has moderately increased user retention, it does not keep enough participants to warrant the cost of the gift cards. Another problem that MindTrails has faced is meeting the user’s needs during spikes in anxiety or stress. Accessibility to the website in these situations is not always perfect, as participants may not have access to a web-enabled device or Wi-Fi network. Due to the structure of the MindTrails training suite, having constant access to sessions is key to the overall success of the program.

Application Design

In order to solve these problems, our capstone team has been tasked with creating a cross-platform mobile application for MindTrails. The goal of this app is to better address the problems of user retention and session accessibility that MindTrails currently faces. The retention rate can be improved through system notifications that remind the user of their available sessions. These notifications would lead the user directly to their current sessions. This would improve upon the current process that requires the user to check for an email or text message, log into the website, and then navigate to the desired sessions. The app will resolve accessibility problems by storing the user’s current working sessions locally, allowing them constant access to MindTrails in the absence of an Internet connection.

Application Requirements

Gathering requirements is essential for the overall success of our project, as the requirements we gather will determine the work done within the time frame of the capstone project. Quality requirements are important to ensure that we resolve the problems that originally created the desire for a mobile MindTrails app. Since MindTrails personnel will maintain the app after our capstone project completes, it is important that our build is aligned with the overall goals and skills of the MindTrails development team. Our requirements are broken into three sections: minimum, desired, and optional.

Minimum Requirements: Functionality required by the end of the Fall 2019 semester

- Authenticate users using login information
- Perform any tasks available on the website within the mobile application
 - Be able to complete questionnaires
 - Be able to complete quizzes
 - Be able to complete trainings
- Give users reminders for available training modules
- Cross-platform availability (iOS and Android)
- Have user information remain private and secure

Desired Requirements: Functionality required by the end of the Spring 2020 semester

- Notify users when an intervention may occur
- Have access to training and intervention sessions without Internet connection and sync information with the cloud upon reconnecting to the Internet
- Have the application read mobile sensor data (GPS, accelerometer)
- Optimize the user experience for mobile platforms
- Optimize screen layout for portrait and landscape views
- Utilize the same API endpoints to supply data to both web and mobile platforms
- Utilize the Sensus API to collect sensor data

Optional Requirements: Functionality that is wanted, but not required

- Integrate with wearable technology
- Login using fingerprint or face ID (on applicable devices)
- Give users the option to manually sync progress between web and mobile platforms

The Function of Mobile Device Use in Modern Child Development

How do the defenders and critics of mobile device use among children advance their respective agendas? As mobile devices have become more available, their use among children has increased. Developers have responded by designing content that targets young users, including beneficial and educational content, and content that exploits behavioral psychology in children for monetary gain. As a result, some groups argue that mobile content can promote children's healthy development while others contend that mobile device usage among children detracts from their development and should be limited.

Wennersten et al. (2015) studied the educational effects of mobile phone video content in India. Their project, BridgeIT, “had a strong, positive, and statistically significant effect on learning for both English and Science.” Students exposed to BridgeIT outperformed others by 7.92% in English and 15.45% in Science. This study highlights the educational benefits of mobile devices without considering their social effects. Yan (2017) found that mobile device use promotes cultural interaction; children can “develop cognitively, socially, and emotionally by observing and participating... within the general mobile culture,” which engages children with communities that would otherwise be remote. However, children may access harmful communities through mobile devices.

According to the Consumer Technology Association, “91% of parents and 87% of educators agree tech allows students increased access to education,” while “34% of parents and 39% of educators say tech is a distraction for students” (CTA, 2019). CTA argues that tech is useful in the classroom as it promotes the technological skills they will need. Mobile devices increase access to education; about 75% of parents list smartphones and tablets as devices that their children frequently use for learning. The Entertainment Software Association promotes youth mobile gaming, claiming that “game-based learning is a growing movement,” and that “educational applications of video games might be even more powerful than we ever anticipated” (ESA, 2019). ESA is promoting access to educational games through video game companies such as Riot and Ubisoft. The Summer Slugger program supported by the ESA is an example of a collection of educational video games. The program aims to help the player retain knowledge over the summer, when students are susceptible to falling behind in their studies.

Common Sense Media contends that excessive mobile device use by children can lead to tech addiction later in life. It found that “50% of teens said they feel addicted” to their mobile device and that “62% of parents said they feel their teen is addicted” (Robb et al., 2019). These

rates have increased from 45% and 61% respectively since 2017. Common Sense Media argues that the increase in rates can be attributed to various factors, such as the increased access to and functionality of mobile devices. The World Health Organization has recently included gaming disorder in the 11th revision of its International Classification of Diseases. According to WHO, gaming disorder is an “impaired control over gaming, increasing priority given to gaming over other activities” (WHO, 2018). WHO adds that excessive gaming can also cause sleep deprivation and decreased physical activity.

The American Academy of Pediatrics claims that in young children, using mobile devices risks “displacing language-and-play-based interactions with caregivers,” which are crucial to developing “important preacademic skills such as self-regulation, empathy, social skills, and problem-solving” (Radesky et al., 2015). AAP argues that while other mechanisms, such as heavy television exposure, can also displace these interactions, mobile devices greatly increase exposure.

References

- Anderson, Monica. (2019). Pew Research Center. Mobile Technology and Home Broadband 2019. <https://www.pewresearch.org/internet/2019/06/13/mobile-technology-and-home-broadband-2019/>
- CTA. (2019). Consumer Technology Association. CTA Study Find 4-in-5 Educators and Parents Believe Tech Helps Kids Learn. <https://www.cta.tech/News/Press-Releases/2019/August/CTA-Study-Finds-4-in-5-Educators-and-Parents-Belie.aspx>
- ESA. (2019). Entertainment Software Association. Learning Through Play: Using Games to Educate. <https://www.theesa.com/perspectives/learning-through-play-using-games-to-educate/>
- MindTrails. (2019). MindTrails Project. The Science of MindTrails. <https://mindtrails.virginia.edu/calm/public/researchSupport>
- Radesky, J. S., Schumacher, J., & Zuckerman, B. (2015). Mobile and Interactive Media Use by Young Children: The Good, the Bad, and the Unknown. *Pediatrics*, 135(1), 1-3 <https://pediatrics.aappublications.org/content/135/1/1>
- Robb, M. B., Bay, W., & Vennegaard, T. (2019). The New Normal: Parents, Teens, and Mobile Devices in Mexico. https://www.common sense media.org/sites/default/files/uploads/research/2019_the new normal in mexico-final-release_eng-092519_web.pdf
- Weir, Kirsten (2011). Behavior change in 15-minute session?, *42(10)*, 42. <https://www.apa.org/monitor/2011/11/behavior-change>
- Wennersten, M., Quraishy, Z. B., & Velamuri, M. (2015). Improving Student Learning via Mobile Phone Video Content: Evidence from the BridgeIT India Project. *International Review of Education*, 61(4), 503-528 <https://link.springer.com/article/10.1007/s11159-015-9504-y>
- WHO. (2018). World Health Organization. Depression. <https://www.who.int/en/news-room/fact-sheets/detail/depression>
- WHO. (2018). World Health Organization. Gaming Disorder. <https://www.who.int/features/qa/gaming-disorder/en/>
- Yan, Zheng. (2017). Child and Adolescent Use of Mobile Phones: An Unparalleled Complex Developmental Phenomenon. *Child Development*, 89(1), 5-16 <https://srcd.onlinelibrary.wiley.com/doi/full/10.1111/cdev.12821>