

Investigating mental health distress and help-seeking perceptions in first-year engineering students

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Abstract

Distressed engineering students are significantly less likely to seek professional help for a mental health concern when compared to their non-engineering peers. This represents a treatment gap, making engineering students at risk for escalation of symptoms to more significant and potentially chronic mental illness. To better understand the causes of this treatment gap, this study was designed to look at first-year engineering students' perceptions of seeking help for a mental health concern. Self-report survey data was collected from 440 first-year engineering students during the first month of the Fall 2021 semester, including psychometrically sound measures of mental health help-seeking attitudes, perceived norms, personal agency, and intention developed in accordance with the Integrated Behavioral Model. Results show 12% of students self-report symptoms of moderate or higher depression and 14% moderate or higher anxiety. While these statistics are lower than the national averages for college students, breakdowns by gender showed that female students showed a higher prevalence of anxiety and depression compared to the corresponding national average. In general, students had positive attitudes, control, and self-efficacy related to seeking help for a mental health concern. Mean scores for help-seeking intention and perceived norms were lower, with 50% of distressed students indicating low intention to seek professional help if in distress. Results from this study provide insight into the key mental health help-seeking perceptions that could influence help-seeking intention in first-year engineering students. This could aid in identifying targets for interventions aimed at improving help-seeking within this student population.

Introduction

Mental illness is estimated to account for one-third of adult health disabilities [1] and is increasing and becoming more chronic amongst college students [2]. Evidence suggests that deterioration of mental health (MH), particularly due to anxiety and depression, has accelerated in college students since the onset of the COVID-19 pandemic [3]-[6]. Addressing this challenge within the college student populations is paramount to their health and wellness. One strategy to improve the MH of college students is to increase access to and utilization of services from MH professionals (i.e., psychologists, psychiatrist, clinical social workers, counselors) for distressed individuals.

Adoption of professional help seeking behaviors has been shown to improve the prognosis of MH problems and/or decrease the progression to more chronic and advanced MH disorders [7]. Through this study, we aim to better understand the perceptions that first-year engineering (FYE) students have about seeking help for a MH concern. Additionally, we will investigate subpopulation differences in MH distress and MH related help-seeking perceptions.

Help-seeking behavior in college students

In the broader college student population, it has been hypothesized that the most effective way to increase MH help seeking behaviors in college students is to change their self-perceptions and attitude toward professional MH services [8]-[10]. Research has also examined help seeking behaviors of students in self-identified high-stress academic programs (e.g., law [11], medicine [12], [13], nursing [14], dentistry [15], [16]). In these studies, the most significant factors for not seeking help for MH concerns pertained to perceived stigma(s), fear of disclosure, and perceived detriment to academic and/or career success; students in these high-stress programs were more influenced by external perceptions while the broader college population were more influenced by internal perceptions. While overlap exists in the predictors and perceptions associated with help-seeking behavior across said high-stress academic programs, they may not be representative of students within the engineering population as predictors of behavioral outcomes have been shown to vary by both behavior and population [17].

Mental health in engineering students

Engineering programs have been described by students as competitive, academically rigorous and lacking a sense of belonging [18]. Despite anecdotal and some scientific evidence supporting the notion that engineering is also a high-stress academic program, little research has been reported for this demographic aside from general characterizations of engineering student MH [19]-[22]. When compared to their non-engineering peers, engineering students experiencing symptoms of mental health distress are less likely to seek professional help [23]. Sanchez-Pena et. al. [24] investigated the relationship between the stigma of MH conditions and help seeking behaviors in engineering students but cited the lack of engineering-specific factors as the hypothesis for why their results were not differentiable from the broader college population. Jensen & Cross [18] investigated the social interactions that occur within the engineering culture and stated, “Overall,

the results from this study suggest that mental health is an urgent issue needing immediate attention in undergraduate engineering programs and that social identity may be an important consideration in developing interventions.”

While these studies have focused on characterizing the MH of engineering students, they have yet to examine how to improve help seeking behaviors in this student population. As a result, few beliefs and predictors associated with not seeking professional MH services have been identified as targets for intervention, limiting the ability to translate the results into interventions for increasing help-seeking behavior. Thus, it is important to apply theory-guided methods to the identification of key perceptions that are amenable to behavior change interventions among specific populations (i.e., first-year engineering students).

Theoretical grounding

The Integrated Behavioral Model (IBM) is a theoretical framework that can be used to determine the specific factors that drive behavioral intention [17]. In the context of mental health related help-seeking, the IBM states that the most important driver for help-seeking is the intention to seek help. Intention is determined by three factors: perceived norms, personal agency, and attitudes [17] (Figure 1).

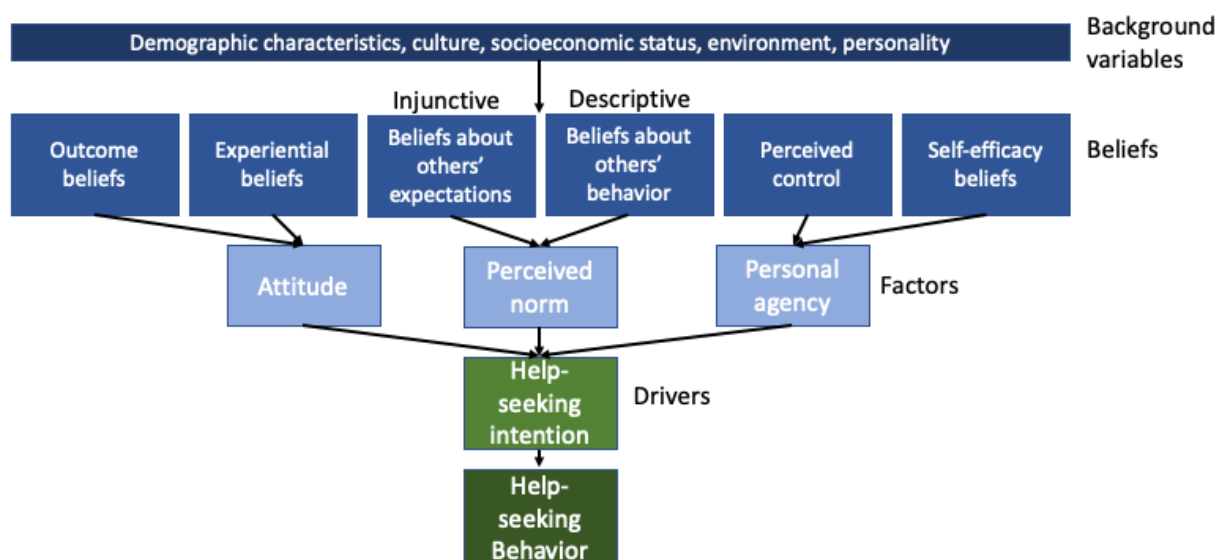


Figure 1. The background variables, beliefs, and factors influencing intention to seek help per the Integrated Behavioral Model.

Perceived norms can be broken down into two types: injunctive perceived norms and descriptive perceived norms. Injunctive perceived norms refer to an individual's beliefs about others' expectations for their own behavior (e.g., do they believe that their friends or family would expect them to seek help?). Descriptive perceived norms refer to an individual's beliefs about others' behavior (e.g., do they believe that their friends or family would seek help for themselves?). Personal agency refers to an individual's evaluation of whether or not they will be able to seek help. It accounts for beliefs about an individual's control over the decision to seek help (e.g., do they believe that they are in control of the decision to seek help?) as well as their self-efficacy (e.g. do they believe that they have the ability to seek help?). Finally, attitude accounts for a person's overall evaluation of help-seeking as bad versus good (e.g., do they believe help-seeking is helpful vs. hurtful?, desirable vs. undesirable?, etc.). Overall attitude is driven by a person's perceived outcomes of help-seeking, as well as their experiential beliefs (emotional response to the idea of help seeking). Understanding the relationship between these help-seeking factors and help-seeking intention can provide guidance for interventions that could improve help-seeking behaviors within a population.

Research questions

A quantitative research study was designed to better understand the factors that influence mental health related help-seeking in first-year engineering students, as guided by the IBM. Data was collected to address the following research questions:

- 1) How do we measure help-seeking perceptions and intention in first-year engineering students?
- 2) How does mental health status vary across gender in first-year engineering students at the University of Kentucky?
- 3) Do help-seeking perceptions and intention vary across gender and mental health distress level in first-year engineering students?

Identifying key factors that influence help-seeking intention is a first step towards understanding how to change help-seeking behavior in undergraduate engineering students.

Methods

Participant recruitment

This research study was approved by the Institutional Review Board (IRB) at University of Kentucky. In September 2021, students were asked to complete the survey as a course assignment in a required course for all first-year engineering students. At the start of the survey, students were provided with a cover letter that detailed the purpose of the study. They were then asked to agree to participate in the research study. Their decision to participate in the research did not impact their grade on the assignment and the faculty in charge of their course did not know which students chose to participate. They were then asked to provide their name, email address and course section so that they could be given credit for the completion of the assignment. Students were able to skip questions at any point and were not given credit for completion of the full survey instrument. After the deadline for the assignment had past, all identifying information was removed from the dataset. Data was collected from a total of 440 students (Table 1).

Table 1 *Demographic Information for Engineering Students Participating in this study (N = 440)*

Demographic group	N	%
Gender identity		
Male	321	72.9%
Female	110	25.0%
Transgender	2	0.5%
Nonbinary/genderfluid	7	1.6%
Race/Ethnicity		
White	351	78.7%
Biracial	14	3.1%
Black	12	2.7%
Hispanic/Latino	31	7.0%
Asian American/Asian	32	7.3%
Middle Eastern/Arab/Arab American	2	0.5%
American Indian or Alaskan Native	2	0.5%
Native Hawaiian/Pacific Islander	1	0.2%
Sexual identity		
Heterosexual	378	85.9%
LGBTQ+	62	14.1%

Mental health status measures

The PHQ-8 and GAD-7 questionnaires are widely used as a screening measure for self-reported symptoms of depression and anxiety, respectively. The PHQ-8 was shown to have good validity and reliability as a measure for depression in the general population [25]. For this instrument, students were asked to respond from Not at all (0) to Nearly every day (3) for a series of 8 items. If they scored less than 2 on the first two items, they were not required to answer the remaining six items. To characterize the depression severity, the sum was taken across all 8 items in the PHQ-8. A score of 0-4 was characterized as none-minimal, 5-9 as mild, 10-14 as moderate, 15-19 as moderately severe and 20-24 as severe depression. The GAD-7 was shown to have good validity

and reliability as a measure for anxiety in the general population [26]. For the GAD-7 instrument, students were asked to respond from Not at all (0) to Nearly every day (3) for a series of 7 items. To characterize the anxiety severity, the sum was taken across all items. A score of 0-4 was characterized as no to low risk, 5-9 as mild, 10-14 as moderate and 15-21 as severe anxiety. When used as a screening tool, a characterization of moderate or higher is used as a threshold for recommending further evaluation with both the PHQ-8 and GAD-7 [24], [26]. Therefore, students that self-reported symptoms associated with moderate or higher levels of depression and/or anxiety were characterized as “distressed.”

Help-seeking perceptions and intention measures

At the start of the survey, students were given definitions of mental health professionals and mental health concerns. More specifically, a mental health professional included psychologists, psychiatrists, clinical social workers, and counselors. A mental health concern included issues ranging from personal difficulties (e.g., related loss of a loved one) to mental illness (e.g., anxiety, depression). To measure students’ perceptions of seeking help for a mental health concern, students were first provided with a hypothetical scenario: “Let’s imagine that you have been experiencing a serious mental health concern for the last month.” They were then asked if they could imagine themselves in this hypothetical scenario. If yes, they proceeded forward to the instructions for the help-seeking factors and intention instruments. If no, they were given the prompt, “Ok, let’s suppose you’ve been experiencing significant stress over the past month. It has started to impact your performance in your classes and you haven’t been hanging out with your friends.” They were then told that they would be asked questions about how they might feel about seeking help from a mental health professional if they were dealing with this hypothetical mental health concern right now. Importantly, the IBM dictates that the health behavior is clearly defined. Therefore, the behavior is defined as “seeking help from a mental health professional in the next three months.”

The Mental Help-seeking Intention Scale (MHSIS) was used to measure the students’ intention to seek help from a mental health professional if experiencing the hypothetical mental health concern [27]. This is a 3-item instrument that uses a seven-point scale. A representative item is, “I would intend to seek help from a mental health professional in the next three months” with a response

ranging from “extremely unlikely (1) – extremely likely (7).” A mean score was calculated across the items, with a low score indicating a low intention to seek help and a high score indicating a high intention to seek help.

The Mental Help-seeking Attitudes Scale (MHSAS) was used to measure attitude about seeking help for a mental health concern [28]. This is a 9-item instrument that uses a seven-point semantic differential scale. All items start with the stem, “Seeking help from a mental health professional would be...” and students were asked to choose a response that represents how their opinion for different pairs of words such as “useless (1) – useful (7),” “ineffective (1) – effective (7),” or “bad (1) – good (7).” A mean score was calculated across the 9 items, with a low score indicating a negative attitude and a high score indicating a positive attitude.

Perceived norms were measured using 3 items that correspond to injunctive perceived norms and 3 items that correspond to descriptive perceived norms [29]. All responses were on a seven-point scale. A representative item from the subscale for injunctive perceived norm is, “The people in my life whose opinions I value would _____ of my seeking help from a mental health professional in the next three months” with responses ranging from “disapprove (1) – approve (7).” A representative item from the subscale for descriptive perceived norm is, “The people in my life whose opinions I value would _____ from a mental health professional in the next three months” with responses ranging from “not seek help (1) – seek help (7).”

Personal agency was measured using 3 items that correspond to control and 3 items that correspond to self-efficacy [29]. All responses were on a seven-point scale. A representative subscale for self-efficacy is, “I would have the ability to see help from a mental health professional in the next three months” with responses ranging from “completely false (1) to completely true (7).” A representative subscale for control is, “My seeking help from a mental health professional in the next three months would _____” with responses ranging from, “not be under my control (1) to be under my control (7).”

Data analysis

Descriptive statistics were used to look at mental health status and help-seeking factors for the study population. An independent samples t-test was used to investigate the effect of gender or distress level on continuous variables. For categorical variables (severity of depression or anxiety), Chi squared tests of independence with post hoc analyses were conducted.

Results

Subscale reliability

The reliability of the instrument was verified through determination of a Cronbach's alpha measurement for each subscale (Table 2).

Table 2. Cronbach's alpha measure for each subscale

Subscale	Construct	Cronbach's alpha
PHQ-2	Depression	0.712
PHQ-8	Depression	0.799
GAD-7	Anxiety	0.912
MHSIS	Help-seeking intention	0.920
MHSAS	Help-seeking attitude	0.939
PNI	Injunctive perceived norm	0.856
PND	Descriptive perceived norm	0.837
PAC	Personal agency - control	0.845
PAS	Personal agency - self-efficacy	0.850

Cronbach's alpha were above 0.7 for all subscales. Because the PHQ-2 and PHQ-8 are self-report instruments that are determining symptoms associated with depression, it is not expected that all respondents experience all the symptoms measured on the instrument. Because the PHQ-2 is only two items compared to the eight in the PHQ-8, a lower score for the Cronbach's alpha is to be expected. Additionally, the structure of the PHQ-8 instrument meant that not all students were required to respond to all items, only 116 students were included in the reliability analysis.

Mental health status

We investigated the degree to which first-year engineering students self-reported symptoms of depression and anxiety. Overall, 76% of students self-reported no symptoms of depression, whereas 12% of students self-reported that they had experienced symptoms of moderate or higher levels of depression. For anxiety, 63% of students self-reported no symptoms of anxiety, whereas 14% of students self-reported that they had experienced symptoms of moderate or higher anxiety. Because the prevalence of mental health concerns can differ by gender, we next investigated differences in self-reported symptoms of mental health distress across men and women enrolled in the first-year engineering program. An independent samples t-test showed that mean scores were significantly higher for women when compared to men for both depression ($p = 0.003$) and anxiety ($p = 0.002$). A Chi squared test of independence showed a significant relationship between gender and depression severity (Figure 2a) and gender and anxiety severity (Figure 2b).

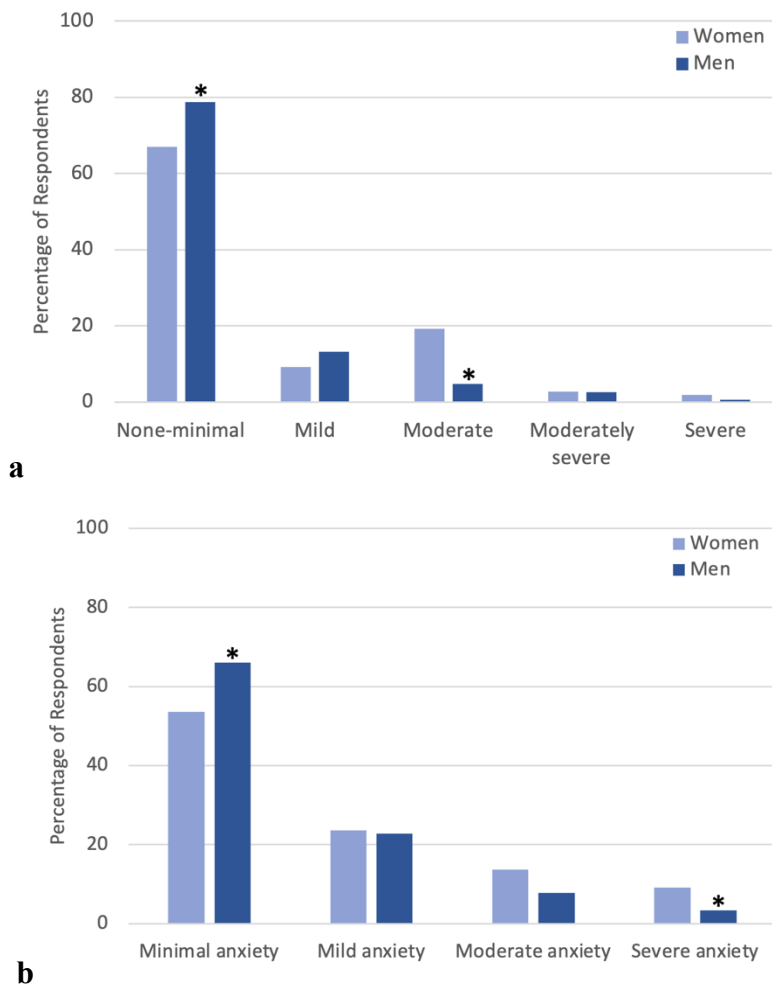


Figure 2. Percentage of respondents who self-reported symptoms of depression (a) and anxiety (b). * indicates a statistically significant difference between men and women as determined by post hoc analysis ($p < 0.05$) using the Bonferroni correction.

Post hoc analysis indicated that men were statistically more likely to report symptoms of none-minimal depression, whereas women were more likely to report symptoms of moderate depression. In total, 24% of women self-reported symptoms of moderate or higher depression compared to just 8% of men. For anxiety, post hoc analysis indicated that men were significantly more likely to report symptoms of minimal anxiety whereas women were more likely to report symptoms of severe anxiety. In total, 23% of women self-reported symptoms of moderate or higher anxiety compared to just 11% of men.

Based on a cut-off of moderate or higher levels of depression and/or anxiety, 80 students (19%) were characterized as distressed. Chi squared test of independence showed a significant relationship between gender and percentage of distressed students, with 33 (41%) distressed students self-identified as women and 43 (54%) self-identified as men. Considering the overall population of survey respondents was 73% men, this shows the higher proportion of women who were characterized as distressed.

Help-seeking factors

Student help-seeking factors differed by gender, with women generally having more favorable perceptions about seeking help when compared to men (Figure 3).

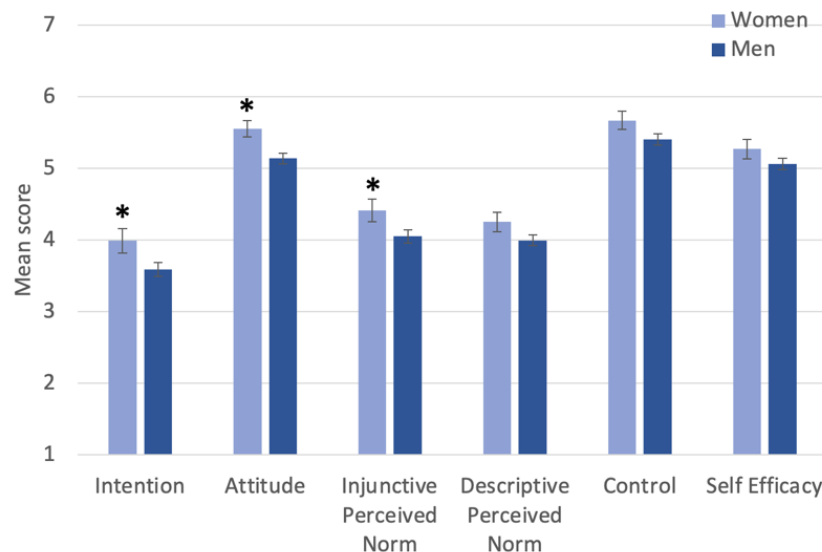


Figure 3. Mean score for help-seeking factors across men and women. * indicates a statistically significant different between men and women as determined by an independent samples t-test ($p < 0.05$).

Mean scores for women were statistically higher than men across help-seeking intention, as well as attitude and injunctive perceived norm. Data was collected on a 7-point scale, so mean scores for intention, injunctive perceived norm and descriptive perceived norm were neutral. For intention, 43% of female students and 57% of male students had mean scores below 4, indicating low intention to seek professional help.

Student help-seeking perceptions did not significantly differ by distressed state (Figure 4).

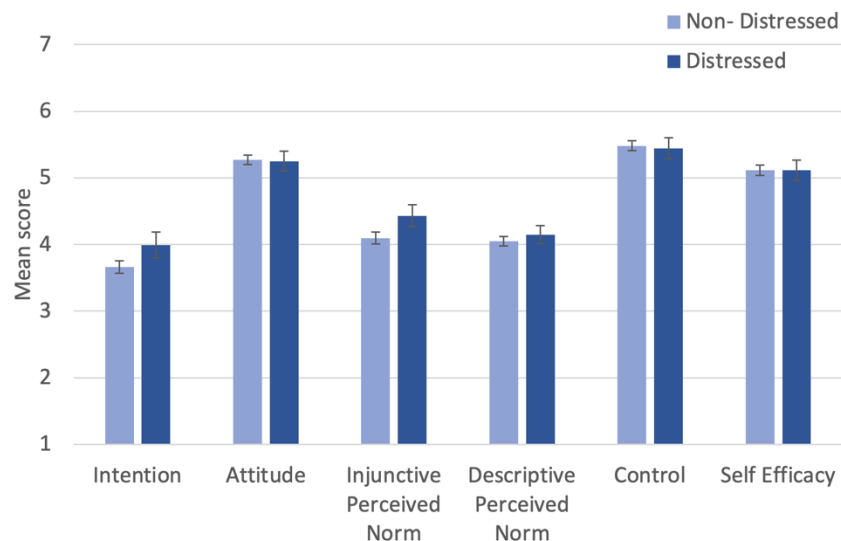


Figure 4. Mean score for help-seeking perceptions across distressed and non-distressed students. * indicates a statistically significant different between distressed and non-distressed students as determined by an independent samples t-test ($p < 0.05$).

Mean scores for help-seeking intention and help-seeking perceptions were statistically similar across distressed and non-distressed students. Of those students that were distressed, 50% had a mean score below 4 for intention, indicating low intention to seek help if they were in distress. This compares to 54% of non-distressed students who indicated low intention to seek help (mean score below 4 for intention).

Discussion

This quantitative study aimed to better understand the help-seeking perceptions of first year engineering students and how they varied with gender and distress. The prevalence of moderate or higher depression and anxiety in first-year engineering was found to be 12% and 14% of respondents, respectively. These values are low when compared to national averages for college students. Nationally, an average of 16.8% of college students self-report symptoms associated with moderate or higher depression and 17.7% of students self-report symptoms associated with moderate or higher anxiety [30]. In comparing the mental health distress data to the literature on

engineering students, several studies have found that prevalence of mental health concerns are higher within engineering students compared to non-engineering students [18], [21], whereas others have found them to be lower [23]. This highlights the importance of understanding the impact of institutional context on student mental health distress.

Results showed that female students were more likely to self-report symptoms of depression and anxiety when compared to male students. Overall, 24% of women self-reported symptoms of moderate or higher depression compared to just 8% of men. Similarly, 23% of women self-reported symptoms of moderate or higher anxiety compared to just 11% of men. These gender differences are consistent with the literature for both college students [31] and the general population [32], with women twice as likely to develop depression across their lifetime when compared to men [33]. Looking at national data on college students, 16.8% of female students self-reported symptoms of moderate or higher depression compared to 16.7% of male students [30]. Concerningly, this shows a larger proportion of female first year engineering students at the University of Kentucky are reporting symptoms of depression compared to the national average. Similar results are seen for anxiety, with national data showing moderate or higher symptoms of anxiety in 20.6% of women compared to 16.7% of men.

While it is promising that men reported fewer symptoms associated with anxiety and depression when compared to the national average, it is also important to think about the setting in which students are responding to questionnaires about their mental health, as well as their perceptions about mental health distress. Through a self-report instrument, it is possible that the prevalence of those reporting symptoms of mental health stress is decreased due to: 1) unwillingness to admit distress to others (especially if data is collected in a class environment) and/or 2) unwillingness to admit distress to self. Interestingly, a study on self-report instruments for depression found that college men, but not women, reported fewer symptoms associated with depression when there was potential follow-up (e.g., referral, phone call) after the data collection [34]. While our study specified that the data collected would be anonymized, it is possible that students still associated the assignment with the course and this impacted their willingness to self-report symptoms. Future studies could look to investigate the fear of disclosure of students participating in the study.

Additionally, the perceived “stress culture” in engineering [18] could change how students self-evaluate their own stress based on their perception of high levels of stress as “normal.”

Mean scores for help-seeking intention were at neutral or below for all student subpopulations, indicating that a significant proportion of students have low intention to seek help if in distress. Mental health related help seeking can reduce the progression of symptoms to more severe or chronic disorders [7]. Therefore, understanding how student perceptions about help-seeking could influence help-seeking intention could allow for the development of targeted interventions to improve help-seeking behavior. In general, students had more positive attitudes and perceptions about self-efficacy and control than they did perceived norms. This indicates that overall, students tend to think that help-seeking is good, that they have the skills necessary to seek help and that help-seeking is within their own personal control. Lower scores for perceived norms indicate that students have negative thoughts about what people would think of them if they were to seek help, and that they have negative perceptions about others’ help-seeking behavior if they were in distress.

Mean scores for help-seeking intention, attitude and injunctive perceived norms were lower in men when compared to women. This is consistent with the literature that support that those who adhere to traditional masculine gender roles have decreased willingness to seek help and decreased attitude about help seeking [35], [36]. Over 50% of students had low intention to seek help (54% of non-distressed students and 50% of distress students). This is in line with the literature that shows that engineering students who are in distress are less likely to seek help when compared to their non-engineering peers [23]. Because help-seeking behavior can help to improve mental health related outcomes, it is important to further study the relationship between students’ perceptions about help-seeking and their help-seeking intention. Future work aims to further explore this relationship and how it changes across different student subpopulations.

Limitations and Future Directions

There are several limitations associated with this study. First, data was collected from first-year students at the start of their first month in college. Therefore, results are likely not representative

of students as they progress through an engineering program. Further work will aim to expand the study to include students across the engineering program, rather than just during their first year.

Because data was collected through a course, it is possible that students did not fully report symptoms on the self-report instruments for anxiety and depression. While it was clear in the cover letter for the survey that the data would be anonymized and the faculty in their courses would never see the data connected to their name, they could still have perceived the potential for follow-up based on their responses to the study. Moving forward, we will be intentional about communicating the purpose of the study and clearly communicate that there will be no follow-up associated with the data collection. Additionally, we will further explore strategies to better assess the mental health status of students within this population.

Understanding the mental health distress and help-seeking perceptions of marginalized students within an engineering community is crucially important. This study was limited to overall population averages, as well as examining differences between men and women, for which we had sufficient subsample sizes and thus statistical power for inferential tests. We understand that this is a limited perspective for many reasons. First, we recognize that gender is not binary and were unable to explore differences for those who did not self-identify as men or women. Additionally, race, ethnicity, socioeconomic status, and disability status can impact mental health distress and perceptions about seeking help for a mental health concern. Given that the present sample, like the overall first-year population at University of Kentucky, is predominantly White, the present findings generalize most strongly to this population. Further work will aim to increase representation of our population to include students from outside of the University of Kentucky, including a larger percentage of racial/ethnically marginalized students. This will allow us to further explore mental health within marginalized student groups, as well as understand the impact of institutional context on student mental health and help-seeking.

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References

- [1] P. Anderson, E. Jané-Llopis and C. Hosman, "Reducing the silent burden of impaired mental health," *Health Promotion International*, vol. 26, pp. 4-9, 2011.
- [2] O. Erdur-Baker, C. Aberson, J. Barrow and M. Draper, "Nature and severity of college students' psychological concerns: A comparison of clinical and nonclinical national samples," *Professional Psychology: Research And Practice*, vol. 37, no. 3, pp. 317-323, 2006.
- [3] C. Son, S. Hegde, A. Smith, X. Wang and F. Sasangohar, "Effects of COVID-19 on College Students' Mental Health in the United States: Interview Survey Study," *Journal of Medical Internet Research*, vol. 22, no. 9, p. e21279, 2020.
- [4] H. Jia, R. J. Guerin, J. P. Barile, A. H. Okun, L. McKnight-Eily, S. J. Blumberg, R. Njai and W. W. Thompson, "National and State Trends in Anxiety and Depression Severity Scores Among Adults During the COVID-19 Pandemic — United States, 2020–2021," US Department of Health and Human Services/Centers for Disease Control and Prevention, 2021.
- [5] K. M. Soria and B. Horgos, "Factors Associated with College Students' Mental Health during the COVID-19 Pandemic," *Journal of College Student Development*, vol. 62, no. 1, pp. 236-242, 2021.
- [6] "2021 Annual Report," Penn State Center for Collegiate Mental Health, 2022.
- [7] C. Mitchell, B. McMillan and T. Hagan, "Mental health help-seeking behaviours in young adults," *The British journal of general practice : the journal of the Royal College of General Practitioners*, vol. 67, no. 654, pp. 8-9, 2017.
- [8] K. Vanheusden, C. Mulder, J. van der Ende, F. van Lenthe, J. Mckenbach and F. Verhulst, "Young adults face major barriers to seeking help from mental health services," *Patient Education And Counseling*, vol. 73, no. 1, pp. 97-104, 2008.
- [9] D. Rickwood, F. Deane, C. Wilson and J. Ciarrochi, "Young people's help-seeking for mental health problems," *Australian E-Journal For The Advancement Of Mental Health*, vol. 4, no. 3, 2005.

- [10] L. M. Bohon, K. A. Cotter, R. L. Kravitz, P. C. Cello Jr and E. F. y. Garcia, "The Theory of Planned Behavior as It Predicts Potential Intention to Seek Mental Health Services for Depression among College Students," *Journal of American College Health*, vol. 64, no. 8, pp. 593-603, 2016.
- [11] J. M. Organ, D. B. Jaffe and K. M. Bender, "Suffering in Silence: The Survey of Law Student Well-Being and the Reluctance of Law Students to Seek Help for Substance Use and Mental Health Concerns," *Journal of Legal Education*, vol. 66, no. 1, pp. 116-156, 2016.
- [12] C. A. Chew-Graham, A. Rogers and N. Yassin, "'I wouldn't want it on my CV or their records': medical students' experiences of help-seeking for mental health problems," *Medical Education*, vol. 37, no. 10, pp. 873-880, 2003.
- [13] L. N. Dyrbye, A. Eacker, S. J. Durning, C. Brazeau, C. Y. Moutier, F. S. Massie, D. V. Satele, J. Sloan and T. D. Shanafelt, "The Impact of Stigma and Personal Experiences on the Help-Seeking Behaviors of Medical Students With Burnout," *Academic Medicine*, vol. 90, pp. 961-969, 2015.
- [14] N. D. Galbraith, K. E. Brown and E. Clifton, "A Survey of Student Nurses' Attitudes Toward Help Seeking for Stress," *Nursing Forum*, vol. 49, no. 3, pp. 171-181, 2014.
- [15] S. Ey, K. R. Henning and D. L. Shaw, "Attitudes and Factors Related to Seeking Mental Health Treatment Among Medical and Dental Students," *Journal of College Student Psychotherapy*, vol. 14, no. 3, pp. 23-39, 2000.
- [16] D. Knipe, C. Maughan, J. Gilbert, D. Dymock, P. Moran and D. Gunnell, "Mental health in medical, dentistry and veterinary students: Cross-sectional online survey," *BJPsych Open*, vol. 4, no. 6, pp. 441-446, 2018.
- [17] D. E. Montaña and D. Kasprzyk, "Theory of reasoned action, theory of planned behavior, and the integrated behavioral model," in *Health behavior: Theory, research, and practice 5 ed.*, San Francisco, Jossey-Bass, 2015, pp. 95-124.
- [18] K. J. Jensen and K. J. Cross, "Engineering stress culture: Relationships among mental health, engineering identity, and sense of inclusion," *Journal of Engineering Education*, vol. 110, pp. 372-392, 2021.

- [19] M. Deziel, D. Olawo, L. Truchon and L. Golab, "Analyzing the Mental Health of Engineering Students using Classification and Regression," *Educational Data Mining*, 2013.
- [20] A. Danowitz and K. Beddoes, "A Snapshot of Mental Health and Wellness of Engineering Students Across the Western United States," in *2020 IEEE Frontiers in Education Conference (FIE)*, Uppsala, 2020.
- [21] A. Danowitz and K. Beddoes, "Characterizing Mental Health and Wellness in Students Across Engineering Disciplines," in *2018 CoNECD - The Collaborative Network for Engineering and Computing Diversity Conference*, Crystal City, 2018.
- [22] S. J. Bork and J. Mondisa, "Science, Engineering, and Mathematics Graduate Student Mental Health: Insights from the Healthy Minds Network Dataset," in *2019 ASEE Annual Conference & Exposition*, Tampa, 2019.
- [23] S. K. Lipson, S. Zhou, B. Wagner III, K. Beck and D. Eisenberg, "Major Differences: Variations in Undergraduate and Graduate Student Mental Health and Treatment Utilization Across Academic Disciplines," *Journal of College Student Psychotherapy*, vol. 30, no. 1, pp. 23-41, 2016.
- [24] M. L. Sanchez-Pena, N. Ramirez, K. R. Xu and D. B. Samuel, "Work in Progress: Measuring Stigma of Mental Health Conditions and Its Impact in Help-seeking Behaviors Among Engineering Students," in *2021 ASEE Annual Conference*, 2021.
- [25] K. Kroenke, T. W. Strine, R. L. Spitzer, J. B. Williams, J. T. Berry and A. H. Mokdad, "The PHQ-8 as a measure of current depression in the general population," *Journal of Affective Disorders*, vol. 114, no. 1, pp. 163-173, 2009.
- [26] B. Löwe, O. Decker, S. Müller, E. Brähler, D. Schellberg, W. Herzog and P. Y. Herzberg, "Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population," *Medical care*, vol. 46, no. 3, pp. 266-274, 2008.
- [27] 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, pp. 394-401, 2018.

- [28] J. H. Hammer, M. C. Parent and D. A. Spiker, "Mental Help Seeking Attitudes Scale (MHSAS): Development, reliability, validity, and comparison with the ATSSPH-SF and IASMHS-PO," *Journal of Counseling Psychology*, vol. 65, pp. 74-85, 2018.
- [29] I. Ajzen, "Constructing a Theory of Planned Behavior Questionnaire," 2019. [Online]. Available: <https://people.umass.edu/aizen/pdf/tpb.measurement.pdf>. [Accessed 3 February 2022].
- [30] S. K. Lipson, A. Kern, D. Eisenberg and A. M. Breland-Noble, "Mental Health Disparities Among College Students of Color," *Journal of Adolescent Health*, vol. 63, no. 3, pp. 348-356, 2018.
- [31] R. P. Auerbach, P. Mortier, R. Bruffaerts, J. Alonso, C. Benjet, P. Cuijpers, K. Demyttenaere, D. D. Ebert, J. G. Green, P. Hasking, S. Lee, C. Lochner, M. McLafferty, M. K. Nock, M. V. Petukhova, S. Pinder-Amaker, A. J. Rosellini, N. A. Sampson, G. Vilagut and Zs, "Mental disorder comorbidity and suicidal thoughts and behaviors in the World Health Organization World Mental Health Surveys International College Student initiative," *International Journal of Methods in Psychiatric Research*, vol. 28, no. 2, p. e1752, 2019.
- [32] A. Riecher-Rössler, "Sex and gender differences in mental disorders," *The Lancet Psychiatry*, vol. 4, no. 1, pp. 8-9, 2017.
- [33] C. Kuehner, "Why is depression more common among women than among men?," *Lancet Psychiatry*, vol. 4, no. 2, pp. 146-158, 2017.
- [34] S. T. Sigmon, J. J. Pells, N. E. Boulard, S. Whitcomb-Smith, T. M. Edenfield, B. A. Hermann, S. M. LaMattina, J. G. Schartel and E. Kubik, "Gender differences in self-reports of depression: The response bias hypothesis revisited," *Sex Roles*, vol. 53, pp. 401-411, 2005.
- [35] J. Berger, R. Levant, K. McMillan, W. Kelleher and A. Sellers, "Impact of Gender Role Conflict, Traditional Masculinity Ideology, Alexithymia, and Age on Men's Attitudes Toward Psychological Help Seeking," *Psychology of Men & Masculinity*, vol. 6, no. 1, pp. 73-78, 2005.
- [36] J. Smith, G. Tran and R. Thompson, "Can the Theory of Planned Behavior Help Explain Men's Psychological Help-Seeking? Evidence for a Mediation Effect and Clinical Implications," *Psychology of Men & Masculinity*, vol. 9, no. 3, pp. 179-192, 2008.

