Investigating Perceptions that Predict Mental Health Related Help-Seeking in First-Year Engineering Students

Dr. Sarah A. Wilson, University of Kentucky

Sarah Wilson is an assistant professor in the Department of Chemical and Materials Engineering at the University of Kentucky. She completed her bachelor's degree at Rowan University in New Jersey before attending graduate school for her PhD at the University of Massachusetts.

Ava Kay Huth, Iowa State University of Science and Technology

Ava Huth is a third-year undergraduate student in materials engineering at Iowa State University.

Sara Xochilt Lamer, University of Kentucky
Dr. Joseph H. Hammer

Associate Professor of Counseling Psychology

Matthew Whitwer, University of Kentucky

Matthew Whitwer is a PhD candidate in the department of Chemical and Materials Engineering at the University of Kentucky. He completed his bachelor's degree in chemical engineering at West Virginia University in 2020.

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Abstract

National data indicates that engineering students are less likely than students in other academic disciplines to seek professional help for their mental health distress. Without professional intervention, mental health symptoms can worsen and become more challenging to treat. Therefore, this study uses a quantitative approach to investigate the beliefs that first-year engineering students hold about seeking mental health treatment and the influence of these beliefs on their intention to seek professional help. This study addresses the following research questions: 1) Which factors are most strongly associated with first-year engineering students' intention to seek mental health treatment? 2) What beliefs about the outcomes of professional mental healthcare are most predictive of students' intention to seek treatment?

This study used a self-report survey instrument that employed the Integrated Behavioral Model (IBM) as an empirically supported theoretical framework to identify the beliefs that most accurately predict behavior. In December 2021, a survey was conducted in the first-year engineering program at a large public university with a predominantly White population (n = 452). The self-report survey instrument included measures of mental health help-seeking intention, attitude, perceived norm, personal agency, and outcome beliefs guided by the IBM. Respondents exhibited high scores on scales measuring their attitude towards seeking help, perceived control, and self-efficacy. This suggests that, on average, first-year engineering students had positive perceptions of their seeking help, felt in control of their decisions to seek help, and were confident in their ability to seek help. Students had lower scores for perceived norms, meaning they were less likely to believe that seeking help was supported by those who are important to them. Additionally, less than half of the students indicated they would intend to seek help if they experienced mental health distress. Students' perception that others would expect them to seek help (i.e., their perceived norm injunctive) was the strongest predictor of intention to seek help,

followed by their attitude toward seeking help. The specific outcome beliefs that were negatively correlated with intention to seek help were that seeking help would: 1) go against the expectations of the engineering community, 2) be a sign of weakness or an admission of defeat, and 3) result in poor treatment or discrimination from the mental health professional. Conversely, the outcome beliefs most positively correlated with intention were that seeking help would: 1) help me feel supported, 2) help me improve my coping skills, 3) make me feel better, 4) help me find a solution to my problem, and 5) help me gain a better understanding of my mental health concern. The findings of this study offer valuable insights into the beliefs of first-year engineering students towards seeking professional treatment for mental health concerns. These findings will inform the development of targeted interventions to improve help-seeking for mental health.

Introduction

Recent studies have revealed alarming increases in rates of anxiety, depression, and suicidal ideation among college students [1, 2]. For instance, two studies examined rates of suicidal ideation between 2007 and 2017, with one reporting an increase from 6.4% to 15.2% of students [1], while the other reported an increase from 5.8% to 10.8% [2]. Without treatment, mental health symptoms can become more severe, frequent and/or resistant to treatment [3]. Failure to seek help is also linked to adverse academic outcomes such as decreased college satisfaction and academic performance [4-7]. In contrast, students who seek mental health treatment may receive medication, coping strategies, accommodations, treatment plans, and diagnoses, which can benefit student stress levels, problem-solving skills, and overall mental health [8, 9]. While evidence suggests a trend of increasing therapy and medication use among college students [2], several studies have revealed that an alarming number of distressed students fail to seek help for their mental health and remain untreated. For instance, one study found that only 52% of students who reported suicidal ideation had received treatment in the past 12 months [5].

Engineering Student Mental Health

In engineering, students consistently report high rates of mental health conditions such as depression and anxiety [10-12]. Although national studies have found that undergraduate engineering students report similar or lower rates of mental health distress as their peers in other majors [13, 14], distressed engineering students are among the least likely to seek professional mental healthcare. One 2016 study found that even after they accounted for demographic factors, such as gender and race/ethnicity, engineering students who reported mental health distress were

less likely to have received treatment from a mental health professional when compared to their non-engineering peers [13]. More recently, a 2021 study found that 50% of engineering students surveyed met the criteria for a diagnosable mental health condition, and merely 16% of those students had ever been diagnosed for their mental health [15].

Many existing qualitative studies have sought to uncover the beliefs contributing to engineering students' reluctance to seek treatment. Research that investigated modern engineering programs documented cultures of stress [10, 16], and shame [17, 18] that has served to normalize mental health issues and harm overall student mental health. Additionally, the presence of stigma in engineering has been found to negatively affect students' attitudes toward seeking help [19, 20]. The expectation to persevere through the rigor, stress, and suffering of the engineering environment can also contribute to engineering students' reluctance to seek help [10, 20-23]. In addition, research has explored the impacts of traditionally masculine social norms on help-seeking behavior, finding that norms of self-reliance, emotional control, and prioritization of work over personal relationships were linked to reduced help-seeking intention [24-26]. Many of these norms have been found to influence help seeking within engineering, where students feel as though they must prioritize academics over their mental health and continue to push through their mental health challenges independently [23].

These qualitative studies have established possible impacts of engineering culture and provided valuable information about possible causes of reduced rates of mental health help-seeking among engineering students. This study aims to explore the mental health help-seeking perceptions of first-year engineering students and to identify which help-seeking perceptions are most predictive of intention to seek professional mental health treatment. In particular, study of first-year engineering students provides an opportunity to understand the help-seeking beliefs of students who are newly socialized to the culture of engineering.

Integrated Behavioral Model

The Integrated Behavioral Model (IBM) is an empirically supported theoretical framework that allows for the determination of beliefs that are predictive of behavior (Figure 1) [27].

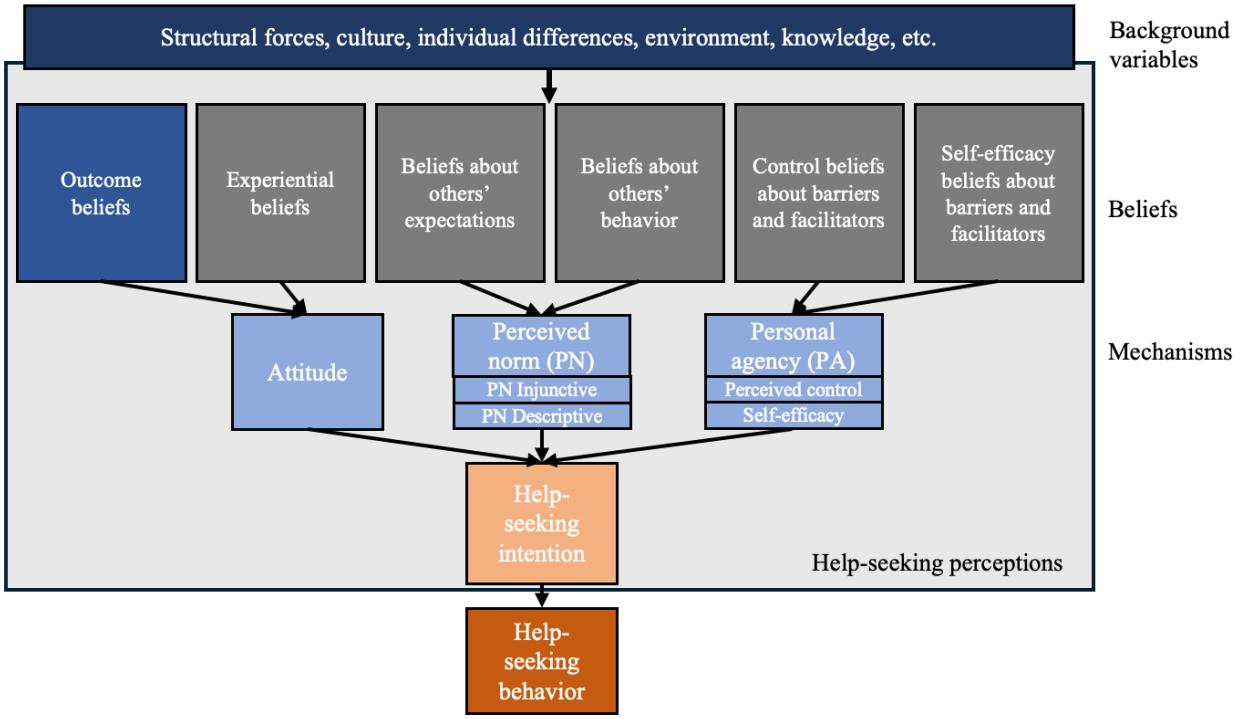

Figure 1 The precursors, beliefs, and mechanisms influencing intention to seek help per the Integrated Behavioral Model.

When the IBM is applied to mental health help-seeking, the IBM dictates that help-seeking behavior is strongly motivated by help-seeking intention, which is an individual's self-reported readiness to exert effort to seek help for their mental health. This relationship between help-seeking behavior and intention has been supported in the literature [28]. Intention is informed by three help-seeking mechanisms: attitude, perceived norm and personal agency. Attitude is an individual's positive or negative evaluation of the idea of their seeking help. Attitude is influenced by their beliefs about the anticipated positive or negative outcomes of help-seeking behavior (i.e., outcome beliefs), as well as their emotional response to the idea of seeking help (i.e., experiential beliefs). Perceived norm refers to an individual's perception of the social approval of mental health related help seeking based on their beliefs about how those people who are important to them feel about seeking help. Perceived norm can be separated into: 1) perceived norm injunctive, which is influenced by their beliefs about what important people or groups in their life expect of them (i.e., beliefs about others' expectations), and 2) perceived norm descriptive, which is influenced by their beliefs about what important people or groups in their life would do themselves if they had a mental health concern (i.e., beliefs about others' behavior). Finally, personal agency is an individual's evaluation of whether or not they have the power and resources necessary to seek help. Personal

agency can be separated into: 1) perceived control, which is influenced by their beliefs about their perceived control over seeking help given the presence of perceived facilitators and barriers to help seeking (i.e., control beliefs about facilitators and barriers) and 2) self-efficacy, which is influenced by their evaluation of whether or not they have the ability to seek help given the presence of perceived barriers and facilitators to help seeking (i.e., self-efficacy beliefs about barriers and facilitators). These definitions are summarized in Table 1.

Table 1. Definitions associated with the integrated behavioral model

Intention	An individual's self-reported readiness to exert effort to seek help for their mental health.
Attitude	An individual's positive or negative evaluation of the idea of seeking help for their mental health.
Outcome beliefs	An individual's beliefs about the anticipated positive or negative results or attributes of seeking help for their mental health.
Experiential beliefs	An individual's emotional reaction to the idea of seeking help for their mental health.
Perceived norm	An individual's perception of the social approval of seeking help for their mental health based on their beliefs about how those people who are important to them feel about seeking help.
Perceived norm injunctive	An individual's perception of whether or not help seeking is approved by others.
Beliefs about others' expectations	An individual's perception of whether or not particular people who are important to the individual would expect the individual to seek help for their mental health.
Perceived norm descriptive	An individual's perception of whether or not help seeking would be performed by others.
Beliefs about others' behavior	An individual's perception of whether or not particular people who are important to the individual would seek help for their own mental health.
Personal agency	An individual's evaluation of whether or not they have the power and resources to seek help.
Perceived control	An individual's perception of whether or not they are in control of their ability to seek help.
Control beliefs about barriers and facilitators	An individual's evaluation of whether or not seeking help is within their personal control given the existence of barriers and facilitators to help seeking.
Self-efficacy	An individual's perception of whether or not they have the ability to seek help.
Self-efficacy beliefs about barriers and facilitators	An individual's evaluation of whether or not they have the ability to seek help for their mental health given the existence of barriers and facilitators to help seeking.

While the help-seeking mechanisms collectively inform intention, the most influential mechanisms can vary by population based on which types of underlying beliefs are exerting the strongest influence on people's help-seeking decision making. Understanding the specific help-seeking mechanisms that shape help-seeking intention can provide insight into the development of interventions aimed at improving help seeking.

The six types of help-seeking beliefs that underlie these mechanisms are themselves shaped by help-seeking determinants such as structural forces (e.g., racism), cultural influences (e.g., norms), individual differences (e.g. personality), environment (e.g., logistical barriers), and knowledge (e.g., about mental illness and professional mental health care options). For example, engineering culture would be considered a determinant if it has downstream impact on students' help-seeking beliefs. Because beliefs about performing health behaviors vary from population to population, the IBM emphasizes the importance of doing qualitative research with the population of interest to elicit the help-seeking beliefs that are salient for that population [27]. These salient beliefs can then be integrated into a self-report measure to permit quantitative analysis to determine which specific beliefs distinguish those who intend to seek mental health care from those who do not.

The IBM provides an analytical framework for answering important research questions about how help-seeking beliefs and mechanisms shape intention. Our research team has applied this model in a mixed-methods study to develop the Undergraduate Engineering Mental Health Help Seeking Instrument (UE-MH-HSI) [29]. For this paper, we will utilize this instrument to understand the mechanisms that influence help-seeking intention. Further, we will demonstrate the application of the IBM in understanding the beliefs that influence intention through measurement of the outcome beliefs of engineering students.

Research Questions

This quantitative study aims to answer the following research questions:

1. Which help-seeking mechanisms are most strongly associated with first-year engineering students' intention to seek mental health treatment?
2. What outcome beliefs are most predictive of students' intention to seek mental health treatment?

Methods

Participant Recruitment

In December 2021, following IRB approval, students enrolled in a mandatory first-year engineering course at a large public university were asked to participate in the survey as part of their course assignments (Table 2). Before beginning the survey, the students received a cover letter explaining the purpose of the study. They were then given the option to participate in the study. Participation in the study did not impact student assignment grades. Students could skip questions at any time and were not rewarded for completing the entire survey. To receive course credit for completing the assignment, students were asked to provide their name, email address, and course section. Personal identifying information was removed from the dataset following the assignment deadline to safeguard privacy. The faculty that oversaw the course remained unaware of which students opted to participate.

Table 2 Demographic information for first-year engineering student participants (N = 452)

Demographic Group	N	%
Gender Identity		
Man	337	74.6%
Woman	108	23.9%
Nonbinary	7	1.5%
Race/Ethnicity		
White	352	77.9%
Multiracial	26	5.8%
Black	14	3.1%
Hispanic/Latine	26	5.8%
Asian American/Asian	25	5.5%
Middle Eastern/Arab/Arab American	2	0.4%
American Indian or Alaskan Native	1	0.2%
Jewish	1	0.2%
Sexual Identity		
Heterosexual	398	88.1%
LGBQ+	51	11.3%

Help seeking perceptions and intention measures

This study used the IBM to identify mechanisms and beliefs that most strongly associated with engineering students' decision to seek help from a mental health professional "in the next three months," given a hypothetical serious mental health concern. Before beginning the survey, participants received definitions of mental health professionals and mental health concerns, as well as the hypothetical scenario to keep in mind while answering the questions.

Intention and the three help seeking mechanisms were each measured using existing multi-item measures. The three-item Mental Help-Seeking Intention Scale (MHSIS) [30] was used to measure intention. Attitude was measured using the nine-item Mental Help-Seeking Attitudes Scale (MHSAS) [31]. Three items were used to assess the injunctive perceived norm, and another three were used to assess the descriptive perceived norm [32]. Finally, personal agency was assessed through two sets of items. Three items were used to assess perceived control, and another three were used to assess self-efficacy [32]. Each item used a 7-point Likert-type response, with a higher value indicating a more positive response.

The reliability of each measure was previously verified for this population, with each subscale having a Cronbach's alpha value greater than 0.7 [30]. Mean scores were obtained for each subscale and used in the analyses for this study. The mean score from the MHSIS was used to categorize students as intenders, non-intenders, or neutral. Students with a mean intention score >=5 were classified as intenders, and students with a mean intention score <=3 were classified as non-intenders. Students with a mean score between 3 and 5 were considered neutral.

Outcome belief measure

Measures for perceived outcome beliefs were taken from the UE-MH-HSI [29]. Participants were asked to indicate how much they agreed with each statement using a 6-point Likert-scale response. There were a total of 34 perceived outcomes included in the analysis.

Data Analysis

Perceptions of help-seeking behavior were investigated using descriptive statistics. Bivariate correlation analysis was conducted to understand the relationship between the help-seeking mechanisms and help-seeking intention. Further, regression analysis was utilized to determine the multivariate relationship between the help-seeking mechanisms and help-seeking intention. Bivariate correlation analysis was conducted to explore the relationship between students' outcome beliefs and intention to seek help. Additionally, descriptive statistics were used to determine differences in endorsement of each outcome belief between the help-seeking intenders versus non-intenders.

Results

Descriptive statistics for help-seeking mechanisms and intention

Mean scores for intention, perceived norm injunctive, and perceived norm descriptive were near 4, which is the center of the score range (Figure 2).

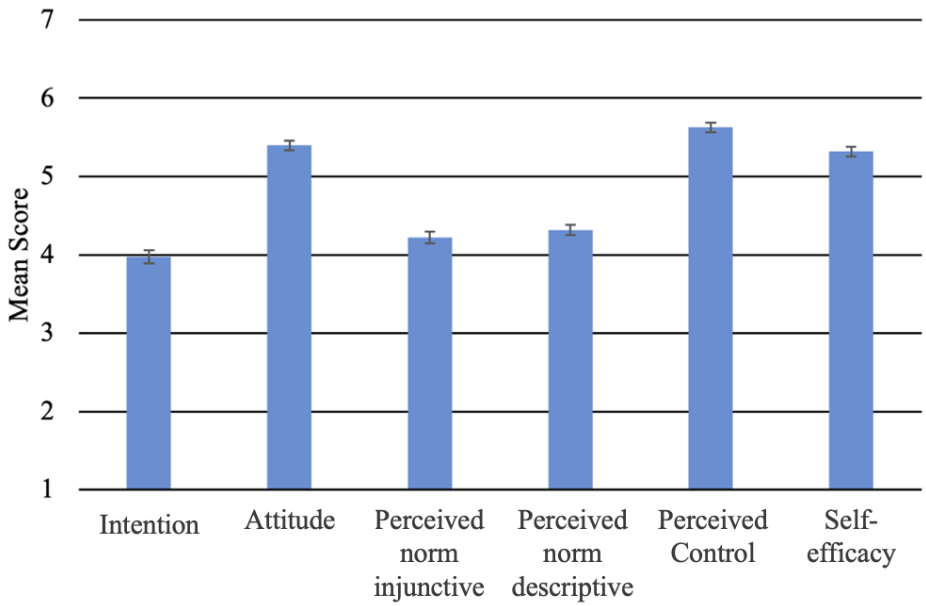

Figure 2. Mean score for each help-seeking perception on a 7-point scale.

The average first-year engineering student reported: uncertain/weak intention to seek help (only 37% reported a score of 5 or higher, which would classify them as an "intender"), perceiving that those around them would have a neutral opinion (i.e., not strongly disapprove nor strongly approve) about the student seeking help (perceived norm injunctive), and uncertainty about whether those around them would or would not seek help themselves for their own mental health concerns (perceived norm descriptive). In contrast, mean scores for attitude, perceived control, and self-efficacy were between 5.3 and 5.6 indicating a moderately positive attitude, sense of control and self-efficacy related to seek help.

Predictors of help-seeking intention

Table 3 provides a summary of the correlations between each help-seeking mechanism and intention to seek help.

Table 3. Bivariate correlation coefficients for help-seeking mechanisms with intention

Help-Seeking Mechanism	Intention	*p*
Attitude	0.575	<0.001
Perceived norm injunctive	0.786	<0.001
Perceived norm descriptive	0.674	<0.001
Self-efficacy	0.413	<0.001
Perceived control	0.217	<0.001

All five help-seeking mechanisms were significantly correlated with help-seeking intention, with the highest correlation coefficients for injunctive perceived norm (0.786), descriptive perceived norm (0.674) and attitude (0.575). When all five predictors were forced to compete to account for variance in help-seeking intention, intention was parsimoniously predicted by attitude, injunctive perceived norm, and descriptive perceived norm, with standardized regression coefficients of 0.24, 0.52, and 0.16, respectively (Figure 3).

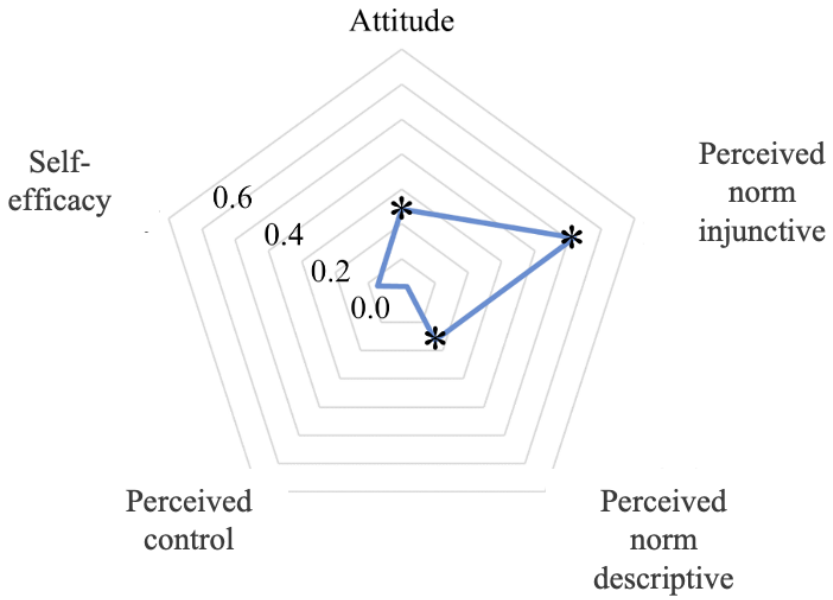

Figure 3. Predictors of help-seeking intention as determined by regression analysis. * indicates a statistically significant predictor ($p < 0.05$).

Although perceived control and self-efficacy were significantly correlated with intention, these mechanisms failed to account for incremental variance in intention, with standardized regression coefficients of -0.03 and 0.07, respectively.

Relationship between outcome beliefs and help-seeking intention

Table 4 provides a summary of the bivariate correlation coefficients between each outcome belief and intention to seek help.

Table 4. Correlation of outcome beliefs with intention to seek help

Outcome Belief	Intention	*p*
go against the expectations of the engineering community	**-0.205**	**0.002**
be a sign of weakness	**-0.192**	**0.003**
result in me being poorly treated by the mental health professional.	**-0.191**	**0.004**
be admitting defeat	**-0.177**	**0.007**
result in me being discriminated against by the mental health professional	**-0.170**	**0.010**
make me look unstable	**-0.158**	**0.016**
result in me being discriminated against in academic/professional settings	**-0.149**	**0.024**
make me look overly emotional	**-0.145**	**0.027**
result in me being negatively judged by others	**-0.137**	**0.037**
be stigmatized by other people	-0.126	0.055
mean that I can't fix my own problems	-0.123	0.062
go against the expectations of my gender identity	-0.117	0.333
be a sign that I'm not independent	-0.107	0.103
bring shame on my family	-0.099	0.131
go against the expectations of my racial identity	-0.089	0.742
hurt my reputation	-0.088	0.183
go against the expectations of my religious/spiritual community	-0.082	0.653
take time away from my academic work	-0.074	0.260
be a sign of imperfection	-0.057	0.386
result in me being penalized in my courses	-0.055	0.403
be an unfamiliar process	-0.004	0.951
result in me being prescribed medication	-0.001	0.983
lead to other people finding out that I was seeking help	0.021	0.748
require me to tell others that I am seeking help	0.040	0.541
require me to be vulnerable	0.051	0.443
result in a diagnosis	0.100	0.130
be emotionally difficult	0.122	0.066
decrease my stress	**0.177**	**0.007**
involve a treatment approach that is tailored to me	**0.185**	**0.005**
require me to accept what the mental health professional has to say	**0.216**	**0.001**
improve my academic performance	**0.233**	**0.000**
improve my relationships	**0.240**	**0.000**
help me gain a better understanding of my mental health concern	**0.300**	**0.000**
help me find a solution to my problem	**0.301**	**0.000**
make me feel better	**0.318**	**0.000**
help me improve my coping skills	**0.318**	**0.000**
help me feel supported	**0.385**	**0.000**

Note: Bolded fields are statistically significantly correlated with intention ($p < 0.05$).

There were nine beliefs that were found to have negative correlations with intention to seek help, including items beliefs that seeking help would "be a sign of weakness" and "be admitting defeat." In particular, the strongest negative relationship between an outcome belief and intention was for the belief that seeking help would "go against the expectations of the engineering community" ($r=-0.205$, $p<0.05$). Conversely, the strongest positive correlation between an outcome belief and intention to seek help was for the belief that seeking help would "help me feel supported" ($r=0.385$, $p<0.05$). A total of ten outcome beliefs were positively correlated with intention to seek help, including items such as seeking help would "make me feel better" and "improve my academic performance."

Endorsement of beliefs between help-seeking intenders and non-intenders

The top eight outcome predictors of intention were further analyzed to provide a descriptive look at the differences in responses between students identified as help-seeking intenders (those that indicated they likely would seek help) vs. non-intenders (those that indicated they likely would not seek help). Figure 4 compares intenders vs. non-intenders in the top 4 most negatively correlated beliefs to intention.

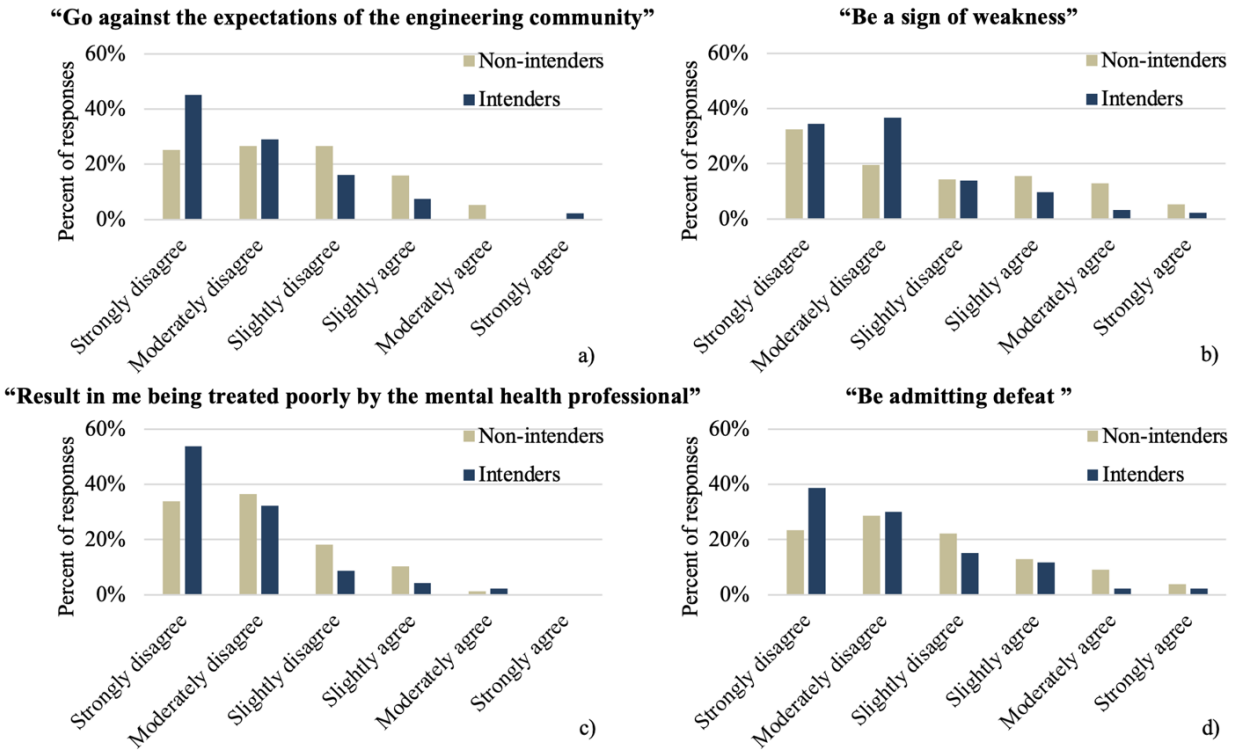

Figure 4 Beliefs that are highly negatively correlated with intention: a) "go against the expectations of the engineering community", b) "be a sign of weakness", c) "result in me being treated poorly by the mental health professional", d) "be admitting defeat"

The belief most negatively correlated to intention was the belief that seeking help from a mental health professional would "go against the expectations of the engineering community." Although a majority of respondents in both the intender and non-intender populations disagreed with this statement, there was a nearly 20% difference in the percentage of respondents that strongly disagreed with this statement; 45.2% of intenders strongly disagreed with this belief compared to 25.3% of non-intenders. Results were similar for the belief that seeking help would result in me being treated poorly by the mental health professional. While most students disagreed with this statement (94.6% of intenders, 88.4% of non-intenders), there was a nearly 20% difference in the percentage of respondents who strongly disagreed. The responses to seeking help would "be a sign of weakness" and "be admitting defeat" were more distributed from strong disagreement to strong agreement, with help-seeking intenders more likely to disagree with these statements. For instance, 66.3% of non-intenders disagreed with the belief that seeking help would be a sign of weakness compared to 85% of intenders. Finally, 31% of non-intenders agreed with the belief that seeking professional help would be admitting defeat compared to just 16% of intenders.

Similarly, we looked at differences in endorsement of the four beliefs that were most positively correlated with intention (Figure 5).

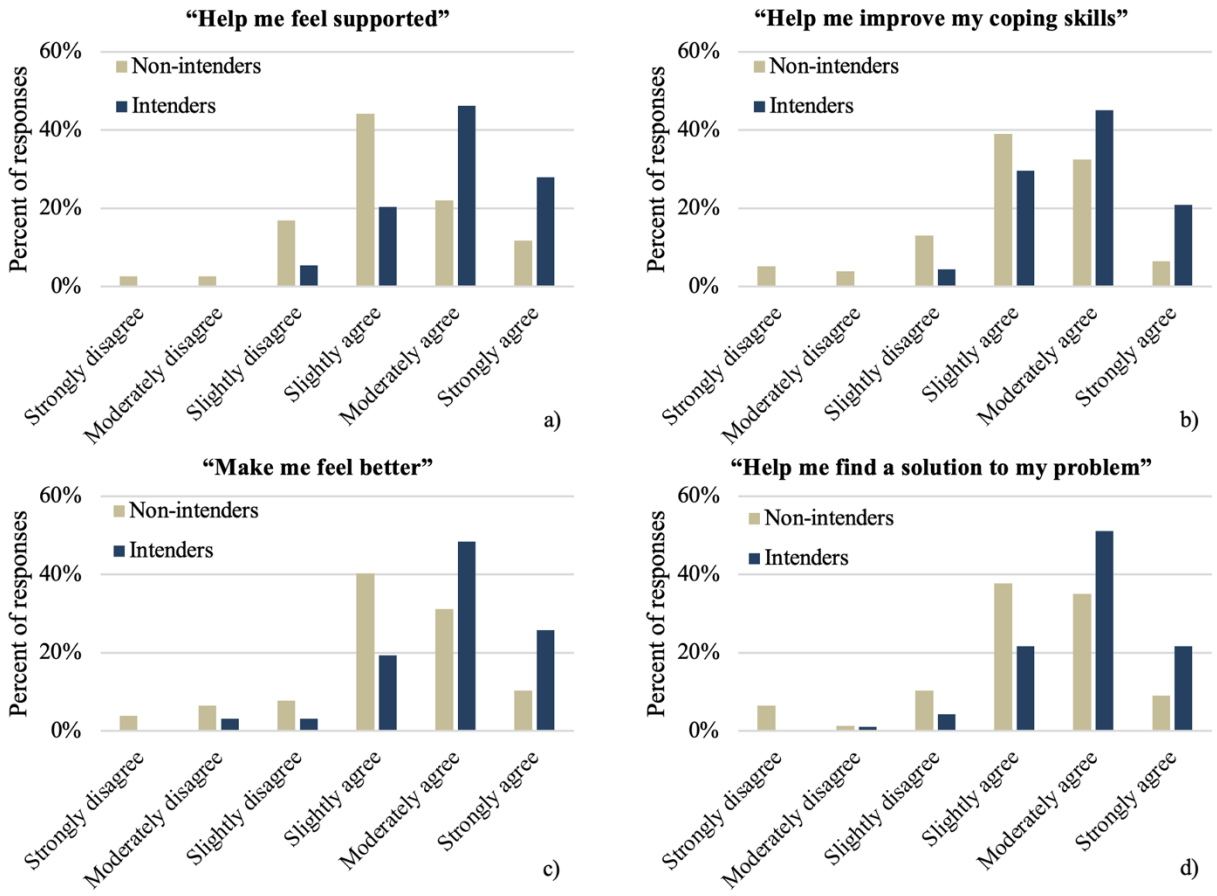

Figure 5 Beliefs that are highly positively correlated with intention: a) "help me feel supported", b) 'help me improve my coping skills', c) "make me feel better", d) 'Help me find a solution to my problem'

The four most positively correlated beliefs were related to the efficacy of help seeking and were more positively endorsed by help-seeking intenders. For example, only 78% of non-intenders agreed with the belief that seeking professional help for a mental health concern would help them feel supported compared to 94.6% of intenders agreeing with this belief. Similarly, 95.7% of intenders agree with the belief that professional help would help them improve their coping skills, where only 78% of non-intenders agreed. The belief that professional help would help them feel better was agreed on by 93.6% of intenders and 81.9% of non-intenders. Finally, 94.5% of intenders agree with the belief that professional help would help them find a solution to their problem compared to 81.9% of non-intenders.

Finally, we looked at variables that were not statistically significantly correlated with intention to further understand how these beliefs were endorsed by respondents. We found that although some beliefs were not statistically significantly correlated with intention, they were still widely agreed on by both intending and non-intending students. For example, 77% of non-intenders and 75% of intenders agree with the belief that seeking help for a mental health problem would "require me to be vulnerable". Similarly, 69% of non-intenders and 64% of intenders agree with the belief that seeking help for a mental health problem would "take away time from my academic work". Therefore, while not statistically significant, the high endorsement of these beliefs could still influence the overall intention of the population to seek help.

Discussion

Help-seeking mechanisms and intention

This study focused on investigating first-year engineering students' mental health help-seeking perceptions and their ability to predict help-seeking intention. Mean scores for attitude, perceived control, and self-efficacy were higher than those for intention and perceived norm. This means that, on average, students are more likely to believe that seeking help from a mental health professional would a good thing, that they would be in control of their decision to seek help, and would be capable of seeking help. In contrast, students were not perceiving that those around them would be clearly supportive of their seeking help, nor that those other people would themselves seek their own mental health care if needed. These results are consistent with a previous study of first-year engineering students utilizing the same mental health help-seeking measures [30].

Results showed that both injunctive and descriptive perceived norms were significantly predictive of intention to seek professional mental health treatment. This is in line with findings from qualitative studies in engineering, which has found that students viewed help-seeking behavior as contrary to engineering cultural norms due to indirect and direct messages received from professors and peers [21]. Some students may even believe that by agreeing to become an engineering student, they had implicitly committed to prioritizing academic success over their mental well-being [23]. A 2022 qualitative study reported that interviewees often perceived engineering students as superior, or smarter and more capable than students in other majors [37]. This could lead them to believe that struggling with mental health would mean that they are not fit

to be engineer. Because first-year engineering students are navigating a new college experience and the socialization into the culture and expectations of engineering, it is possible that they feel more significant pressure to adhere to the expectations of those around them. Therefore, it will be interesting to understand how these perceptions change as students continue to navigate not only their college experience but also their experiences within the culture of engineering.

While previous qualitative research has identified physical and informational barriers to help-seeking faced by engineering students, perceived control and self-efficacy were not incrementally predictive of mental health help-seeking intention [23, 31]. Institutional differences in student knowledge of campus mental health resources, availability, and engineering program cultures could contribute to this discrepancy. However, it is important to clarify these findings: the fact that perceived control and self-efficacy failed to account for additional variance beyond the more powerful predictors (e.g., perceived norm) does not mean they are not associated with intention. In fact, bivariate correlations (in which predictors are not forced to compete for variance in the dependent variable) indicated that all five of these mechanisms were positively associated with intention. Thus, it is not that perceived control and self-efficacy are irrelevant, it is that the portions of variance that they explain in intention are already parsimoniously explained by the other mechanisms.

Intention, attitude, and outcome beliefs

While attitude toward mental health was generally favorable in this sample, it was also predictive of help-seeking intention. Analysis of the specific outcome beliefs that drive attitude provides context for understanding specific intervention targets to improve help-seeking. Overall, our findings show that engineering students with low intention to seek help feel that seeking help might either feel like a personal failure ("be a sign of weakness" or "be admitting defeat") or be looked upon negatively by others ("go against the expectations of the engineering community," "result in me being negatively judged by others," etc.). These beliefs are likely influenced by perceived cultural norms within the engineering community. For example, prior studies have shown that engineering students are under the impression that engineers are supposed to think, feel, and act in a certain way [21]. The clash between traditional engineering norms (i.e., self-reliance, problem solving and resilience) and the idea of seeking help from a mental health professional could result in engineering students feeling that seeking help might "be a sign of weakness" or that it would "go against the norms of the engineering culture." Engineering students that are naturally driven

by their personal success and competence may fear possible career implications of help-seeking and that it might "result in me being discriminated against in academic/professional settings." This could contribute to the culture of silence around mental health in engineering, where mental health is not often talked about within engineering spaces [32]. This lack of conversation around mental health by both faculty and students in engineering can result in the assumption that academics must be prioritized over mental health throughout their education [23, 33].

Our findings also highlight how help-seeking intention is influenced by self-stigma, which can be defined as a reduction in an individual's self-esteem due to the perception of one's self as socially unacceptable [34]. Prior studies have found a negative relationship between self-stigma and help-seeking attitude in the general college student population [35, 36], as well as within engineering [20]. The outcome beliefs of our study, such as "be a sign of weakness", "be admitting defeat", and "make me look unstable", highlight some of the internalized shame that students might have about the idea of seeking help for their mental health. Further, the beliefs that seeking help would "require me to be vulnerable," "make me look unstable" and "make me look overly emotional" can be connected to the themes of hardness (e.g., lack of emotion) in engineering culture [21]. This self-stigma can powerfully influence help-seeking intention [34], as students may be hindered from acknowledging their mental health concerns and/or they may be hesitant to seek help based on their internalized perspectives of how they may be judged by their community.

Those students who were more likely to seek help for their mental health were more likely to believe in the efficacy of professional help-seeking ("help me feel supported," "help me improve my coping skills, "make me feel better," etc.). This is consistent with prior research indicating that perceived benefits of seeking help are strongly predictive of intention to seek help for college students [37, 38]. These beliefs are likely not unique to engineering students but highlight the importance of ensuring that students are aware of research validating the efficacy of professional mental healthcare [8, 9]. Further, the belief that seeking help might "improve my academic performance" could be a particularly salient belief for engineering students and could be highlighted through data on the impact of mental health maintenance on academic outcomes [4-7].

Although not significantly correlated with intention, a widely endorsed belief among all first- year engineering students was that seeking help for a mental health concern could divert time away

from academic pursuits. Prior work has shown that students feel the need to prioritize their academics. This can result in students being hesitant to seek help for their mental health because they feel it might require them to sacrifice the time typically used to complete their school work [23]. This belief is one that has the potential to become more salient as engineering students move further into their academic training and embedded into a larger number of engineering-specific courses. Therefore, the demanding nature of engineering studies emphasizes the need for interventions that acknowledge and address the belief that prioritizing mental well-being and dedicating sufficient time to academics are not mutually exclusive. To combat this belief, we must emphasize that addressing mental health concerns is an investment in overall well-being, contributing to better academic performance in the long run.

Limitations and Future Directions

Given that most of the survey respondents were White heterosexual men, these findings apply most broadly to this group. More work is necessary to improve the representation of our population, which would allow for further analysis of data for specific subpopulations. Seeking a greater understanding of mental health distress and help-seeking beliefs among underrepresented students is critical; opinions about pursuing professional treatment for a mental health condition may be affected by gender, race, ethnicity, disability status, and socioeconomic status. Further, data was collected from first-year engineering students at the end of their first semester of college classes. Therefore, the results may not reflect the students' progress through the engineering program. To address this, future directions plan to include a wider range of students from other institutions and a higher proportion of students from racial and ethnic minority groups. As a result, we will be able to learn more about the mental health of marginalized student groups and the effects of institutional context on students' mental health and help-seeking. Finally, currently findings focus on the relationship between help-seeking mechanisms and beliefs with intention to seek professional mental healthcare. While the relationship between intention and behavior has been empirically validated for mental healthcare [28], it is important to further understand the specific perceptions that drive help-seeking behavior.

Conclusions

As engineering education continues to evolve, addressing the mental health needs of students remains a critical priority. By examining the help-seeking perceptions and perceived outcome beliefs related to help-seeking behaviors, we found that students' intention to seek help were

predicted by their attitudes about help seeking, as well as their perceptions of how well mental healthcare is accepted by the important people in their lives. This is reflected in the outcome beliefs that were most predictive of help-seeking intention, including beliefs related to the efficacy of mental health treatment, as well as those related to mental healthcare being a sign of weakness or going against the expectations of the engineering community. These findings provide valuable insights that can inform strategies to promote mental health awareness, resilience, and support among engineering students. For instance, interventions could be targeted towards highlighting the efficacy of mental healthcare, as well as normalizing the use of mental health treatment and the prioritization of mental health within engineering spaces. This can facilitate the cultivation of an environment where seeking help for mental health concerns is normalized, destigmatized, and readily accessible to all students.

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