Exploring Student Use of an ACT-based Mobile Application and its Impact on Reducing Procrastination

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Abstract

Academic procrastination is detrimental to many students' academic performance, well-being, and learning abilities. Acceptance and Commitment Therapy (ACT) interventions, including our own in-person workshop, have been effective in reducing academic procrastination. To offer a more accessible yet useful alternative for large student populations, we developed ClearMind, a smartphone-based application grounded in ACT. It comes with interactive activities to help students manage academic procrastination. This paper reports our qualitative study on user perception and attitudes toward using ClearMind. The data was collected from two focus group meetings and analyzed using inductive and deductive thematic analysis. Our results indicate that the participants found ClearMind both useful and easy to use, with many expressing a willingness to continue using it and recommend it to others. Feedback from this study sheds light on how to refine its features to better align with students' academic needs. Future work will involve conducting a large-scale quantitative study, in order to further evaluate its effectiveness in reducing academic procrastination and its long-term impact on academic performance.

1 Introduction

Procrastination is commonly defined as 'the act of needlessly delaying tasks to the point of experiencing subjective discomfort' [1]. Procrastination is detrimental to many students' academic performance, well-being, and learning abilities. Among various interventions studied to address academic procrastination, stress/anxiety-oriented approaches based on Acceptance and Commitment Therapy (ACT) have gained prominence [2, 3]. Despite some evidence in reducing academic procrastination, existing ACT-based resources are not specific to academic procrastination; they simply use general-purpose ACT content. Thus, our prior work tailored an existing general-purpose ACT resource—the ACT Guide Lite [4]—to specifically guide college students in managing academic procrastination. The content was delivered through a small-scale, in-person workshop. Our results demonstrated that the workshop reduced academic procrastination and anxiety, and helped students develop more constructive coping mechanisms.

However, such an in-person intervention does not scale well. Previous literature showed that mobile applications are an effective alternative for alleviating depression, anxiety, and frustration [5, 6, 7]. Therefore, we developed ClearMind [8], a mobile application based on ACT, to deliver content similar to our in-person workshop but through a series of interactive activities. This paper explores the following research question:

- **Research Question:** Is ClearMind perceived as a useful and accessible resource that helps managing academic procrastination, by college student users?

Each design decision of ClearMind was carefully made in order to effectively support our target users, even when they are under significant academic stress. The design focused on retaining the

usefulness of ACT principles in an easy-to-use user interface, incorporating design concepts such as specific and immediate feedback and stress-relieving elements.

User perception of ClearMind was captured through two focus group meetings with 13 students at a North American R1 University. The meetings were spaced approximately two weeks apart, before and after using ClearMind. The first meeting focused on students' perceptions of existing mental health applications, while the second centered on their experiences with ClearMind. The moderators, who are also the authors of this paper, developed discussion questions based on the Technology Acceptance Model (TAM). The meetings were transcribed and then analyzed using thematic analysis.

The results of this study provide insights into students' perceptions on ClearMind with respect to TAM's core constructs: perceived usefulness, perceived ease of use, and social influence. The participants found ClearMind both useful and easy to use, and were willing to continue using it and recommending it to their peers. They also identified some opportunities for improvement such as fostering positive emotions and better organizing the content.

Our user study results imply that ClearMind is an accessible yet helpful mental health resource for students. This highlights ClearMind's potential for broader adoption. Future work involves a large-scale quantitative study to assess ClearMind's effectiveness in managing academic procrastination and its long-term impact on academic performance.

2 Related Work

2.1 Acceptance and Commitment Therapy (ACT)

ACT is a therapeutic approach that promotes psychological flexibility through acceptance, mindfulness, and values-based behavior-change strategies [9, 10, 11]. It includes 6 treatment components— acceptance, cognitive defusion, being present, self as context, valuing, and committed action [12, 13]. Through these 6 components, individuals can learn to accept thoughts, feelings, and other inner experiences with openness while working towards personally meaningful goals. This perspective change facilitates taking actions towards their core values. ACT is considered an effective intervention for addressing a range of clinical and mental health problems, including depression, anxiety, substance use, and chronic pain [14, 15, 16, 17, 18]. The effectiveness of ACT was also found within the academic domain: reducing math anxiety, alleviating academic stress and depression, and even improving time management and study skills [19, 20, 21].

Some prior ACT-based interventions have been shown to be effective in reducing academic procrastination [2]. However, these interventions simply incorporate general ACT principles without any customization for procrastination. In our previous work, we ran a series of workshops [22] that adapted the ACT Guide Lite [4], developed by one of our authors, to target academic procrastination specifically. We describe more about this work in Section 2.2.

2.2 Intervention on Procrastination

Academic procrastination has been prevalent among college students, leading to worse outcomes and negatively impacting students' well-being and learning abilities [23, 24, 25]. Prior work has shown that approximately 50% of college students exhibit persistent academic procrastination, and over 80% engage in procrastination behaviors [1, 26, 27]. While various interventions have targeted the improvement of time-management skills [28, 29, 30, 31, 32], other interventions have attempted to address the stress and anxiety behind procrastination. These interventions consider procrastination as the product of underlying cognitive and emotional factors. They have achieved significant success through the use of mindfulness training [33, 34] and psychotherapies [35, 36]. Cognitive Behavioral Therapy (CBT) and Acceptance and Commitment Therapy (ACT) are the two most popular psychotherapy-based interventions. Compared to CBT, ACT has been shown to make broader and more lasting behavioral changes [37].

Therefore, we hosted an in-person workshop at a public university to teach students how to manage academic procrastination using ACT principles [22]. This workshop built on the general ACT protocols of the ACT Guide Lite [4], but with additional content to explore procrastination, its causes, and management strategies based on ACT principles. The results showed that the workshop reduced academic procrastination and anxiety while helping students develop more constructive coping mechanisms. However, this in-person method is difficult to scale, so we developed ClearMind—a mobile application featuring interactive ACT activities designed to help students manage academic procrastination.

2.3 College Students and Mental Health Applications

Many information and communications technologies have been employed to alleviate mental health issues. Some examples include web-based therapy services, video consultations, and mobile applications [5, 38, 39]. Among those technologies, mobile applications have become increasingly popular because of their low barriers to entry (e.g. stigma, embarrassment, cost, transportation, and scheduling) [40, 41]. Studies have shown that mobile applications are effective in alleviating depression, anxiety, and frustration [5, 42, 6, 7, 43].

College students are one of the groups who are most vulnerable to mental health issues [44, 45]. However, they often fail to receive traditional mental health treatment in time due to stigma and affordability [46]. Mobile applications appear to be a good alternative as they offer better accessibility to resources and treatments [45]. According to prior research, college students also prefer mobile applications over face-to-face resources for mental health due to their availability, convenience, and confidentiality [5, 47, 48]. Taken together, the previous research implies that ClearMind could be a helpful mental health resource for college students: it provides a more affordable and convenient service, and its content aligns with the academic needs of college students.

3 Development of ClearMind

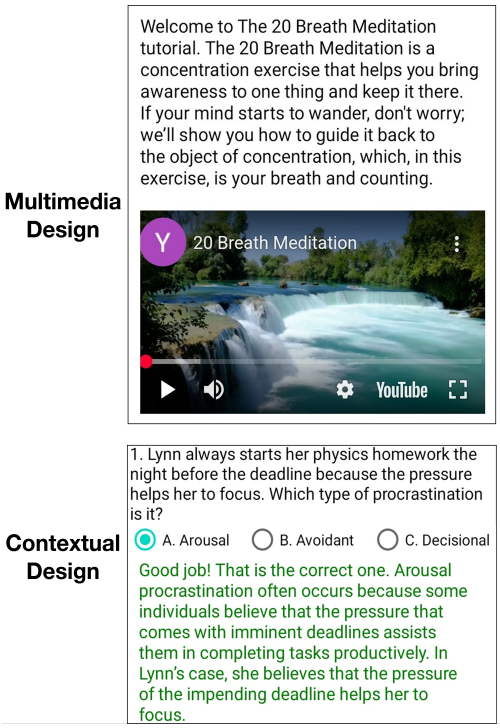

Figure 1: Design Examples

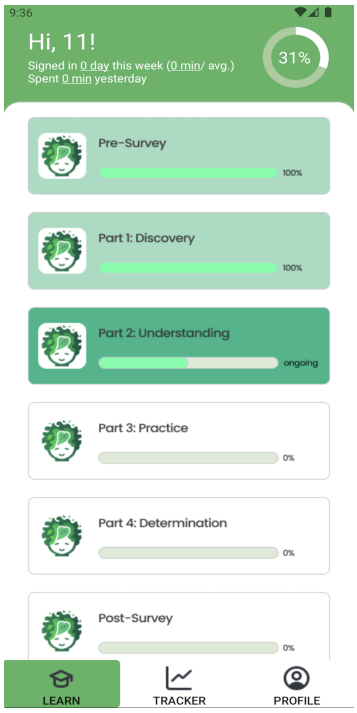

Figure 2: Learning Module

ClearMind was developed using Android Studio in Java with a Firebase database. Our primary goal of the application development process was to retain the usefulness of ACT principles while offering an easy-to-use user interface. The content itself was already known to be effective in the in-person workshop setting, so we were interested in how users would engage with similar content unsupervised.

ClearMind's content are carefully designed to introduce users to the six foundational components of ACT (see Section 2.1 for details), explore different psychological factors of procrastination, and address common cognitive distortions that can contribute to difficult emotions. Our content ends with a feature called the goal tracker which prompts users to set a specific goal for the upcoming week. Throughout the week, participants record their progress, procrastination tendencies, and ACT skills that they practice daily. It serves as a final project of our content, asking users to apply all the ACT skills they learned.

Our design prioritizes high content clarity and minimal cognitive load. The reason is to help users engage with our content as effectively as possible without additional stress. In order to achieve high content clarity, we integrated multimedia resources through which ClearMind's content is delivered via videos and audio (Figure 1). We contextualized our user interface and content as well, by tailoring them specifically for college students to manage procrastination. For example, we used colorful and playful themes (Figure 2) and real-life examples that resonate with students' everyday experiences at school (Figure 1). To minimize cognitive load, we structured the learning modules of ClearMind into smaller parts. More specifically, each module includes five to eight

activities that take less than 10 minutes to complete. This allows users to take breaks between tasks and manage their learning progress more effectively. Moreover, we used soothing design elements, such as green themes, rounded containers, to help reduce visual load. Figure 2 shows the home page of ClearMind. It uses rounded containers and green colors consistently.

ClearMind also aimed to provide specific feedback on users' actions as frequently as possible, by visualizing their progress. For example, our home page colored the parts that the user had completed in green, and progress bars displayed more detailed progress (Figure 2). Currently, ClearMind is available for free download on mobile application stores [8].

4 Methods

4.1 Study Participants

Our study was conducted with thirteen students enrolled in one of two entry-level courses in data science at a North American R1 University during Fall 2024. The curricula of these courses covered topics in introductory programming, statistics, data structures, and algorithms. Eleven of the thirteen participants (84.62%) were first or second year students. Only one had tried any form of mental health therapy. Additional details about the participants are provided in Table 1.

Participants were required to engage with all app content and attend two semi-structured, in-person group meetings to share their thoughts on ClearMind. All meetings were video- and audio-recorded and transcribed afterward. The protocol for this study was approved by the Institutional Review Board and all participants provided informed consent. Participants received a gift card as compensation upon completing the study.

Table 1: Participant Breakdowns

Gender	Male	7 (53.85%)
	Female	6 (46.15%)
Major - Minor	Data Science	8 (61.54%)
	Math & CS	2 (15.38%)
	Cognitive Science - ML	1 (7.69%)
	Psychology	1 (7.69%)
	Political Science - Data Analytics	1 (7.69%)
Year in School	0-1 year	7 (53.85%)
	1-2 years	4 (30.77%)
	2 or more years	2 (15.38%)

4.2 Framework for Data Collection and Analysis

The Technology Acceptance Model (TAM) [49, 50] was partially adopted to develop our study questions and analyze the collected data. TAM is a widely used framework for understanding user perceptions and attitudes towards a technology, and it has also been extensively applied in the context of computing education [51].

TAM suggests that perceived usefulness and perceived ease of use are the two key factors

predicting the level of acceptance of technology [5]. Perceived usefulness refers to users' belief in a technology's potential to improve performance on a certain task and provide potential benefits. Perceived ease of use refers to their belief about how easy and effortless the technology is to learn and use. TAM2 extends the original TAM by adding multiple external factors that influence technology acceptance [52]. Among these factors, social influence, which refers to how the social context shapes an individual's intention to use a technology, is known to be critical [52]. Each of these TAM factors—perceived usefulness, perceived ease of use, and social influence—was taken into account when developing the focus group questions and guiding our analysis.

4.3 Data Collection

We conducted two rounds of semi-structured focus group meetings, one before and one after the participants used ClearMind, with an interval of approximately two weeks between the meetings. Each meeting lasted 90 minutes and was led by at least two authors of this paper to ensure all key aspects were covered. Participants were encouraged to share their honest thoughts and experiences, with the option to skip questions or provide more detailed responses if they wished. Although all responses were voluntary, for each discussion question, we received responses from at least six different participants.

Three to four questions per TAM construct were used in each meeting. The first meeting focused on students' perceptions of existing mental health applications, while the second centered on their experiences particularly with ClearMind. The second meeting followed up on the participants' overall engagement with ClearMind. We asked about reasons for varying levels of engagement, barriers that prevented participants from fully exploring its features, and specific points where they faced challenges or fell behind. We also solicited feedback on ClearMind's features and design to identify areas for improvement. Some sample questions from both focus group meetings are listed in Table 2.

4.4 Data Analysis

We first removed the names and other identifying information from the original transcripts to ensure anonymity. The anonymized transcripts were analyzed using the thematic analysis approach, which is a commonly used method for qualitative data including interview and focus group transcripts [53]. Thematic analysis systematically identifies, analyzes, and interprets patterns within the data [54]. Thematic analysis can be further categorized into two specific methods: deductive and inductive. The former applies a specific theory or framework to compile codes and themes before confirming with the data (top-down) [54], whereas the latter compiles codes and themes from the data itself (bottom-up) [55].

Our analysis used a hybrid approach of both the inductive and deductive methods. The inductive method was used to capture participants' unique narratives and experiences that went beyond what we expected from the deductive method. However, the deductive method was still needed to ensure a thorough analysis without missing any core aspect of TAM. The inductive method started with noting recurring patterns, terms, and statements from the transcripts and generating keywords from those findings. These keywords were then analyzed and grouped based on their

Table 2: Sample Focus Group Questions. (1) and (2) indicate questions from the first and second focus group meeting respectively.

TAM Factor	Questions
Perceived Usefulness	What makes a mental health app more effective or ineffective compared to traditional in-person care? (1)
	Have you used any mental health apps for academic procrastination? If so, which features were helpful? If not, what features would you like to see? (1)
	Can you describe a specific time you procrastinated on a task and how ClearMind helped you with it? (2)
	How did you usually feel when you procrastinated, and did ClearMind change those feelings? (2)
Perceived Ease of Use	What makes a mental health app easier or harder to use when you're feeling stressed or overwhelmed? Can you give an example? (1)
	Were there any features or parts of ClearMind that you found confusing or difficult to use? (2)
	When you're feeling stressed or overwhelmed, are there any specific feature(s) of ClearMind you try to avoid or use more? Why? (2)
Social Influence	How does social media influence your decision to use or recommend mental health apps? (1)
	Have recommendations from your social circle influenced your decision to use mental health apps? How do you think they're perceived if you haven't received any? (1)
	Are there specific challenges or stressors in your college major that make ClearMind helpful or not? (2)

conceptual relevance and patterns using the 6R coding strategy [56]. The resulting codes encapsulated the core meanings of the transcript data and served as summative, salient, and essence-capturing attributes [57]. For the deductive method, predefined themes were derived from TAM's core constructs: perceived usefulness, perceived ease of use, and social influence. Using these themes, we created an initial set of codes and categorized the transcript data [54, 58].

The results indicated that our observations from the inductive method did not reveal any new themes or phenomena outside the codebook we derived from the deductive method. This implied that the codebook from the deductive method was robust enough to capture all notable behaviors. On the other hand, not all codes derived from the deductive method had corresponding counterparts that emerged from the inductive method. We removed such codes from our final codebook as no related evidence was found from our dataset. We further elaborate on our decision in Section 7.

5 Results

This section presents our findings in terms of each component of TAM: perceived usefulness, perceived ease of use, and social influence. We report the results on the first two components in

terms of participant comments about existing mental health applications compared to ClearMind. For the social influence component, participant responses from both contexts are reported altogether because the responses frequently switched between the two contexts. The quotes we report in this section are modified for clarity and brevity. All changes to the original quotes were proofread by two authors of this paper to ensure that the participants' authentic narratives were preserved. Participants' perceptions of ClearMind after use were categorized into three main themes and ten subthemes (see Table 3).

Table 3: Themes and Definitions Regarding Participants' Perceptions of ClearMind

Theme	Subtheme	Definition
Perceived Usefulness	Self-Awareness	Recognize that difficult emotions are related to procrastination
	Self-Acceptance	Accept difficult emotions as natural responses to challenges
	Self-Forgiveness	Embrace difficult emotions without self-judgment
	Committed Actions	Focus on future improvements
Perceived Ease of Use	Specific Feedback	Specific progress tracking (e.g., score updates)
	High Content Clarity	Easily understood content (e.g., metaphors, multi-media)
Social Influence	Academic & Cultural Barrier	Disengagement from mental health resources due to academic pressure and cultural norms that prioritize academics
	Stress Normalization	Accept stress as normal and not seeking help
	Endorsement	Institutional support would encourage adoption
	Trendiness	Popularizing mental health applications among young people reduces stigma

5.1 Perceived Usefulness

5.1.1 Existing Mental Health Applications

The participants highlighted convenience and affordability as key benefits of using mental health applications.

> *Digital access is quick and easy, unlike in-person care, which requires traveling and isn't always convenient. On days you're not feeling good, digital options let you reschedule—it's easier to manage.*

> *The good thing about the cost is that it gets a lot more people into it. It encourages greater access, especially since therapy with a therapist costs significantly more.*

Moreover, many participants perceived mental health applications as a catalyst for seeking professional help. Participants indicated that these apps are particularly effective in addressing minor mental health concerns and can serve as a convenient starting point. They also appreciated

how the apps help them acknowledge their mental health issues without feeling ashamed about seeking support.

> *If it's a minor issue, using a mental health app might be more convenient and efficient. I know mental health isn't minor, but if it's just one thing bothering you, it could be resolved digitally.*
>
> *It's a good first step toward in-person therapy because admitting you have an issue can be hard or feel unnatural with someone else. Using an app to work on it yourself first could help, and when you feel ready, you can transition to in-person therapy.*

5.1.2 ClearMind

All participants found ClearMind useful from multiple psychological perspectives. First, they appreciated how the application helps them become ***self-aware*** of why they procrastinate by teaching different types of procrastination and their underlying psychological reasons.

> *Going over different types of procrastination helps me recognize why I procrastinate and understand the reasons behind it. It made me think about why I put things off, stay accountable, and reflect on what I should stop doing so I don't procrastinate.*

Second, participants recognized that ClearMind helps ***self-accept*** that difficult emotions leading to procrastination behaviors are a natural response to what their body perceives as danger. Such self-acceptance made them more willing to work towards their goals, regardless of the difficult emotions that an academic task may bring. This mindset appeared to help them excel in academics. For example, one participant shared:

> *ClearMind helped me accept that you're not going to know everything and or be perfect. Just accepting that and working towards your goal—for instance, admitting you might not get a perfect score on this homework—and that [procrastinating on an assignment due to fear of not getting a good grade] is okay. Accepting that helped me a lot... and in the end, I resolved all the [homework] questions.*

The participants also reported improved ***self-forgiveness*** as they learned to embrace their emotions, even negative ones such as guilt and shame.

> *I was not only able to manage those feelings better to avoid procrastinating, but I also became a little more forgiving of myself for procrastinating. It wasn't just, 'I'm terrible, and why am I not fulfilling my responsibilities?' Instead, I realized it was because I didn't feel confident while writing the speeches [referring to their past experience of procrastinating on writing scripts for a speech].*

Ultimately, self-awareness, self-acceptance, and self-forgiveness seemed to help the participants focus less on past procrastination episodes and more on ***committed actions*** to prevent similar procrastination behavior in the future. The participants noted that this change not only helped to

reduce stress but also decreased procrastination over time. Two participants shared:

> *ClearMind made me stop thinking about just what I felt or did and start reflecting on how to manage or address it. Before, when I was sad, I wouldn't think about why—I'd just say I was sad. But now, after taking a moment to understand how I'm actually feeling, I can ask, 'What can I do to help deal with this'?*
>
> *The passengers on the bus metaphor really resonated with me. It reminded me that there are always distractions in life, so it's important to find ways to deal with them productively to keep working toward your goal. This analogy was really helpful because I got easily distracted by my phone or other tasks, but it helped me stay focused on my goal and made it easier to handle distractions.*

Meanwhile, a common critique of ClearMind was that participants felt it mostly focused on their difficult emotions. They suggested that prompting them to acknowledge positive emotions as well would be helpful. For example, one participant shared:

> *The daily check-in questions ask about the difficult emotions you feel and the strategies you use to manage them. The only ones I could think of were stressed, overwhelmed, and tired. Since you said 'difficult emotions,' those were the only ones I could relate to, and I kept repeating them. It made me feel like I wasn't doing well.*

5.2 Perceived Ease of Use

5.2.1 Existing Mental Health Applications

Participants highlighted two key reasons why they find existing mental health applications easier to use during times of stress or when feeling overwhelmed: soothing design and specific and immediate feedback. Soothing design, which includes calming visuals, simple and uncluttered interfaces, and an overall uplifting aesthetic, is perceived as easier to use when participants feel overwhelmed. Intuitive navigation was also identified as an important soothing design element. Participants noted that easy access to essential features supports memory recognition and recall, reducing cognitive load and preventing additional stress during use.

> *I think the features I expect from a mental health app are things like bright colors and positive themes.*
>
> *The color theme should be smooth colors, and definitely not black.*
>
> *What would make it easier to use during stressful times is definitely navigation. If too many things are hidden, like clicking a bar that leads to ten different options, it gets confusing. Too much bouncing between links makes it difficult to find what you need.*

The participants also valued the specific and immediate feedback, which communicated progress and sometimes served as a reward. Such feedback also boosted participants' confidence and satisfaction with mental health applications. One participant shared their favorite feature related to positive feedback from another application, saying:

This app lets you create a list of the things you want to get done, and you can assign time periods to each task. As you complete tasks, you check them off. Crossing them off feels like a little reward.

Another participant chimed in to express a desire for a similar feature for any procrastination application, saying:

I also feel it would be cool [for any procrastination application] to have something happen once you complete a task, like getting confetti.

5.2.2 ClearMind

Participants found ClearMind easy to use due to its ***specific feedback*** and ***high content clarity***. They reported that the feedback provided by ClearMind effectively visualizes their learning progress. They believe its specific feedback encourages them to use ClearMind more, which contributes to reduced procrastination over time. Multiple participants shared their experience with the goal tracker feature of ClearMind:

I had a lot to focus on each day, but the goal tracker kept me on track with checking in with ClearMind. The daily progress was color-coded, which motivated me to fill it in every day. [This refers to the goal tracker feature, where if a user misses a day, the color for that day's progress grays out.] As a visual learner, seeing my progress was helpful. It not only helped me with procrastination but also with career planning.

I would keep using ClearMind because of that one feature I just talked about—the score. I want to see how high it goes [my score changes over time].

Many participants appreciate the variety of content formats (videos, audios, graphics, and reading materials) in ClearMind, as it supports different learning styles and encourages consistent engagement. For example, one participant shared how the different resources helped him remember to use ClearMind to manage his procrastination.

I often procrastinate on homework. I start early, but end up doing something else. ClearMind helps me with its variety of videos, readings, and activities, especially meditation exercises. When I'm working on homework now, ClearMind is always on my mind [referring to when he uses the app and does various activities when he wants to procrastinate].

Another participant emphasized how the graphics in ClearMind, paired with real-life examples, make the concept of cognitive distortions easier to understand.

I really liked the section on cognitive distortion, especially the part about 'jumping to conclusions.' When I saw the example [referring to the graphics demonstrating the concept], I thought, 'Oh my God, that's me.' Since then, every time I encounter this kind of distortion, I recall the solution and handle it more rationally.

Although ClearMind was generally perceived as easy to use, participants indicated that more distinctive boundaries across different sections could ease the use of ClearMind further. They found the different sections on ClearMind to be too tightly coupled, making it difficult to stop and come back to ClearMind later.

> *I think the different parts [referring to the learning module] were good, and having to complete Part 1 before moving to Part 2 made sense. However, in Part 1, there were multiple sections, and it felt like I had to complete all of them in one go.*

5.3 Social Influence

The participants pointed out that Science, Technology, Engineering, and Mathematics (STEM) students often disengage with mental health resources, including mobile applications, ***because they often see their peers overlook mental health***. They believe this is due to the demanding academics of STEM disciplines.

> *I feel there's a lot of peer pressure to do more and stay competitive. It always seems like others are doing more, so you feel the need to put more time into academics. Many ignore mental health issues because they simply don't have time, especially if your majors require a lot of time, like STEM. Personally, I don't want to spend too much time on my mental health because I have homework and other responsibilities.*

One participant added a cultural perspective about being an Asian student, which is one of the dominated ethnicity in STEM:

> *For a lot of Asian culture, mental health is always put on the side, with academics coming first. You do your work first, and then you take care of yourself.*

Our participants also mentioned the ***pervasive stress*** within STEM culture leads them to become accustomed to stress. As a result, they rely on self-developed stress management techniques which may not be the most helpful.

> *The people I surround myself with tend to stress a lot and avoid using apps or seeking help. I think it's because they've dealt with stress their own way for so long that they stick to what they know, even if it's not ideal. I'm the same. I handle stress from assignments and deadlines in a certain way. It's not the best and I can do better, but I've been doing it for so long that it's hard to break out of my comfort zone.*

The two focus group meetings revealed some ways to encourage STEM students to use mental health applications more. One idea was to promote using these applications to be ***trendy***. One participant suggested:

> *To reduce stigma, I think you guys [referring to the developers of the ClearMind] should make it feel cool and trendy to use a mental health app.*

However, trendiness by itself does not appear compelling enough. The participants noted that ***personal endorsements*** of these mental health applications from someone they relate to or trust would go a long way. Multiple examples were mentioned—peers, professors, institutions, and even the application developers.

> *If an app came from Instagram or TikTok, I'd think, 'Oh, it's cool,' but I wouldn't think it was helpful. If I saw it advertised at school, from a professor, or at orientation, I feel like I would believe it more.*

> *Talking to you guys—not just the people using this app (ClearMind), but also you, the ones who are making this app and wanting to improve it—made it feel a little more personal. Knowing there was someone behind this app, with hard work and good intentions, made me want to continue using it and recommend it to others.*

Many participants even recommended ***requiring*** students to utilize these mental health resources at the institutional level. They believed it would raise student acceptance to these resources since everybody in the community would be using them.

> *Mental health education needs to be enforced. You don't have to talk about mental health issues in depth, but requiring everyone to take a class at least once could help.*

Still, most participants wish to continue using ClearMind and share it with their peers, which could have a positive social influence for future users of ClearMind.

> *After using the app (ClearMind), I want to recommend it to people I know in the same program because I know how stressful the major is and how difficult it can be to stay on task with such a heavy workload.*

6 Implications

Overall, participants perceived ClearMind as useful, as detailed in Section 5.1.2. It enabled them to acquire core ACT skills and apply these skills to address procrastination tendencies. After trying ClearMind, many participants recognized how significantly these psychological skills could improve their academic performance. Understanding this connection seems to have helped them validate their perceived usefulness of ClearMind, perhaps because most participants were from academically demanding majors such as STEM, as explained in Section 5.3.

This study demonstrates that delivering ACT interventions through a mobile application, instead of an in-person workshop, is a feasible approach for academic procrastination. We believe this can be attributed to ClearMind's design goals—great perceived ease of use through high content clarity and specific feedback. These intentional design choices were reflected in the participant responses in Section 5.2.2 as well.

The results also reveal that social influence contributes to participants' willingness to continue using the app and recommending it to their peers. The participant responses in Section 5.3 also

emphasized the need of introducing these resources early by someone they can relate to or trust. They even suggested mandating students to utilize these resources. These suggestions imply how insensitive STEM students are to their mental health concerns, making it imperative for STEM educators to emphasize the importance of mental health to their students.

Participants identified various opportunities for improvement such as fostering positive emotions and better content organization. Despite these comments, they noted their willingness for long-term use. This suggests that ClearMind has the potential to broaden its content to support other non-serious mental health issues that can impact academic performance.

7 Threats to Validity

One potential threat to validity is the participant population. Since participants were recruited voluntarily, they may be more motivated to try ClearMind than the general student body. Therefore, participants' perceptions may be more favorable than those of the broader student population. However, these results remain valuable for the concurrent development of ClearMind version 2.0, which will be tested in a large-scale quantitative study on its effectiveness in reducing procrastination and its long-term impact on academic performance.

Another possible threat to validity is bias arising from the nature of focus group meetings, where participants may withhold their honest opinions to conform to others' views. This can be due to social desirability bias in which participants say what they believe the moderators want to hear. Additionally, groupthink may occur through dominant participants unintentionally influencing the discussion. To mitigate this, we trained moderators to encourage all participants to voice their opinions and ensure that no single participant dominated the conversation. As a result, everyone actively participated, allowing us to collect at least six responses per question. These two threats may have limited data collection, which could explain why some codes derived from the deductive method lack corresponding counterparts from the inductive method.

8 Conclusion and Future Work

This paper presents a preliminary examination of college students' perceptions and attitudes toward using smartphone-based mental health resource named ClearMind. Our user study suggests that the participants demonstrated overall positive attitudes, perceiving it as both useful and easy to use. The participants also expressed a willingness to continue engaging with it and recommend it to their peers. Participant feedback will help refine ClearMind's features for better usefulness and usability, as well as improve promotion strategies for better user engagement. By adapting to this feedback, ClearMind can better meet STEM students' academic needs. Future work will involve a large-scale quantitative study to evaluate the actual effectiveness of the upgraded ClearMind in managing academic procrastination and its long-term impact.

We believe ClearMind is a strong candidate for a helpful mental health resource that can serve large groups with minimal administrative costs. We hope that our work could help reduce stigma surrounding mental health among STEM students, raises awareness of their mental well-being, and serves as a gateway to encourage seeking professional support.

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