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Identifying Engineering Students' Beliefs About Seeking Help for Mental Health Concerns

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Abstract

National data show that engineering students with mental health problems are significantly less likely to seek professional help than their peers. While treatment gaps exist for cisgender men, Black, and first-generation students in general, disparities are further pronounced in engineering. Interventions targeted at reshaping engineering identity to support mental health related help-seeking could increase success and retention of at-risk students. To accomplish this, it is important to first understand how the engineering student experience influences student mental health and the beliefs students hold that influence their help-seeking. This qualitative research study aims to characterize stressors in engineering undergraduate students, while also identifying students' beliefs about perceived barriers and facilitators to seeking help for mental health distress. Students from across all engineering majors and years of study were invited to participate in a pre-screening survey that included questions related to prior mental health service utilization and psychological distress. Students were selected for interviews to promote representation across majors, gender identities, class years, and prior help-seeking.

The research team conducted semi-structured interviews with seven participants to understand the key beliefs that engineering students hold about seeking help related to mental health. Interview questions were grounded in the Integrated Behavioral Model, which recognizes the importance of the perceived barriers and facilitators associated with mental health related help-seeking. Researchers used Braun & Clarke's thematic analysis to identify emergent themes related to engineering students' mental health help-seeking beliefs. Six major themes were identified: 1) An unsupportive engineering training environment creates stress, 2) Difficult work and time constraints create stress, 3) Supportive input from others promotes help-seeking, 4) If time is limited, mental health is a lower priority, 5) Students operate on a suck it up mentality unless they've reached a breaking point and 6) Help-seeking is associated with public shame. Implications associated with these results are discussed, including opportunities for faculty and administrators to engage in structural and cultural changes within their programs to improve help-seeking in undergraduate engineers.

Keywords: engineering; STEM students; mental health; help-seeking; stressors

Introduction

Engineering offers a challenging learning context. Engineering students often experience educational barriers such as fast-paced and highly challenging academic expectations with competitive grading scales [1.2], which can increase student stress and anxiety levels [3]. For instance, in a study of 40,000 students across 70 campuses, engineering students who viewed their classrooms as competitive were found to be 6.7% more likely to suffer from anxiety and 7.6% more likely to suffer from depression [4]. Minority status increased these adverse effects. Female engineering students who perceived competition in the classroom were three times more likely to suffer from anxiety and depression when compared to their non-engineering Female counterparts. Similar results were found for Black engineering students [4].

Despite this, few studies have examined academic stressors in engineering and there are no studies that look at how stressors affect mental health related help-seeking in the engineering student population. In a 2018-2019 survey of 60,000 U.S. undergraduate students, only 46% of engineers with significant anxiety or depression symptoms had sought professional help in the last year, compared to 62% of their non-engineering peers [5, 6]. This treatment gap persists among subgroups that are traditionally less likely to seek help such as cisgender men (43% engineers vs. 53% non-engineers), Black (40% engineers vs. 50% non-engineers), and first-generation college students (42% engineers vs. 56% non-engineers) [6]. These trends are especially alarming as untreated mental health concerns can increase the risk of more chronic and severe disorders [7] and have been linked to increased student drop-out and lower academic performance [8-11]. Given these risks, developing resources and interventions that address the mental health treatment gap in engineering students is important for creating an engineering culture that is inclusive of those who experience mental health problems.

One of the most comprehensive and integrative frameworks for understanding help-seeking beliefs is the Integrated Behavioral Model (IBM). The IBM builds on the Theory of Planned Behavior, a well-established theory that has proven utility for studying help-seeking behavior (Vogel & Heath, 2016) and other health behaviors [12]. The IBM states that the most important driver of mental health help-seeking behavior is the intention to seek help which, in turn, is determined by attitudes, perceived norms, and personal agency [12]. Of central importance to the present study, personal agency is a person's ability to inittiate and pursue action towards completion of a goal. In the context of the IBM and help-seeking, personal agency is driven by beliefs about barriers and facilitators to seeking help and self-efficacy beliefs (e.g., confidence in ability to seek help). Personal agency beliefs are influenced by background variables such as demographic characteristics, culture, socioeconomic status, personality, and environmental stressors. IBM provides researchers with a qualitative protocol for identifying key background variables and personal agency beliefs.

In this study, we use an integrative approach to investigate students' beliefs by combining qualitative research methods with the Integrated Behavioral Model. As we seek to understand what beliefs drive help-seeking behavior, it is also important to understand the unique stressors that influence the mental health of engineering students. Therefore, we will first characterize

those stressors that impact undergraduate engineering students and how they might influence student help-seeking beliefs. Because these stressors can act as barriers to help-seeking, we will then further investigate student help-seeking beliefs related to personal agency, with a focus on identifying perceived barriers and facilitators to professional help-seeking. This study is a first step towards understanding the help-seeking behaviors of undergraduate engineering students.

Methods

Theoretical Grounding and Framework

This study was designed to enhance our understanding of undergraduate engineering students' beliefs about seeking professional help (e.g. counselor, therapist) for mental health concerns. Underlying this goal was the need to identify similarities in engineering students' sources of stress and their approaches to maintaining their mental health. Our research design was guided by pragmatism, as we believe that (a) an objective reality exists but can only be encountered through subjective human experience [13], (b) beliefs and habits are socially constructed and subject to sociopolitical forces [14], (c) understanding the problem (i.e., treatment gap) and identifying practical solutions is the central priority [15], and (d) the best method (e.g., qualitative, quantitative) is the one most effective in achieving desired research outcomes [16]. Therefore, we used IBM as our guiding theoretical framework, semi-structured interviews as our method of data collection, and thematic analysis [17] to identify themes and patterns that could be used to organize and describe our data in rich detail. We specifically examined student stressors, their perceived influence on help-seeking beliefs, and perceived barriers and facilitators to seeking professional help for mental health concerns.

Participant Recruitment

After obtaining IRB approval, we recruited students in two stages. First, we distributed a voluntary pre-screening survey to select courses that were evenly represented across academic year and major. The pre-screening survey included questions related to prior mental health service utilization [18] and psychological distress [19] which would allow the research team to ensure that the final sample of interviewees includes students who were currently distressed (and thus have a reason to consider seeking mental healthcare) and a mix of students who did and did not have prior experience with mental health related help-seeking (such experience can influence beliefs). From the pre-screening respondents, the research assistant selected and emailed students to recruit students for an individual interview. Students were informed that their participation was completely voluntary, and they would receive a $50 Amazon gift card as an incentive for participation. A total of seven students, four men and three women, were interviewed for this study. All students identified as White and had not previously sought help for mental health concerns. Students' ages ranged from 19-24 years old. Four students are Mechanical engineering students, and the remaining three studied Civil, Chemical, and Biosystems engineering. Each student's major, class year, and demographic information is summarized in Table 1. The students' names used throughout the paper have been changed to ensure anonymity.

Table 1. Demographic Breakdown of Study Participants

Participant	*Age*	*Gender*	*Engineering Major*	*Class Year*	*First Generation?*	*Currently Distressed*	*Likely to seek help?*
Cameron	23	Man	Mechanical	Senior	Yes	No	No
Alex	22	Man	Mechanical	Senior	No	Yes	No

Sam	22	Man	Mechanical	Senior	No	No	No
Morgan	20	Woman	Biosystems	Sophomore	No	No	Yes
Taylor	22	Woman	Mechanical	Junior	No	No	No
Kai	24	Woman	Chemical	Senior	No	No	No
Sidney	19	Man	Civil	Sophomore	No	No	No

Data Collection

The data in this study were collected from October 2020 to February 2021. The research assistant coordinated an interview time with students who responded to the recruitment email. Prior to conducting the interview, the research assistant reviewed the purpose of the study and obtained verbal consent for participation and recording from each student. The research assistant conducted all semi-structured interviews via Zoom. The interview protocol incorporated questions about help-seeking from the IBM and about student's identity, engineering stressors, and stigma. Interview recordings were then transcribed with assistance from the Microsoft Office Suite. For the purposes of the present paper, we focused on the portions of the interviews that contained the constructs of specific interest: academic stressors, beliefs related to help-seeking barriers and facilitators, and the connection between the two. In this way, a deductive boundary was set, and then data analysis within that boundary proceeded in an inductive manner.

Data Analysis

The analysis team consisted of two graduate students (counseling psychology PhD students) and two professors (counseling psychology professor, chemical engineering professor). The first graduate student was a cisgender, Black woman. The second graduate student was a cisgender, White woman. The first professor was a cisgender White man, and the second, a cisgender White woman. The research team followed Braun and Clarke's (2006) six steps for conducting thematic analysis [17]. First, all researchers independently engaged in familiarization and immersion by actively reading and re-reading the initial five interview transcripts and taking observational notes. The team then met to discuss insights generated. Second, the researchers independently and inductively generated codes (both semantic and latent), a systematic process of tagging specific segments of text with meaningful labels. Through subsequent discussion, the team iteratively revised the codes until consensus was reached, leading to the creation of a master codebook that captures the patterns and variety of relevant meaning within the dataset. The sixth and seventh interviews were coded using the master codebook and just under two-thirds of the codes from the master codebook were utilized. Third, the researchers constructed themes by combining codes together into bigger patterns that reflect a central organizing concept. We aimed to create a set of themes that were distinctive yet complementary. Next, we came together to review and define themes via consensus, moving from a summative to interpretative position and seeking to ensure clarity, cohesion, and precision.

Results

The participants' reflections on their personal and academic experiences as engineering students revealed shared experiences of wanting to solve personal problems independently, while struggling to balance academic responsibilities with other aspects of their lives as students. Upon further discussion, students described the unique factors of their personal identities and their engineering student status that facilitated and hindered their help-seeking behaviors. Our results indicate six themes that portray the impact of engineering-specific stressors on the participants' beliefs about seeking help for mental concerns. These themes include: 1) unsupportive engineering training environment creates stress, 2) difficult work and time constraints create stress, 3) supportive input from others promotes help-seeking, 4) if time is limited, mental health

is lower priority, 5) operate on a suck it up mentality unless you've reached a breaking point, and 6) help-seeking is associated with public shame.

Unsupportive engineering training environment creates stress.

Participants spoke about the importance of earning high grades and how it negatively affects their relationships and interactions with other students and professors. For example, some participants talked about feeling the need to strive for perfection without asking for help (e.g. extensions from professors). They did this in order to meet academic demands and avoid being brushed off or viewed as "making excuses" by professors. They also described how a competitive atmosphere and professors' inflexibility and high expectations contributes to their overall sense of stress. Alex expressed:

> And I hope this isn't a tangent, but it seems like there's a lot of engineering professors who they, you know, they try and teach us problem solving, so they throw a whole lot of things at us at once and they expect us to kind of fight our way out of it, is the way it seems to a lot of students.

In addition to fighting to prove their ability in the classroom, students also compare themselves to each other. Participants described the importance of internships to help them be marketable job candidates upon graduation. However, access to such internships and other opportunities in the field requires students to excel. Morgan described this thought process:

> whenever I see someone else doing it, I'm like should I be doing that? Is that how they're more successful? Like are they going to do better than me on the exam? Um, 'cause I guess it's always trying to be at the top of it. Yeah, like I don't want to be like a subpar or even average [–]like average is not good enough either. I need to be above 'cause this is like my competition, I guess, for who's gonna get what internship and who's gonna get, you know…who's gonna get awarded for this and...yeah. It's, it's just stressful when other people are doing things differently than you.

Interestingly, participants did describe other students as very collaborative with regard to course work and attributed this to the difficulty level of most of the subjects and the inability to rely solely on professors.

Difficult work and time constraints create stress.

In addition to rigorous coursework, students have various demands on their time, and some of these demands are dictated by different identity considerations. Some students' time constraints were further constrained by extracurricular engagements which notably enhance one's marketability, whereas others needed to earn income. One such student, Cameron, describes how these responsibilities lead to stress:

> The time constraints is a big one. Specially I'm, you know, I have to have to work to pay my rent and stuff like that so. Whenever I have, you know, 10 assignments, due one week and two projects, and I also have to make 300- $400 for that week like it's [–]it gets tight sometimes and it's really stressful.

Throughout the interviews, participants described how the difficulty and the amount of engineering coursework prevented them from engaging in self-care, thus contributing to their inability to adequately reduce their stress levels. Sam shared:

> I thought before about, you know, like going and um…Maybe just like venting with a friend or whatever, just taking a day off with a friend to go hang out, complain about classes, go goof off, do something relaxing, whatever. Kind of recharge the batteries, so to speak, but the biggest thing that keeps me from doing anything like that is lack of time. Again, the workload.

Like Sam, several participants spoke to the importance of their friendships in enduring the challenges of engineering-related stressors. In fact, the majority of participants disclosed that support or encouragement from friends would positively influence their help-seeking behaviors. Friendships seemed to function as a safe space where students could disclose about personal difficulties or seek advice about how to handle challenges.

Supportive input from others promotes help-seeking.

The majority of participants disclosed that support or encouragement from friends would positively influence their help-seeking behaviors. Alex said:

> I would honestly probably have to like confide in some of my friends and it would take like a, you know, kind of like a collective…like all of us coming together and you know, maybe saying like "yeah, you know you should go, you should go talk to someone."

In addition to the encouragement from friends and the ability to confide in them, participants also sought support from friends to gauge the validity of their concerns. For example, when asking what might make it easier to seek help, Sidney shared:

> Definitely talking to a peer who knows about seeking help. They don't have to have necessarily sought help, but just…confirming that it is OK and valid to feel like you needed to seek help. Yeah, I feel like that would make it...make me a lot more liable to go and seek help if I needed it.

Sam provided a strikingly similar response to the same question:

> Another thing that I think would help is if one of my friends encouraged me. Like if they saw- "oh hey, you're looking really down," or "looks like you haven't slept in like 2 days or whatever," and someone expresses concern about it. I'd probably, well, I'd almost certainly be more likely to admit, "yeah, I've got crap going on or whatever," and then get help, especially like if the friend specifically recommends seeking help for it.

This underscores the importance of peer-to-peer interactions despite the competitive aspects of seeking engineering internships or jobs. In fact, the majority of participants named friends within the engineering community as an essential part of their support network. Participants were more

likely to seek input from engineering friends first, before expressing concerns with family or professionals within engineering.

If time is limited, mental health is lower priority.

Although students would be open to seeking help, time factors into their decision in multiple ways. Previously we portrayed how the difficulty level and the amount of coursework produces a sense of constraint or limitation on students' time. While coursework often disproportionately commands students' time and attention, students do in fact belong to clubs, hold jobs, exercise, and spend time with friends. Participants seemed to imply other important but underlying factors that influenced how they chose to spend their time such as the level of priority given to the task or activity. Kai described how time could be a barrier for pursuing therapy in more ways than one:

> I guess it goes back to the time thing. Like if I have five assignments due tomorrow, I'm probably not gonna want to go to an hour therapy and driving there or whatever it may be.

The time needed for the session, as well as the time to get to and from the session, does not register as "valuable" for Kai, and Alex provides further insight into this interpretation:

> You know, you have all these stresses on you and all these things, you know, you need to get done and you know you might say like, yeah, I really need to go see a therapist or I wish there was someone, you know, that I could just rant to for a little bit but you got so much other stuff going on, and that kind of becomes an afterthought and you just you don't really act on it and just, you know, keep trucking through.

Other participants expressed sentiments similar to this idea of "keep trucking through," and they expanded on the possible consequences of doing so, which ultimately became a motivating or facilitating factor for seeking help.

Operate on a suck it up mentality unless you've reached a breaking point.

When asked what kinds of factors would influence their decision of whether or not to seek help from a mental health professional, some participants discussed the intensity of the problem or an inability to continue ignoring it which may be akin to a "suck it up" or "don't admit weakness" mentality. Taylor specifically mentions:

> Maybe if something caused the problems I was having to escalate. That—if some you know situation brought out more issues or really magnified those issues, and I felt like it was kind of reaching a breaking point where it's like OK, I can't ignore this anymore. I need to go seek out.

Moreover, Sidney discusses how this mentality might be rooted in toxic masculinity that has permeated engineering culture, regardless of one's felt gender:

> It would, it would be a lot harder to seek help if, say, the peer I was discussing with was a very like rigid sort of masculine figure that was sort of against that prospect of admitting weakness...that would make it a lot harder because I would feel like, well, it's these aren't valid feelings. You know, it's not valid to feel like you need help…I've seen oftentimes some of my female peers have that same, you know, be strong, persevere, don't you know you don't need help, sort of mentality. And while those are like historically stereotypically masculine ideals, engineering sadly is a male dominated field even now. We're trying to get out of that. I hope we do, but it can be toxic at times.

The validity of their concerns was also an important consideration that participants discussed especially when asked about what factors might make it easier for them to seek help. However, stigma was another variable that could deter students from seeking help, regardless of the validity of their concerns.

Help-seeking is associated with public shame.

To offset the stigma of seeking help for mental health concerns, some participants felt that discretion would facilitate their ability to seek help and minimize feelings of shame. When asked what would make it harder to seek help, Cameron shared:

> I guess…if it's kind of like in a spot where, I don't know, if people could like…if it was like a designated like, you know, mental health center or something like that. And you know…everyone could see [you] going in there. That's kinda, I feel like that would be kind of awkward or, or make you feel a little ashamed or something.

All participants were aware of the various consequences of stigma; however, the ways in which they thought stigma might influence their decision to seek help or not did vary. For Sam, public shaming and the internalization of that shame, as a function of stigma, would be a deterrent altogether. Specifically, Sam notes:

> Actually, if I weren't already seeking help, when someone made fun of me I probably wouldn't seek help after that. Um. I don't know. Just...I guess based on kind of having that like unconscious bias against it, after that thinking, "oh hey, I'll be silly or I'll be made fun of," or whatever if I actually do seek help. I mean, I, I know intellectually that's not the case, but if I'm not thinking about it, if I don't realize it, I probably won't seek help for that reason.

Similarly, Morgan describes being fearful of the potential, lasting impact of stigma that might come from seeking help for mental health concerns:

> If I knew that it was going to be spoken about, or if it was going to be like—say something about me, I guess that's what the fear is. Is that it's going to be like this thing that is held over me for forever. Like I went to therapy once, so then I am-therefore I guess, not mentally well like. If people knew that I had gone to therapy, that would be difficult.

Of course, many of the concerns and barriers that the participants discussed reflect the challenging messages that most people who are thinking about seeking professional help have to

contend with in our society. Next, we consider how our findings reflect and reinforce previous literature on mental health help-seeking and perceived need, academic barriers to help-seeking, and cultural influences on stigma.

Discussion

Interviews with undergraduate engineering students revealed that there are a variety of interrelated stressors that influence their beliefs about seeking professional help for mental health concerns. Moreover, specific combinations of stressors and beliefs typically led students to de-prioritize help-seeking. While one of our themes highlights time as an explicit barrier to the prioritization of mental health help-seeking, it is worth noting that additional barriers such as a lack of perceived need, stigma, and the desire to fulfill cultural norms also contribute to this effect. We break down both the hindering and facilitating factors of seeking help for mental health concerns further in this section.

Time was a perceived barrier to help-seeking and students often felt stress related to best managing their time. Students were more open to the idea of seeking help for mental health concerns if they had extra time available as opposed to making time to address their mental health. Students implied that a significant amount of their time was dedicated to completing coursework and studying for exams. Additionally, they described the material as difficult and their professors' expectations as very high. Thus, it is unsurprising that academics was the most commonly cited source of stress. In an investigation of correlates of depression, anxiety, and stress in a sample of college students, Beiter et al. found that academic pressures and success were the top two sources of concern among students [20].

To prioritize their academic performance, students often "powered through" stress, fatigue, anxiety, and other mental health concerns. We characterized this behavior and mindset as "suck it up," which reflects traditionally Western, masculine ideals of being strong, in control of one's problems and emotions, and able to handle life stresses without asking for help [21]. Societal gender norms and expectations influence individuals' behaviors. Engineering is a historically male-dominated discipline, thereby influencing the overarching culture and subsequent behaviors of its members regardless of actual gender identity. We see this reflected in our female students' reports of wanting to avoid appearing "weak," and instead opting to push through like their male counterparts.

Students also expressed a desire for mental health help-seeking to be normalized in the context of engineering, suggesting that this behavior currently conflicts with the existing environmental norms. This desire is important and consistent with previous research findings which indicate that the endorsement of seeking help for mental health concerns by one's social network is a key factor in the decision-making process [21, 25-28]. However, one unique component of the engineering environment that needs to be taken into consideration is the effects of competition. In a study of elite athletes' beliefs about mental illness stigma and help-seeking, researchers found that engaging in competition to achieve success conflicted with athlete's opinions and attitudes about mental health issues [22].

Mental health issues were linked to weakness thereby threatening the athlete's self-perceptions and status [22]. Additionally, they established that maintaining one's status as a competitor is

critical for athletes because players rival one another for top positions [22]. Similarly, in our study, students voiced concerns about maintaining their marketability for a competitive job market by having high grades and experience in internships, thus requiring them to engage in competition with peers. Similarly, in a study of the relationship between competition, anxiety, and depression in college classrooms, "competition had a stronger association with depression and anxiety among students from backgrounds that have been historically underrepresented and/or marginalized in higher education," [p. 979 [4]]. Students in engineering were among those found to be at risk of significantly higher probabilities of anxiety which was also as a function of competition in the classroom [4]. In order to remain competitive, students might believe that they need to avoid stigmatizing labels which could result from seeking help.

Our participants were highly aware of the stigma associated with seeking help, specifically for mental health concerns. Stigma can be public or it can be internalized by the self. Vogel et al. (2006) define public stigma for help-seeking as "the perception that a person who seeks psychological treatment is undesirable or socially unacceptable" [p. 325; [23]]. Moreover, self-stigma, is the internalization of this perception and can cause people to avoid seeking psychological help to preserve a more positive self-image [23, 24]. In our study, the possibilities of being viewed by others as "weak" or being defined by a mental health issue was highly unfavorable among students and garnered reactions such as worry, fear, or embarrassment. While some participants recognized how they had internalized aspects of stigma, many desired to actively reject or be less influenced by it, citing their understanding of the value in addressing mental health concerns. In other words, they seemed to be mental health advocates who still struggled with the idea of utilizing the resources they proclaimed to support. Consistent with literature cited earlier, students seemed to be more willing to engage with their mental health if other people who are important to them, such as friends or family, expressed concern or otherwise modeled that seeking help is acceptable [21, 25-28].

Although students strove to overcome distress by temporarily ignoring it, several students did note that reaching a "breaking point" would promote their help-seeking. After overcoming their distress, students retrospectively were able to acknowledge the possibility that their distress might have warranted outside help; however, they were not able to recognize their need for help in the moment. Existing research has found that stigma can impair one's ability to recognize a need for professional help [29, 30]. Furthermore, stigma is a central component of the cycle of avoidance which Biddle et al. describes as young adults' tendency to avoid defining their symptoms as "real" mental illness, by avoiding this interpretation of "real mental illness" and the perceived associated stigma, young adults delayed their help seeking until reaching a point of crisis [29, 30]. Thus, the crisis or breaking point provides undeniable evidence that the distress one is experiencing is real and warrants professional attention, whereas not seeking help allows one to continue using "normalization" as an avoidance strategy.

Limitations and Future Directions

The present findings should be considered in the context of study limitations, which can be addressed by future research. First, our sample participants were White and cisgender, which means that our reported themes do not necessarily capture the experience of engineering students

with marginalized racial, ethnic, and gender identities. Systems of power (e.g., racism, sexism, etc.) shape the historical and current experience of engineering students from privileged and marginalized backgrounds. The academic stressors (e.g., imposter syndrome, microaggressions in the classroom) and other factors shaping help-seeking beliefs (e.g., past experience with the healthcare system) are subject to these systems. Studies have shown that race/ethnicity, gender and socioeconomic status can affect service utilization and the perceived need for mental healthcare [31]. For instance, there are significant disparities in mental health care utilization for Blacks LatinX and Asian people when compared with White people [32]. Moreover, the male student population also represents a significant group for this study which focuses on help-seeking in the engineering student population. Prior work has found that men underuse mental health services, possibly due to the Western culture demands on men to stay in control of their emotions and handle stresses without needing to ask for help [33, 34]. Additionally, suicide rates for college-age White males (27.2 per 100,000) are significantly higher than those for the average college-age male (22.7 per 100,000) and college-age female (5.8 per 100,000) [35]. Non-Hispanic American Indian or Alaska Native males were the only racial or ethnic group with higher suicide rates in this age group [35]. As we continue this study, we will intentionally collect interview data that represents diverse identities. As we do this, we expect to see our themes expand and evolve to capture the diversity of lived experiences represented in the undergraduate engineering student population.

Next, it is worth noting that none of our sample participants had previously sought mental health treatment. In our data collection process, we prioritized students who had not previously sought help to better understand what prevents students from seeking help. We were interested in learning what beliefs and attitudes prevented students from seeking help. In accordance with the IBM students who had not previously sought help could best provide insight on the attitudes, perceived, norms and personal agency factors that are related to a lack of help-seeking [12]. This information allows us to potentially speculate about students who would not only avoid participating in a study on the topic of mental health but also fail to seek mental health treatment. Future data collection will also incorporate students with varied experiences of prior mental health help seeking.

Lastly, we intentionally focused on key aspects of the IBM model (i.e., stressors, facilitators, barriers), but a fuller account of engineering students' help-seeking perceptions will arise when interview data tied to the remaining aspects of the IBM model (e.g., attitudes, perceived norm) are incorporated into the analysis. This comprehensive qualitative approach will provide rich information about the nuances of themes related to engineering student help-seeking. In doing this, we recognize the limitation that these data will not allow us to compare the relative importance of these factors in dictating engineering students' intention to seek help. Thus, the qualitative work that we have developed based on the IBM will guide future quantitative studies. This will start with the development of a quantitative instrument that can validly and reliably measure the key IBM help-seeking factors relevant to engineering students. With this instrument, we will be able to understand which student beliefs have the greatest impact on help-seeking behavior. This understanding will be key to designing data-driven intervention and prevention efforts to help close the mental health treatment gap within the engineering student population.

Implications for Engineering Education

Engineering educators cannot control or influence all academic stress and help-seeking beliefs. For instance, they may not be able to directly influence perceived barriers related to support (or lack of support) from those outside the university community (e.g., family members, community health providers). That being said, the major themes identified within this study have the potential to be addressed through structural or cultural shifts within the engineering community. For instance, students identified an unsupportive engineering training environment (e.g., lack of faculty support, competition, heavy course load) as an academic stressor. Faculty have considerable control over the difficulty/time-requirements of their engineering courses and the tone set in their classroom around the appropriateness of asking for help or for flexibility around deadlines. While it is not expected that faculty alter the rigor of the engineering curriculum, they can be strategic and thoughtful about expectations and demands on student time both inside and outside the classroom. Additionally, faculty can model mental wellness in their interactions with students. They can be intentional about messages that they send students about competition in the classroom, unhealthy demands on work-life balance and seeking-help for a mental health concern. These behavioral changes can not only have a positive influence on the mental well-being of the student, but also the faculty member modeling the behavior. Engineering educators should consider how structural or cultural changes in their student interactions could influence student mental wellness and their beliefs about seeking help for a mental health concern.

Engineering academic administrators have similar influence over structural and culture changes in engineering programs that can influence student mental health and help-seeking. For instance, they can advocate for high quality, easily accessible, free mental health services on campus. These resources could include satellite clinics that are tailored specifically to serving the unique needs of engineering students. Clinicians at these facilities should have an understanding of the cultural environment of engineering and be able to work with students on overcoming engineering related stressors while also emphasizing the positive aspects of engineering training. In advocating for mental health services, administrators should encourage faculty training around mental health, including how to integrate mental wellness into the classroom and how to identify and respond to students that are in distress. For a true cultural shift in the engineering community, prioritization of mental wellness needs to happen from the top down. To have the greatest impact, administrators need to be intentional about their modeling and messaging about mental wellness to the faculty, staff and students in their engineering programs.

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References

[1] Secules, Stephen, "Putting Diversity in Perspective: A Critical Cultural Historical Context for Representation in Engineering," *Proceedings of the American Society for Engineering Education,* 2017, doi: 10.18260/1-2--28776

[2] R. M. Felder, G. N. Felder, and E. J. Dietz, "The Effects of Personality Type on Engineering Student Performance and Attitudes," *Journal of Engineering Education,* vol. 91, no. 1, pp. 3-17, 2002/01/01 2002, doi: 10.1002/j.2168-9830.2002.tb00667.x.
[3] R. Misra, and L.G. Castillo, "Academic Stress Among College Students: Comparison of American and International Students," *International Journal of Stress Management,* vol. 11, no. 2, pp. 32-148, 2004, doi: 10.1037/1072-5245.11.2.132.
[4] J. Posselt and S. Lipson, "Competition, Anxiety, and Depression in the College Classroom: Variations by Student Identity and Field of Study," *Journal of College Student Development,* vol. 57, pp. 973-989, 11/01 2016, doi: 10.1353/csd.2016.0094.
[5] D. Eisenberg *et al.*, "The Healthy Minds Study: 2018-2019 Data Report," 2019.
[6] S. A. Wilson, Hammer, J.H., Usher, E.L., "Engineering Student Mental Health: Analysis of national data from the Healthy Minds Study," presented at the American Institute of Chemical Engineers National Conference, Virtual, 2020.
[7] C. Mitchell, B. McMillan, and T. Hagan, "Mental health help-seeking behaviours in young adults," (in eng), *Br J Gen Pract,* vol. 67, no. 654, pp. 8-9, 2017, doi: 10.3399/bjgp17X688453.
[8] M. S. Deberard, G. I. Spielmans, and D. L. Julka, "Predictors of Academic Achievement and Retention among College Freshmen: A Longitudinal Study," *College Student Journal,* vol. 38, no. 1, 2004.
[9] D. Eisenberg, E. Golberstein, and J. B. Hunt, "Mental Health and Academic Success in College," in *The B.E. Journal of Economic Analysis & Policy* vol. 9, ed, 2009.
[10] R. Bruffaerts *et al.*, "Mental health problems in college freshmen: Prevalence and academic functioning," *Journal of Affective Disorders,* vol. 225, pp. 97-103, 2018, doi: 10.1016/j.jad.2017.07.044.
[11] M. T. Hartley, "Increasing Resilience: Strategies for Reducing Dropout Rates for College Students with Psychiatric Disabilities," *American Journal of Psychiatric Rehabilitation,* vol. 13, no. 4, pp. 295-315, 2010, doi: 10.1080/15487768.2010.523372.
[12] D. E. Montaño and D. Kasprzyk, "Theory of reasoned action, theory of planned behavior, and the integrated behavioral model," in *Health behavior: Theory, research, and practice, 5th ed.* San Francisco, CA, US: Jossey-Bass, 2015, pp. 95-124.
[13] D. L. Morgan, "Pragmatism as a Paradigm for Social Research," *Qualitative Inquiry,* vol. 20, no. 8, pp. 1045-1053, 2014/10/01 2014, doi: 10.1177/1077800413513733.
[14] V. Yefimov, "On Pragmatic Institutional Economics," 12/03 2003.
[15] T. Goles and R. Hirschheim, "The paradigm IS dead, the paradigm is dead . . . long live the paradigm: the legacy of Burrell and Morgan," *Omega,* vol. 28, pp. 249-268, 06/01 2000, doi: 10.1016/S0305-0483(99)00042-0.
[16] A. Tashakkori and C. Teddlie, "Quality of inferences in mixed methods research: Calling for an integrative framework," *Advances in mixed methods research,* vol. 53, no. 7, pp. 101-119, 2008.
[17] V. Braun and V. Clarke, "Using thematic analysis in psychology," *Qualitative Research in Psychology,* vol. 3, no. 2, pp. 77-101, 2006, doi: 10.1191/1478088706qp063oa.
[18] J. H. Hammer and D. A. Spiker, "Dimensionality, Reliability, and Predictive Evidence of Validity for Three Help-Seeking Intention Instruments: ISCI, GHSQ, and MHSIS," *Journal of Counseling Psychology,* vol. 65, no. 3, pp. 394-401, 2018, doi: 10.1037/cou0000256.

[19] R. C. Kessler *et al.*, "Short screening scales to monitor population prevalences and trends in non-specific psychological distress," *Psychological medicine,* vol. 32, no. 6, p. 959, 2002, doi: 10.1017/S0033291702006074.
[20] R. Beiter *et al.*, "The prevalence and correlates of depression, anxiety, and stress in a sample of college students,", *Journal of Affective Disorders,* vol. 173, pp. 90-96, 1990.
[21] D. Vogel, S. Wester, J. Hammer, and T. downing-matibag, "Referring Men to Seek Help: The Influence of Gender Role Conflict and Stigma," *Psychology of Men & Masculinity,* vol. 15, p. 60, 01/01 2014, doi: 10.1037/a0031761.
[22] S. Delenardo and J. Terrion, "Suck It Up: Opinions and Attitudes about Mental Illness Stigma and Help-Seeking Behaviour of Male Varsity Football Players," *Canadian journal of community mental health = Revue canadienne de santé mentale communautaire,* vol. 33, pp. 43-56, 12/01 2014, doi: 10.7870/cjcmh-2014-023.
[23] D. Vogel, N. Wade, and S. Haake, "Measuring the self-stigma associated with seeking psychological help. Journal of Counseling Psychology, 53, 325-337," *Journal of Counseling Psychology,* vol. 53, pp. 325-337, 07/01 2006, doi: 10.1037/0022-0167.53.3.325.
[24] D. A. Spiker, J. H. Hammer, and K. J. Parnell, "Men in unhappy relationships: Perceptions of couple therapy," *Journal of Social and Personal Relationships,* vol. 36, no. 7, pp. 2015-2035, 2019/07/01 2018, doi: 10.1177/0265407518775537.
[25] M. C. Angermeyer, S. G. Matschinger H Fau - Riedel-Heller, and S. G. Riedel-Heller, "What to do about mental disorder--help-seeking recommendations of the lay public," (in eng), *Acta Psychiatrica Scandinavica,* vol. 103, 2001.
[26] J. Cusack, F. P. Deane, C. J. Wilson, and J. Ciarrochi, "Emotional expression, perceptions of therapy, and help-seeking intentions in men attending therapy services," *Psychology of Men & Masculinity,* vol. 7, no. 2, pp. 69-82, 2006, doi: 10.1037/1524-9220.7.2.69.
[27] D. J. Rickwood and V. A. Braithwaite, "Social-psychological factors affecting help-seeking for emotional problems," *Social Science & Medicine,* vol. 39, no. 4, pp. 563-572, 1994, doi: 10.1016/0277-9536(94)90099-X.
[28] B. A. Pescosolido and C. A. Boyer, "How do people come to use mental health services? Current knowledge and changing perspectives," in *A handbook for the study of mental health: Social contexts, theories, and systems.* New York, NY, US: Cambridge University Press, 1999, pp. 392-411.
[29] L. Biddle, J. Donovan, and D. Gunnell, "Explaining non-help-seeking amongst young adults with mental distress: A dynamic interpretive model of illness behaviour," *Sociology of health & illness,* vol. 29, pp. 983-1002, 12/01 2007, doi: 10.1111/j.1467-9566.2007.01030.x.
[30] G. Schomerus *et al.*, "Stigma as a barrier to recognizing personal mental illness and seeking help: a prospective study among untreated persons with mental illness," *European Archives of Psychiatry and Clinical Neuroscience,* vol. 269, 06/01 2019, doi: 10.1007/s00406-018-0896-0.
[31] A. P. Villatoro, V. M. Mays, N. A. Ponce, and C. S. Aneshensel, "Perceived Need for Mental Health Care: The Intersection of Race, Ethnicity, Gender, and Socioeconomic Status," *Society and Mental Health,* vol. 8, no. 1, pp. 1-24, 2018/03/01 2017, doi: 10.1177/2156869317718889.

[32] B. Cook, N.-H. Trinh, Z. Li, S. Hou, and A. Progovac, "Trends in Racial-Ethnic Disparities in Access to Mental Health Care, 2004-2012," *Psychiatric services (Washington, D.C.),* vol. 68, p. appips201500453, 08/01 2016, doi: 10.1176/appi.ps.201500453.

[33] S. R. Wester and D. L. Vogel, "The psychology of men: Historical developments, current research, and future directions," in *APA handbook of counseling psychology, Vol. 1: Theories, research, and methods.*, (APA handbooks in psychology®. Washington, DC, US: American Psychological Association, 2012, pp. 371-396.

[34] J. M. O'Neil, "Summarizing 25 Years of Research on Men's Gender Role Conflict Using the Gender Role Conflict Scale: New Research Paradigms and Clinical Implications," *The Counseling Psychologist,* vol. 36, no. 3, pp. 358-445, 2008/05/01 2008, doi: 10.1177/0011000008317057.

[35] S. C. Curtin and H. Hedegaard, "Suicide rates for females and males by race and ethnicity: United States, 1999 and 2017," *NCHS Health E-State,* 2019.

Table 1. Demographic Breakdown of Study Participants

Participant	*Age*	*Gender*	*Engineering Major*	*Class Year*	*First Generation?*	*Currently Distressed*	*Likely to seek help?*
Cameron	23	Man	Mechanical	Senior	Yes	No	No
Alex	22	Man	Mechanical	Senior	No	Yes	No
Sam	22	Man	Mechanical	Senior	No	No	No
Morgan	20	Woman	Biosystems	Sophomore	No	No	Yes
Taylor	22	Woman	Mechanical	Junior	No	No	No
Kai	24	Woman	Chemical	Senior	No	No	No
Sidney	19	Man	Civil	Sophomore	No	No	No