



Identifying common perceived stressors and stress-relief strategies among undergraduate engineering students

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Abstract

Mental health concerns have become a growing problem among collegiate engineering students. To date, there has been little research to understand the factors that influence student mental health within this population. Literature on engineering student mental health supports the idea that engineering students experience high levels of mental health distress, which often stems from stressors such as academic workload, maintaining a strong grade point average (GPA), and pressure from parents and/or professors. Of particular concern, distressed engineering students are less likely to seek professional help when compared to students in other majors. As a result, a comprehensive study was conducted on engineering mental health help-seeking behavior. Through secondary analysis of the data from that study, this work aims to identify common perceived stressors that may contribute to mental health distress, as well as perceived coping strategies that may be used instead of seeking professional mental health help.

A diverse group of 33 engineering undergraduate students were a part of the comprehensive study on engineering mental health help-seeking behavior. For this study, qualitative data was analyzed to address two specific research questions: 1) What are the main sources of stress that engineers have experienced in their engineering training? and 2) What coping strategies have students developed as an alternative to seeking professional help? Several common perceived stressors were identified including an unsupportive and challenging engineering training environment, challenges in time management, and academic performance expectations. Perceived coping strategies identified include relationships with family, friends, and classmates and health and wellness activities such as exercise, mindfulness, and maintaining spiritual health. The results of this work will be helpful in recognizing ways to improve engineering education and increase student support.

Introduction

Engineering has historically been a demanding and rigorous field of study. It involves a competitive curriculum that creates extreme stress for many students. As stress is an inevitable part of college, a healthy amount contributes to a students' academic and personal success [1]. However, high levels of constant stress can be detrimental to students' mental health, leading to depression, anxiety, and other psychological distress [2]. Additionally, stress has been identified as an early indication of undergraduate students' risk for a mental health concern [3]. An estimated 10.7% of people worldwide face mental health issues daily, with 3.4% suffering from anxiety [4]. This is more exaggerated in college students, with a reported 35.3% of students facing a mental health disorder globally in 2018, with anxiety disorders coming in at 23.6% [5]. As a result, it is integral that the causes and treatment of mental illness are investigated and understood thoroughly, especially in a college setting.

Within engineering, several studies have looked to quantify the prevalence of mental health disorders [5-10]. For instance, a study of 800 engineering students found that approximately 38% were at high risk for one or more mental health concerns [7]. 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 [11]. Studies have also found that female and first-generation [9], and female and gender minority [10] engineering students were more likely to report symptoms of mental health distress when compared to their peers. Further, analysis of mental wellness during the Covid-19 pandemic indicated that stress levels for Latinx and international students were significantly higher than the baseline population, indicating a differential impact of the pandemic on student stress levels [12]. Within the engineering student population, those students reporting symptoms of mental health distress are less likely to have sought professional help compared to their non-engineering peers [13]. While stigma has been found to correlate with lower help-seeking attitudes within engineering students, results were not significantly different from the non-engineering student population [14]. Concerningly, distressed engineering students were less likely to know where to go to seek, and more likely to believe in the negative stigma surrounding mental health treatment when compared to non-distressed peers [10]. Because engineering students have negative perceptions about help seeking, understanding the alternative coping strategies that students use could be important for improving student support.

Broad statistics on mental health and wellness in college students provide an important perspective on the mental health challenges facing students but do not provide insight into the potential cause of this distress. It is important to understand both the broader impacts of stress on college students as well as the struggles that specific populations endure so that targeted intervention strategies may be employed. With this study, we aim to better understand the perceived stressors that impact engineering students and the strategies that they have developed to cope with stress.

Literature Review

When a student enters college, they face personal stressors such as living away from home or sharing a room for the first time. Throughout college, they continue to encounter stressors related to platonic and romantic relationships, paying for their education, peer pressure, and finding a healthy work-life balance. In response to these stressors, students develop stress management strategies in an attempt to reduce the impact of perceived stressors on their well-being. The Lazarus Theory identifies two key concepts associated with stress theory: appraisal and coping [15]. Through appraisal, an individual evaluates the significance of perceived stressors and the potential influence they could have on their well-being. In response, the individual establishes coping actions which aim to reduce the impact of the stressor [16]. Coping can be categorized as problem-focused coping (attempting to change the reality behind the negative emotion or stress) and emotion-focused coping (attempting to reduce the negative emotional state) [16]. Through the Lazarus Theory, coping actions encompass both behavioral changes (stress reduction strategies) and reactive coping strategies [16]. To understand how to train students to better manage and cope with stress, it is first important to understand common perceived stressors and strategies for coping with stress.

Perceived Sources of Stress

In a quantitative study of undergraduate students, perceived stressors that were identified include social activities, working with people you don't know, changing sleep habits, changing eating

habits, increased class workload, lower grade than anticipated, being placed in an unfamiliar situation, and change in living environment [3]. Of these, change in social activities, working with people you don't know, change in sleeping habits, and lower grade than anticipated were significantly related to symptoms of depression [3]. At a U.S. Hispanic Serving, gender and sense of control over one's life were correlated significantly with academic stress [17]. Males and females differed significantly on the levels of the academic stressors that they faced, with men being more sensitive to frustration, conflict, and appraisal stressors, while females faced more pressures, changes, self-imposed, physiological, emotional, and behavioral stressors [17]. These findings further highlight the need for a deeper understanding of the variations of stress that college students may face.

While engineering students face many of the same stressors as students in other majors, they, like any other subgroup, face their own unique individual stressors. This unique environment has been described in papers that focus on engineering culture as “suffering and shared hardship” with a “bootcamp mentality” [18], a “meritocracy of difficulty” [19], and a “culture of stress” [9, 20]. In particular, the academic rigor of engineering programs has resulted in engineering being labeled as “hard,” not only due to the difficulty but also due to the traditional Eurocentric masculine norms associated with engineering [18]. It has also been noted that a stress culture was dangerous for the mental wellbeing of students because stress being perceived as the societal norm may exacerbate the amount of stress that is in the group, inducing stress on the individuals, as well as making students think that their stress is not “bad enough” to seek help [9].

It is also worth noting that stressors have changed dramatically for college students in recent years due to the onset of the COVID-19 global pandemic. This has had a large impact on the function of educational institutions worldwide, and thus has induced its own stress on students. A study of 527 students at the University of Toronto looked at changes between student stressors at the start of the pandemic and four weeks into the pandemic [21]. Stressors identified as a result of the pandemic include difficulty concentrating, establishing new routines, lack of motivation, logistical problems with online learning, loneliness, financial concerns, missing friends and family, and change in sleep [21]. Within the engineering student population, the most common stressors faced by students were change in social activities, change in school/housing conditions, changes in sleep and changes in eating [12]. While some of these are similar to the stressors seen in typical college semesters, many are a reflection of the variety of methods of course delivery and social isolation due to the onset of the pandemic.

Perceived Coping Strategies

Coping strategies provide an outlet for students to relieve stress which can promote well-being and academic success. They help mediate the effects of academic and non-academic stress on academic performance [1], as well as positively impact undergraduate students' cognitive motivation and achievement [22]. Students who have an outlet to relieve stress are likely to have more personal control and self-efficacy, leading to lower mental health distress [22].

To combat the stress that students face through their college careers, students develop a multitude of coping strategies. A study of undergraduate students found that the coping strategies employed by students were physical activity, nutrition, spiritual growth, and social support (parent and peer)

[23]. In a study looking at gender differences in stress and coping mechanisms, women were more likely to utilize emotion-focused coping strategies such as self-distractions, emotional support, instrumental support, and venting [24]. The strategies that women employed were more passive than men, which has been associated with lower self-esteem and lower perceived well-being [24]. Within engineering, few studies have specifically looked at perceived coping strategies. In a study on engineering culture, the importance of relationships for “academic survival and success” has been highlighted, with relationships resulting in a greater sense of belonging within engineering [18].

In the COVID-19 era, specific coping strategies have arisen in addition to the ones seen typically in a college environment. A study found that COVID-19 resulted in an increase in coping strategies such as establishing a new routine, physical exercise, cooking, eating well, maintaining community (remotely or in their household), maintaining social connections, and trying new activities or hobbies [21]. One study of engineering students who practiced yoga and meditation through the pandemic found these practices could support aspects of student mental health [25]. Though not the focus of this paper, the study also found that engineering coping strategies include exercising, getting outside, and reading among others [25].

Research Objectives

While there is significant literature on perceived stressors and coping strategies in the general college population, the literature on these topics in an engineering context is more broadly focused around engineering culture. Furthermore, research has aimed to characterize the impact of the perceived high stress engineering major on student mental health, but few studies have looked specifically at identifying perceived stressors and coping strategies within this student population. Therefore, this study aimed to address the following research questions:

- 1) What are the perceived stressors that impact engineering students?
- 2) Besides seeking professional help, what perceived coping strategies are engineering students using to cope with stress?

Methods

Participant recruitment

As part of a comprehensive study on engineering undergraduate mental health help-seeking, a total of 33 undergraduate students enrolled in the University of Kentucky College of Engineering were interviewed about their beliefs related to seeking help for a mental health concern [26]. Students were recruited to participate in the study through two strategies: 1) through select courses that were distributed across engineering major and year of study and 2) through student cultural and identity-based engineering organizations (National Society for Black Engineering, The Society of Hispanic Professional Engineers and STEMgiQueers). Those students who were interested in participating were asked to complete a pre-screening survey. This survey included questions related to prior mental health service utilization, psychological distress, major and other demographic variables. Purposeful stratified sampling was then used to invite students to participate in the interviews, with

care taken to ensure representation of varying sociodemographic characteristics (Table 1), and educational background (Table 2).

Table 1. Sociodemographic characteristics of interview participants (N = 33), as disclosed in the pre-screening surveys and through the interview process ^(a).

	Full sample	
	<i>n</i>	%
Physical disability ^a	1	3
Diagnosed mental health concern ^a	2	6
Bisexual ^a	1	3
Queer ^a	1	3
Veteran ^a	1	3
Gender		
Man	15	45
Nonbinary/Genderfluid	4	12
Woman	14	42
Race		
Asian	8	24
Black	1	3
Bi/Multiracial	5	15
LatinX	2	6
Native	1	3
White	16	48
Previous psychological treatment	10	30
No previous psychological treatment	22	67

Table 2. Educational background of interview participants (N = 33), as disclosed in the pre-screening surveys.

	Full sample	
	<i>n</i>	%
Major		
Mechanical	7	21.2
Chemical	8	24.2
Materials	4	12.1
Electrical	3	9.0
Computer Science	3	9.0
Civil	2	6.0
Mining	2	6.0
Biosystems	2	6.0
Biomedical	1	3.0
Computer Engineering	1	3.0
First generation	9	27.2
Number of years in Engineering		
1<	5	15.1
1	8	24.2
2	6	18.1
3	9	27.2
4	5	15.1
International student	3	9.0

Students were characterized as “lower-level” if they had completed 2 years or less in engineering. They were considered “upper-level” if they completed more than 2 years in engineering.

Data collection

Each student was invited to participate in a 60-minute semi-structured interview through Zoom. Participation in the interview was completely voluntary and each student received a \$50 Amazon gift card as an incentive for participation. Data was collected between October 2020 and May 2021. Before starting the interview, the research assistant explained the purpose of the research study and obtained verbal consent for participation in the interview. Audio recordings from the interviews were first transcribed using the Microsoft Office Suite transcription feature before being edited by a research assistant on the project. The current study focused on two questions related to perceived stressors in engineering and alternative coping strategies to seeking help from a mental health professional:

1. What are the main sources of stress that engineering undergraduates have experienced in their engineering training?
2. What coping strategies have students developed as an alternative to seeking professional mental health help?

Data analysis

Qualitative analysis of the data was completed by two White, female, undergraduate, chemical engineering students using MAXQDA coding software. Inductive coding was used to identify

perceived stressors and coping strategies. First, the two undergraduate students separately coded the same segment of each interview. Second, the two students discussed and modified the codes during multiple meetings in the coding process until a final codebook was created. Codes were then grouped into themes that were common within the data. Interrater reliability was checked three times during the coding process and before creating themes from the data to establish agreement in the coded segment. This reliability was improved through comparison and discussion of the coded segment until > 80 percent agreement was achieved.

Results

Qualitative coding of the interviews resulted in 23 codes for perceived stressors and 22 codes for perceived coping strategies. Codes were grouped under five themes: 1) unsupportive and challenging engineering training environment creates stress, 2) time management creates stress, 3) academic performance expectations create stress, 4) relationships are used as a coping strategy, and 5) health and wellness is used as a coping strategy.

Theme 1: Unsupportive and challenging engineering training environment creates stress

Participants mentioned that the high intellectual demands of their engineering training act as a major academic stressor. The demand of the course load, including the rigor of assignments and the sheer amount of work that engineering courses require, was a stressor mentioned by almost every participant. Additionally, the lack of coordination across courses results in periods of high workload that can seem unmanageable.

I'd say a lot of assignments in too little time, so a lot of the core classes end up having exams in the same week, sometimes even the same day; and so there's kind of a lull between those exams and tests. And then leading up to the week where there were both tests, it gets really stressful just. And then there's also homework on top of studying for the exams, so it's just a lot of work in too little time. (Upper-level student, Chemical Engineering)

In addition to the general course load, they discussed the difficulty of assignments, especially exams, and the challenges associated with group work.

Uh, I mean, obviously we have kind of difficult coursework with math and science and stuff. There's usually, you know, exams that are pretty high stakes that it's either right or it's wrong I also see just the group project and the teamwork side of engineering can get a little bit nasty, especially if you start having conflicts with those people because those groups are almost always assigned. So that's one thing that, you know, can be a very positive experience, but I can also see causing a lot of stress. (Lower-level, Computer Engineering)

They also included how this pressure to achieve high grades and maintain their GPA contributes to the competitive atmosphere that engineering students experience. This competitive atmosphere can impact the sense of community amongst engineering students and prevent them from establishing a support network amongst their engineering peers.

Along with just like the competitiveness and everybody is trying to be the best of the best, and so that that puts a lot of stress on your performance and how well you do. (Upper-level student, Chemical Engineering)

I would say there is some stress from, just like a general, it's very...even when it's kind of unsaid, there's a very competitive atmosphere. (Upper-level student, Mechanical Engineering)

Although course load is stressful on its own, the additive nature of academic enrichment stressors makes it more unmanageable. Students put significant time into finding internship and co-op experiences in response to the pressure students face about gaining applied experience prior to graduation.

So just the class load is overwhelming, but honestly, if it was just that, I wouldn't really have a problem. I don't think most people would have a problem, but there is, you know the career side of things. So, I guess just the way engineering is now. It's like you really need Co-op and internship experience before you graduate. To be able to get into industry or job. Yeah. So really, it's kind of like you're doing school, but you're also looking for a job at the same time, and that has been pretty overwhelming for me in the past few years like; I gotta take care of my classes, but I also need to make sure my resume is up to date. I need to go see the career advisors I need to take time out of my schedule to apply for these positions, which a lot of applications I mean they can be a lot sometimes. And really, this idea of like spreading your net wide to be able to get an opportunity to take a lot more time. (Upper-level, Chemical Engineering)

Theme 2: Challenges in time management create stress.

Participants attributed a lot of their stress to the time management that is required of engineering students. Homework can be extremely time consuming both within engineering and outside of their specific major.

A lot of the classes that I've taken are very, very time consuming—physics problems, statics, solids. One problem can take up to 30 minutes even if you know what you're doing. (Lower-level student, Civil Engineering)

As a result, learning time management and finding a healthy work-life balance can feel almost impossible.

And so, it was like trying to strike that balance between like, of course, making sure that school is your top priority, but also making sure that like you aren't wasting four years of your life like burying your nose into a book. But also realizing that like these four years are leading to the rest of your life, like it's a very difficult balance to kind of learn how to strike. And I think it's really easy to be going too far into one [direction] or the other. (Upper-level student, Materials Engineering)

Students who feel like they cannot maintain a healthy work-life balance discussed how it impacted their sleeping and eating habits.

And then besides that, studying, staying up, like having a healthy work life balance is also a stressor because studying... I study at least, I would say 14 hours. Let's say 13 or 14 hours a day. And I eat, my eating habits are very irregular. My sleeping habits I get less than six...five to six hours of sleep a night, so I know that it's taking a toll on my body, so it's bad. (Upper-level student, Mechanical Engineering)

While students might be willing to forego a work-life balance during their undergraduate career, it can have long term impacts on their mental and physical health. As it stands, many students talked about not being able to prioritize stress relief in their schedule.

It really gets bad whenever, you know, things get really hard and you spend, you know, most of your day awake just like studying or doing homework and stuff like that. You don't really have time to go out and relieve some of that stress, and it really just builds up. (Upper-level student, Mechanical Engineering)

Helping undergraduate students to develop a healthy lifestyle and prioritize their personal well-being during their engineering training can have a positive impact on the engineers entering the workforce.

Theme 3: Academic performance expectations create stress.

Participants expressed that high academic expectations from others is a common stressor in their engineering education. Engineering professors often have very high standards for their students. These standards sometimes seem unattainable and can leave a student feeling disconnected and discouraged.

Oftentimes, you know I've had professors who are comfortable with the average being a 50, and you know, that they're not adjusting themselves. They expect the students to adjust, so I would say there's expectations from professors, students and employers that I experience on a day-to-day basis. (Lower-level student, Biosystems & Agricultural Engineering)

But also, one of the other big stressors that I personally have experienced is professors who expect--I don't want to say expect perfection--but professors who grade very harshly. They aren't willing to give you very much partial credit and whatever. (Upper-level student, Mechanical Engineering)

Expectations from parents or family members to perform equally as well in college despite increased rigor and demand of courses creates additional stress for students.

Uhm, probably parental is number one. We're just, uh, well I've basically since I was in like elementary school I've always been in like the like gifted track or whatever. And it basically made it so that once I stopped being ahead of everything, my parents expected the same level. And then I was still like in these advanced classes, and I was floundering. And I managed to keep it up, but I was never able to like to recover the same level of like I guess academics of just being able to completely cruise to everything really, really easily. Said the first time I got like B's, my report cards I remember getting like talked to by my parents and it was kind of weird because I was like, well, this is still like a pretty good grade in my eyes. I don't know what's so weird about this, but...Yeah it was kind of weird in that regard. (Lower-level student, Computer Science)

There is also pressure from the engineering community to obtain an internship while balancing other demands as students.

And I do surround myself with a lot of people who are like still 4.0 students and just the feeling like I'm falling behind, I guess, like there's so much priority on getting like a Co-op or getting an internship and you know, I just want to be involved in everything I can. (Lower-level student, Biosystems & Agricultural Engineering)

This intense pressure to perform well academically while also pursuing external opportunities can hinder a student's ability to cope in difficult situations leading to burnout and physical and mental distress.

Theme 4: Relationships are a coping strategy.

When asked about their coping strategies, many participants spoke about how important it was for them to maintain relationships with their friends and family. It was particularly important for them to use these relationships as an opportunity take a break from the demands of engineering training.

Uh, just spending time with friends was really helpful, and one particular thing I think of is in November, all my friends and I were really like stressed out, especially because of election was happening, and so we had that like one Monday off. We decided that was the day we were going to take, and we went hiking and had a picnic and that was just very freeing because we had like a pact that we were not going to talk about any school and not going to talk about any politics the entire time. So, we were able to just relax and take in the fall air and climb – all the like rocks and stuff, I had never experienced like mountains and hills like Kentucky has. So, that was a very fun experience, and it was a good social bonding time, but also good at just like completely clearing our heads out. (Lower-level student, Computer Engineering)

While taking a break from engineering is important, having a network of peers within engineering allows students to talk about their challenges and work through them together.

I would say 90% of my like peer network are all engineers, so we kind of and I would say throughout the week that's the only people I talk to. You know, on the weekend I'll hang out with other people, but studying together and being vulnerable with those people kind of helps me. Like I can talk to them, and I don't feel like cut off from them. So, I'll talk to them about when I'm stressed and they can kind of help me through it. And you know, it's all--I'll do it for them, and we have that together. (Lower-level student, Biosystems & Agricultural Engineering)

This community of family, friends, and peers can provide students with a diverse support network and provide a break from their demanding and rigorous undergraduate training.

Theme 5: Health and wellness activities are coping strategies.

Many students talked about the importance of having outside activities that contributed to their health and wellness. These ranged from artistic hobbies like crocheting or journaling to reading, watching movies, taking care of plants, and hanging out with friends. Additionally, several

participants mentioned engaging in wellness practices like mindfulness meditations and exercise to relieve their stress.

So, either reading a book or just sitting back, taking a nap, something like that, something very simple that's not putting another, longer stress. (Upper-level student, Electrical Engineering)

I feel like a nice like cup of tea and just like relaxing, staying outside, and just having like a little bit of time like a little bit of time to myself that I do have and then taking that and appreciating that. (Upper-level student, Chemical Engineering)

Some students talked about giving themselves positive reassurance about a bad grade or resetting their mindset prior to going into an exam.

And a lot of it's also just been self-coping and remembering, for example, that like in some classes a 75 or 80 isn't bad. It's OK, we can move on. (Upper-level student, Electrical Engineering)

My psychology teacher in high school...told me it was more beneficial before an exam, instead of cramming or something...it's more important to you know, laugh or something to be happy. So, whenever I'm studying, I always take breaks and watch like a little funny video or something just to, you know, something to something to make me laugh or something. (Lower-level student, Chemical Engineering)

In addition to reframing mindset, maintaining spiritual health allows students an opportunity to focus on self-care and mentally and physically recharge.

Those are huge for me, just taking care of my spiritual health. That's it's something that gives me a lot of grounding. (Lower-level student, Biomedical Engineering)

Finally, several students mentioned they enjoy getting fresh air and exercise to reduce their anxiety and stress.

Just going outside, getting fresh air and getting a little bit of exercise. (Upper-level student, Mechanical Engineering)

I've noticed, um, exercise was something that I've like never intentionally did. But as it being part of how I got around campus, that became a way that I was able to actually relax a little bit and have a little bit of fun, because I bike to all my like mid-range classes that aren't too far away. (Lower-level student, Computer Engineering)

Having an outlet or activity to routinely relieve stress, mentally recharge, and cope with the challenges of an engineering curriculum can prevent prolonged stress on students during their training and prepare them for a career in engineering. Of all of the students that were interviewed, all but one was able to discuss positive coping strategies for stress relief.

Discussion and implications

Through this work, we were able to identify three major themes associated with perceived stressors: 1) unsupportive and challenging engineering training environment creates stress, 2) challenges in time management create stress, and 3) academic performance expectations create

stress. These themes were in line with prior results presented on coding of the first seven interviews associated with this study [26]. Based on the literature review, it is clear that these perceived stressors are not unique to engineering. That being said, they do highlight the impact of the rigorous engineering training environment on student stress levels. In particular, a majority of the stressors identified were around academic expectations, whether it be the workload demands associated with their classes or the self-imposed or externally imposed (professors, parents, employers) expectations for academic success. This is consistent with the literature that highlights the academic rigor and difficulty associated with engineering culture [18, 19]. While it is not possible to remove all rigor from engineering programs, students talked about challenges navigating the curriculum when there was little organization of deadlines across courses and each professor held students to extremely high expectations. In recognizing the impact that this can have on student well-being, faculty can aim to better utilize student time and empathize with the challenges that students face due to the rigorous engineering course load.

We also identified two major themes regarding perceived coping strategies. In response to the stress experienced in their training, students talked about the importance of relationships and health and wellness strategies to relieve stress. Relationships with students from diverse majors especially helped students to prioritize taking breaks from their academics to enjoy time with their peers. Additionally, students talked about the significance of having relationships with other students in engineering because it gave them the opportunity to talk about stressors that are unique to the engineering training environment. This is consistent with the literature on engineering culture, where student-student and student-faculty relationships were highlighted as important for making it through the academic rigor, as well as developing a sense of belonging in engineering [18]. It is important for faculty to talk to students about developing strong relationships and how building a network within the engineering student community can help them through the engineering training experience.

For this study, we specifically asked students to identify stress relief strategies that they might use as an alternative to seeking help from a mental health professional. As a result, many students identified behavioral coping strategies that focused on improving their health and wellness. These ranged from physical activities such as exercise and hiking to mental activities such as reading and maintaining spiritual health. Because the culture of engineering is high-stress and academically demanding, having outside activities that can provide stress relief is important. Therefore, it can be helpful for engineering faculty to encourage students to become active in student organizations and activities that help to encourage them to take breaks from academic demands. Additionally, faculty can share their own experiences and hobbies to help to normalize prioritization of mental health and wellness within the engineering community.

Because this study focused on coping strategies as an alternative to help-seeking, there were few coping strategies identified that related directly to coping with academic stressors. Because of the high impact of academic stress of engineering student success, it is also vital that students learn coping strategies that allow them to directly tackle the academic stressors that they are experiencing. For instance, encouraging students to manage their time and use effective study strategies has been shown to increase student motivation and performance [27]. Thus, faculty and

administrators could encourage students to utilize campus resources such as academic coaching to get support in developing such strategies.

As discussed by Jensen and Cross [19], one concern about a high stress training environment is the normalization of stress can result in increased stress within a group. Additionally, students may not be able to recognize when their stress crosses over into distress, or their threshold for identifying distress could be inflated. On a positive note, all but one student interviewed through this study had alternative coping strategies that they used to help manage stress. However, many students talked about the challenges associated with maintaining these coping strategies while meeting academic demands. This could perhaps be addressed through building a culture in engineering that fosters a supportive environment for mental health and wellness. Students often discussed the pressure that they felt to succeed academically and prioritize their time for academics and studying. If faculty were to integrate discussions about mental wellness and self-care into their classroom, it could give students permission to prioritize themselves, not just their academic performance.

Limitations and future directions

It is important to understand how the student experience and institutional context could influence the results presented through this paper. While recruitment for interviews was intentional to represent the diverse identities of students within engineering at this institution, approximately 50% of those students interviewed were White. As a result, the findings presented most strongly generalize to this population. Additionally, the students interviewed through this study were from a large, public, predominantly White research institution located in the Southern United States. It is likely that the perceived coping strategies of students are significantly impacted by institutional context, especially with regards to aspects such as rurality, geographical location and community culture. Therefore, it would be important to understand how these findings generalize to students at other institutions, as well as how specific marginalized populations within engineering programs experience stress.

Because the interview focused on identifying stressors that engineering students experience related to engineering training, it is not overly surprising that few students talked about stressors that impacted them outside of their schooling. Moving forward, it would be interesting to look more broadly at the stressors impacting engineering students to get a better overall picture of the student experience. Several students talked about the additive nature of stressors within engineering. Therefore, it would be important to also understand stressors that students are experiencing that are not directly related to their training.

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