Proposal for a Mental Health App for Carnegie Mellon University Computer Science Students

Author's Statement

From my own experiences and through the stories and eyes of my friends and peers, I've witnessed the challenges that come with balancing the demands of schoolwork and personal well-being while taking computer science classes here at CMU. Sometimes I'm reminded of it as I walk through Gates to get to class, when a blip of my classmates' conversations comes into earshot: "Ugh, I went to office hours every day this week and I still haven't finished this lab." "Yeah… my CS exam is next week so I'm gonna hermit in my room this whole weekend." "I haven't eaten anything today and I also only slept 4 hours last night, but it's fine haha." We laugh it off and feel sort of desensitized to these kinds of comments, but behind the laughter and behind these passing statements are real students, real human beings who feel that this is a reality they just need to accept.

It was because of this that I was inspired to write this proposal for a mental health app, specifically tailored for students taking CS classes at CMU. Through conducting a survey of my peers, I hoped to get to the root of why these struggles persist despite university-wide mental health resources. Based on their responses, I brainstormed ideas for the app, made a few mockups, and looked into the feasibility of bringing it to reality. Whether or not the app ultimately gets created, I hope that this proposal will shed light on the struggles my peers and I have faced and contribute to creating a more healthy and supportive community within the field of computer science.

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Abstract:
Carnegie Mellon University's community science program is extremely rigorous, so students experience enormous stress and pressure from classes. This makes it difficult for students to balance their mental health alongside classes and exams, potentially contributing to burnout, anxiety, and depression. Currently, CMU is ranked #3 in the U.S. out of universities with the most depressed student body (Baweja et al. 6).

CMU provides students with mental health resources, such as various mental health events and initiatives started by clubs to help students destress and CaPS (Counseling and Psychological Services), which offers a mental health hotline and counseling services. However, there is no centralized location for recurring resources and upcoming events so it may be difficult for students to find the help they need. Additionally, these resources aren't specialized for the specific mental health problems students studying computer science face, such as dealing with feelings of alienation in classes that prohibit group work. For instance, CMU has partnered with apps like Headspace and TimelyCare, and though they provide convenient mental health help, they unfortunately don't touch on these CS-related concerns.

I propose to create a mental health app for computer science students to help them navigate the stress from classes and exams. The app will consolidate campus mental health resources, giving students a convenient place to look for help or a way to destress right from their phone. The app will also give students support relating directly to their computer science classes as it provides a community of other students going through similar challenges. I believe developing this app will positively impact CMU's computer science students' mental health and help foster a healthy, supportive learning environment.

Problem

Mental Health in Computer Science and Impact at CMU

Mental health has been a prevalent issue among university students in the United States. 73% of college students undergo some kind of mental health crisis, and almost 1/3 of college students report having felt so depressed that it was hard to function (Abdu-Glass and Schlozman). Recent studies also show that mental health is getting worse among college students. For instance, in a study conducted from 2013 to 2021 on 300,000 college students from 300 institutions, researchers found that depression numbers have increased 135%, anxiety numbers have increased 110%, and twice as many students met the criteria for having at least one mental health problem (Colarossi). The problem is even exacerbated for racial and ethnic minorities, as fewer students of color sought mental health resources during the pandemic and although "Arab American students experienced a 22 percent jump in mental health issues," they also experienced "an 18 percent decrease in treatment" (Colarossi). These numbers demonstrate how the problem of poor mental health among college students not only exists but is also getting worse over recent years.

CMU's computer science program ranks #1 among those across the country in terms of quality, making it one of the most rigorous and challenging places to study computer science in the United States ("Best Undergraduate"). Research has shown that computer science students in particular experience higher levels of depression and anxiety than students studying other subjects. According to researchers at California Polytechnic State University, compared to other engineering majors, "Computer Engineering (CPE) students are at the highest risk for serious mental illness as measured by the Kessler instrument," a measure of psychological distress. According to the same study, electrical engineering students are at second highest risk and computer science software engineering students are at fourth highest risk (Beddoes and Danowitz 7).

These statistics are significant at CMU because students in other majors outside of the School of Computer Science (SCS) are required to take computer science classes as well. For instance, electrical and computer engineering (ECE) majors in the Carnegie Institute of Technology (CIT) are required to take 18-213 Introduction to Computer Systems, which is part of the CS core. Students in the Statistics and Machine Learning major in Dietrich College of Humanities and Social Sciences take both 15-112 Fundamentals of Programming and Computer Science and 15-122 Principles of Imperative Computation, both notoriously difficult introductory computer science courses. Thus, the mental stress from CMU's computer science classes affects not only SCS students but also students in other departments ("Undergraduate Catalog").

Current Student Experience

CMU provides students with various mental health resources, but they are spread out across different organizations and there isn't a consolidated place to access them. A prominent mental health resource at CMU is Counseling and Psychological Services (CaPS) which offers services to students including consultations, group and individual therapy, and a 24/7 hotline. Students

can find out about these services on their website, a subpage of the Division of Student Affairs. This website has a separate subpage for Campus Wellness, which links to both external resources, like the Headspace app, and internal resources, like information about therapy dogs and student-led initiatives. Student organizations, such as The Activities Board, provide de-stressing events for students, such as painting nights during midterm weeks and care package pickups. They mostly disseminate information about these events through Instagram and other social media platforms. These resources, both official and non-official campus resources, are scattered across multiple websites, and even within CMU's official website they are embedded in layers and layers of subpages.

Mental Health Survey of CMU CS Students

Data Collection

A small survey was conducted on 13 undergraduate students who have taken a CS class at CMU. Students were first asked to rate their mental wellbeing before versus during/after taking CS classes on a scale of 1 (poor) to 5 (great). Students were then asked yes/no and free response questions about the stress they've experienced from CS classes, their usage and accessibility of mental health resources, and how the university could better support them as students taking CS classes.

Data Analysis

The mental wellbeing numerical data was first analyzed by calculating the average mental wellbeing for each question. Then the data was formatted as a histogram to observe trends in the data. Yes/no responses were analyzed by calculating the percentage of students that responded yes versus no to each question. Finally, the free response questions were analyzed by identifying the top keywords and their frequencies, then summarizing the sentiments related to these keywords.

CS Classes are correlated with Worsened Mental Wellbeing

To preface, it is important to note that other stressors such as taking difficult non-CS classes, working jobs while taking classes, adjusting to a new city or country, and the lingering effects of the COVID-19 pandemic may also contribute to declining mental wellbeing. Overall however, the survey data shows that taking CS classes is correlated with worsened mental wellbeing.

As shown in Figure 1, the distribution of mental wellbeing before CS classes is skewed to the right (towards great). On the other hand, as shown in Figure 2, distribution of mental wellbeing after students have taken CS classes is skewed to the left (towards poor).

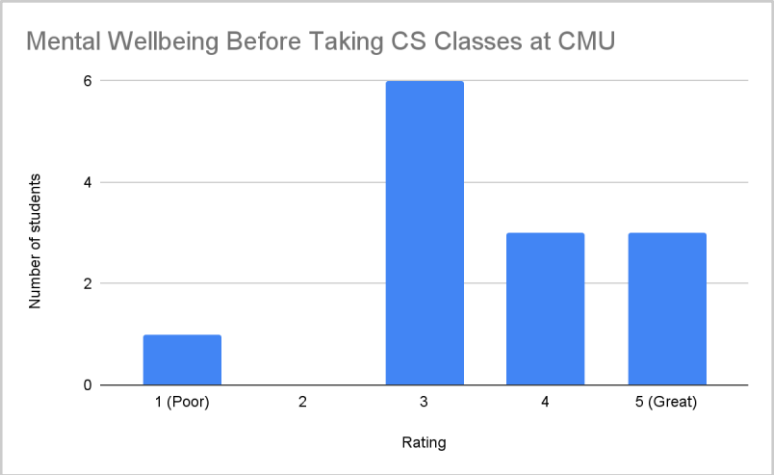

Figure 1. Distribution of mental wellbeing ratings before taking CS classes at CMU.

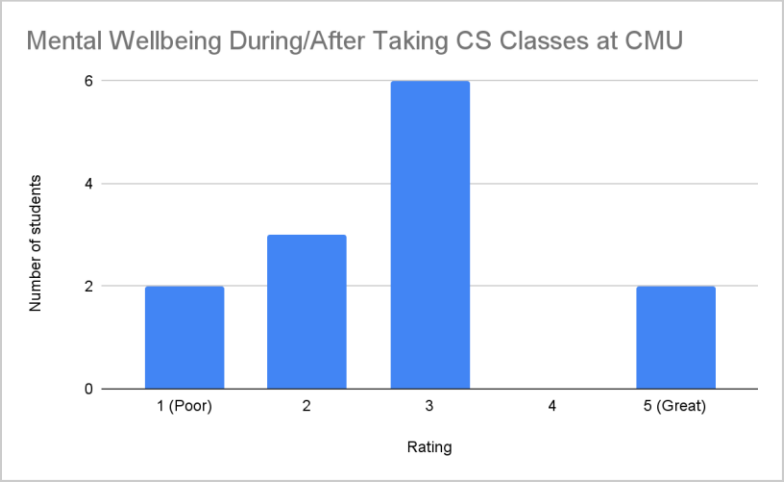

Figure 2. Distribution of mental wellbeing ratings during/after taking CS classes at CMU.

The average mental wellbeing dropped from 3.5 to 2.7. On average, mental wellbeing decreased by 0.77, and all students reported either a decrease or no change in mental wellbeing. When asked how the stress of homework and exams have affected their mental health, the students who indicated that their mental wellbeing declined after CS classes cited imposter syndrome, mental breakdowns, burnout, and self-deprecation.

Mental Health Resources are Generally Unused

Out of all CS students surveyed, 77% of students indicated that they have not used any mental health resources at CMU. The 23% who have used these resources only used CaPS and care packages, leaving many of the other resources like therapy dog sessions, meditation events, free Headspace app subscriptions, the Lean on Me service (which provides peer-to-peer text lines for confidential mental health support), and club-initiated events unused.

Prominent CMU Mental Health Resources May Not Be Effective

Students also provided testimonials that indicated problems with the current resources. Many of the testimonies mention CaPS which is one of the most prominently advertised mental health resources at CMU.

- CaPS can be seen as unapproachable
    - "CaPS is overbooked a lot of the time and still isn't seen as an approachable resource you can use casually/if you aren't facing super serious mental health issues"
    - "[CaPS] is almost used as a joke to some CS students, like if anyone says something concerning as a joke people would be like "oh no I will report you to CaPS" and to be honest it is pretty bad"
    - "CaPS refers you to lean on me, and vice versa"
- Not all professors emphasize mental health
    - "I feel like some professors are much better with making it evident and showing commitment to student wellbeing than others"
    - "professors should change their way of giving tests (I know this is highly improbable), since most of the CS courses aim for the class average of midterms to be around 70% or lower which can be very disheartening for a lot of students, especially those trying to enjoy breaks"

Overall, these problems indicate that less-advertised mental health resources need to be more readily accessible, since CaPS may not be helpful to most students and currently there is no standard as to how many and which mental resources professors should recommend to students.

CMU Mental Health Resources Need Consolidation

70% of responders noted that they don't know where to find CMU's mental health resources or they only know of CaPS and do not know of other resources. Several students indicated that they wish these resources were consolidated in some way:

- Large resources list outside of CaPS
    - "Maybe a giant list of resources would be nice, because outside of caps I don't remember much else."
- List giving summary of services
    - "I think it is fairly difficult to locate the CMU mental health resources (especially since the teachers in the first year immigration course in CS had to specifically have a quiz about it and an essay). I think if there was a website that listed the location, contact, and a little detailed description of each service that would be very helpful."

CMU Students Want Stronger Community Support

Students were also asked, "Specifically as a student who has taken CS classes, what else could CMU provide to better support your mental health?" 5 out of 11 student responses indicated that they wish to have more community support within classes. In most CS classes, students are prohibited from working in groups and consulting friends for help on assignments. One student says it "feels very alienating to not really be able to work with other people," considering how many assignments are restricted to individual work. Another student believes it would be helpful to have "more study buddy systems within the CS community." According to Florida National University, "[study] groups that are effective generate positive energy [and] encourage active participation," which can ease feelings of alienation and improve mental health ("10 Reasons").

Peer Institutions

The other universities that tie with Carnegie Mellon for the best undergraduate CS programs are Stanford, UC Berkeley, and MIT ("Best Undergraduate"). Similar to Carnegie Mellon, Stanford and UC Berkeley promote 3rd-party websites on their mental health resource website that mostly target general mental wellbeing. For instance, Stanford includes links to Headspace and other meditation apps ("Mental Health"). UC Berkeley also links to Headspace, as well as TAO and MyStrength that can help alleviate specific mental health troubles ("Practice"). On the other hand, MIT harnessed the power of mobile apps and developed a general mental health game called The Guardians: Paradise Island where 80% of the tasks improved users' moods (Ferguson). However, overall, these peer institutions present most of their mental health resources through websites and don't have an institution-specific mental health app, or one that helps with computer science specific struggles.

CMU's Partnership with TimelyCare

Like the HeadSpace app, CMU has recently partnered with the TimelyCare app to make mental wellbeing services more available to students. TimelyCare's main services include scheduled counseling, health coaching, guided self-care content, and TalkNow, a 24/7 emotional support hotline. Although TimelyCare provides convenient, accessible mental health help, it doesn't specifically address mental health struggles related to computer science, such as stronger CS community support. Since TimelyCare is a third party application, their mental health resources are separate from those of CMU; particularly, CMU's website states that TimelyCare is an "additional service" ("TimelyCare at CMU"). This means that students cannot access other CMU mental health resources through the app, such as scheduling sessions with CaPS or finding student-led mental health initiatives.

Solution

App Overview

I propose to create an app that will help students take care of their mental health while facing the difficult coursework of computer science classes. The app has two main goals:

1. Consolidate mental health resources so students can find what works best for them and discover new resources
2. Create a sense of community among students taking CS classes where they feel uplifted and supported by their peers

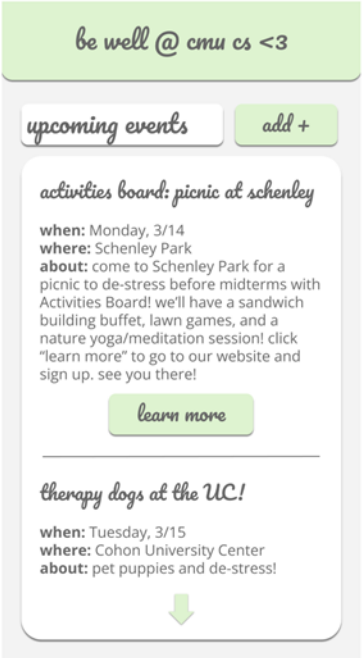

Figure 3. Sample interface of the upcoming mental health events page.

Feasibility: Main Features

<u>Consolidated and Real-Time Lists of Resources</u>

The app will contain two main pages of mental health resources. The first page is a running list of all currently known mental health resources and services, categorized as internal or external to the university. Internal resources would include CaPS, regular therapy dog sessions, Lean on Me, etc. External resources would include the Headspace app, local Pittsburgh mental health awareness events, etc. The data for these resources can be drawn from CMU's newly-launched "Community Health and Wellbeing" website, which includes resources recognized by CMU's Community Health and Well-Being (CHWB) team ("Community Health"). This page also gives students the option to add resources that they find outside of the university. When students come across new resources they think might benefit other students, like other mobile apps and websites, they can add an entry to the page to share it with other app users.

The second page is a real-time events page that shows upcoming mental health events occurring around campus. This page is primarily for single events that don't occur as regularly as the services listed on the first page. For instance, if a student club is planning a one-time yoga session to relax before finals, they can add their event to the page and give users a link to sign up. A sample interface for this second page is shown in Figure 3.

Community Support System

The community support system will consist of three main features: a "study buddy" or study group finder, a celebration message board, and an advice column from past students of various CS classes.

- Study Buddy Finder
    - The app will provide a system that helps students find study partners or study groups, giving students two different methods.
    - The primary method is a tool built into the app where a student can input their current CS classes and fill in profiles about their study habits (what times of the day they study, where they prefer to study, etc.). The app will give students the option to look through other users' profiles and contact them if interested in becoming study partners. The app will also give students a "study group" page for each class, where they can browse current study groups or start their own. A sample interface is shown in Figure 4.
    - If students are not interested in using the primary method or want to find study buddies for all classes in general (not just CS classes), the app can redirect them to the ClassFinds site, which allows students to input their schedules and finds students who are taking the same classes. We can embed the ClassFinds service directly into the app so that students do not have to go to external websites.
- Motivational Message Board
    - The app also features a "Celebration Message Board" meant to boost student morale, shown in Figure 5. Students can post motivational messages to spread positivity to students facing similar problems or just having a difficult time. Students can also post about struggles they've overcome or achievements they're proud of and students can respond with positive comments. This message board creates a space where students can feel like they're in a community and

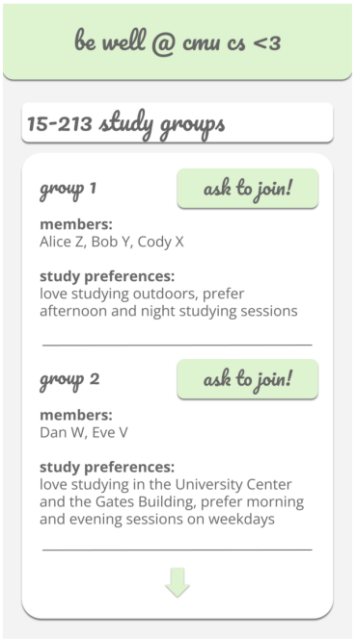

Figure 4. Sample interface of a page for finding study groups for the class 15-213.

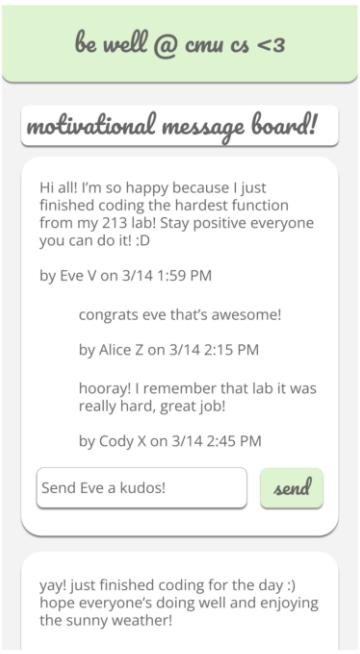

Figure 5. Sample interface of the motivational message board.

they're not tackling their challenges alone, as other students are there to support and uplift them.

- Advice Columns from Previous Students
    - Many organizations have mentoring systems where students can get advice about classes from upperclassmen. Currently, there exists a mentorship program within SCS, but many students surveyed have indicated that after a short period of time, they fell out of touch with their mentors. Students have anonymously given advice online about how to best manage one's work and time in CS classes to prevent burnout and the stress from close deadlines, particularly though sites like Reddit and other social media, but they are spread out and not consolidated. Thus, the app solves this problem by providing an advice column for students to post advice about the CS classes they've taken, making it easy to find all in one place. Students can also have the option to ask questions and have them answered in the advice column. Reading the advice from previous students can give current students a sense of relief and feel more prepared to take on the challenges the class presents. A sample interface of the advice column is shown in Figure 6.

Figure 6. Sample interface of the advice column.

Timeline and Plan for Release

The table below gives a high-level overview of the plan to develop and release the app.

Month	Action Item	Estimated Hours
1	Finish user interface prototype	50
2	Start app development	100
3	Finish app initial prototype	100
4	Conduct user testing	50
5	Revise app based on user feedback	100
6	Launch app to CMU students and organizations	20

I propose developing and testing the app through Scotty Labs, a technology club at CMU that designs and develops applications to help students in their everyday life at CMU. Some of the

club's past projects include a website for planning classes to take, a real-time dashboard that shows which dining locations on campus are open, and an app for navigating around campus. The mental health app is similar to these past projects in that it aims to support CMU's students through technology, making it a perfect fit for a future project for the club. As a member of the technology committee who has worked on developing the TartanHacks dashboard in the past, I believe that the project is within the same scope of difficulty and amount of work as other Scotty Labs projects.

Since Scotty Labs projects are developed by volunteer students, the development of the app would be free. However, a paid alternative is to outsource the work to a freelance developer: Given that the average hourly rate of a US software developer is $47 and the estimated number of hours of work is 420 hours, the estimated cost would be about $19,740.

Possible sources of funding include undergraduate student research grants, such as the SURF: Summer Undergraduate Research Fellowship that can provide a stipend of $3500 and SURG: Small Undergraduate Research Grants that can provide up to $1000 ("Undergraduate Research"). If the project can be developed by a graduate student, it may be eligible for other research grants. Graduate Small Project Help (GuSH) can provide $750 in funding ("Other Seed Grant"). Fellowship programs may also provide larger funding, such as the NVIDIA fellowship which may provide $50,000 and the Microsoft Research Dissertation Grant, which backs research by a $20,000 grant ("Graduate Fellowship").

To advertise the app to students, I propose to do the following:

- Require computer science professors to integrate the mental health app into their syllabus and introduce it to students at the beginning of the course. Professors usually have a section in the syllabus for introducing mental health resources, like CaPS and the 24/7 hotline.
- Create an Instagram account and Facebook page to inform students about the app's features and encourage them to download it. This is the approach that students have used to spread the word about apps to help students, like ClassFinds, as mentioned earlier, and berri, an app for finding friends on campus.
- Inform students through club email lists. For instance, when a club adds their mental health event to the app, they can inform students about the app when they send an email about even information. Additionally, technology clubs like SCS@CMU and Women@SCS, composed of many students who take CS classes, can email information about the app to club members.

Conclusion

Ultimately, the proposed mental health app will help CMU students navigate the extreme stress and pressure from taking rigorous computer science classes. The app helps bridge the gap in

current mental health resources at CMU by expanding on the list of wellbeing resources provided on the CHWB website and addressing CS-related concerns that aren't addressed by other apps CMU has partnered with like TimelyCare. The app consolidates mental health resources from across campus, giving students a centralized location to get the help they need or find an outlet to destress. Furthermore, the app brings students together and alleviates feelings of alienation through features that foster an uplifting and supportive community. Developing this mental health app will be a huge step towards creating a happier, healthier student body and making CMU a place where students feel emotionally and mentally supported as they embark on their learning journeys.

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