



Experiences of Undergraduate Computer Science Students Living with Mental Health Conditions

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ABSTRACT

Along with the growing number of students with disabilities in higher education comes an opportunity to explore the difficulties they experience, especially in the post-pandemic era, as well as how to better support them, thus making post-secondary education more inclusive. A considerable amount of research has been done in providing accommodation for students with physical disabilities, but other hindrances to accessibility such as mental health conditions are prone to be overlooked, perhaps in part due to the stigmatization and subjective invisibility of this topic, specifically in rigorous, competitive fields such as Computer Science (CS).

In order to bridge this gap, we conducted a nationwide survey in which 53 undergraduate CS students who identify as living with a mental health condition shared their experiences in their CS courses, instructor and TA office hours, interactions with other students, and the rest of the field. This paper summarizes the most common negative and positive experiences, as well as respondents' recommendations for CS instructors, including recognizing these students' struggles, making themselves approachable, and providing flexible formats of lectures and office hours. The results of this study provide a glimpse of the academic lives of CS students living with mental health conditions, so that CS instructors could foster a more inclusive environment by supporting more students in their paths of pursuing higher education.

CCS CONCEPTS

• **Social and professional topics** → **Computing education.**

KEYWORDS

mental health; mental illness; anxiety; depression; wellness; well-being; diversity; broadening participation

ACM Reference Format:

Jie Ji, Christian Murphy, Brianna Blaser, and Jennifer Akullian. 2024. Experiences of Undergraduate Computer Science Students Living with Mental Health Conditions. In *Proceedings of the 55th ACM Technical Symposium*



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SIGCSE 2024, March 20–23, 2024, Portland, OR, USA
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ACM ISBN 979-8-4007-0423-9/24/03.
<https://doi.org/10.1145/3626252.3630846>

on *Computer Science Education V. 1 (SIGCSE 2024)*, March 20–23, 2024, Portland, OR, USA. ACM, New York, NY, USA, 7 pages. <https://doi.org/10.1145/3626252.3630846>

1 INTRODUCTION

In addition to the physical and economic impact of the outbreak of COVID-19, the pandemic brought about serious mental health concerns, as evidence suggests significant increases in anxiety and depression during this time [7]. Specifically, the pandemic has looming negative impacts on the mental health of college students, including increases in major depressive disorder, generalized anxiety disorder, and mental health disorder rates compared to previous years [5][29][32]. However, the growing concern around college students' mental health is not only due to the pandemic. Nationwide longitudinal studies conducted on hundreds of campuses report that the mental health of college students across the United States has been declining consistently during the twenty-first century, with a substantial increase in anxiety and depression [2][17].

This is particularly an issue in rigorous, quantitative STEM subjects such as Computer Science (CS): even prior to the pandemic, research showed that undergraduate engineering students were nearly 10 times as likely to exhibit a high risk of what are considered serious mental health disorders compared to the U.S. adult population, and that Computer Engineering students were at the highest risk compared to students in other engineering fields [8]. Moreover, a 2020 study found that the prevalence of anxiety and depression symptoms was twice as high in CS students compared to other undergraduate students, and 5-10x higher than in the general population [22].

As our community seeks to make CS education more accessible, it becomes more and more urgent to address student mental health concerns and be inclusive of students who are living with mental health conditions (or “mental health disorders” or “mental illness”), by which we refer to the DSM-5 definition that includes not only neurodevelopmental disorders such as autism and ADHD, but also anxiety disorders, depressive disorders, bipolar disorders, and other mood disorders [3]. Although several studies [4][12][28] have looked at inclusive practices for students with physical disabilities in computing education, there has been little research on students with mental health conditions. Existing work has focused on particular learning disabilities, such as autism and ADHD [26][27][30], but the general experiences of computing students with mental

health conditions such as anxiety, depression, etc. is still an open question.

This paper is a continuation of investigating the current state of our inclusive practices for students with disabilities. Ultimately, we aim to broaden participation in the field of computing by promoting inclusiveness for students who are living with mental health conditions. This work seeks to answer the following research questions:

- **(RQ1)** What are the experiences of undergraduate Computer Science students who are living with mental health conditions?
- **(RQ2)** What suggestions could be made for CS instructors to foster inclusive spaces for these students?

In addition to answering these questions, our aim is to give a voice to students living with mental health conditions, and suggest directions for future research in this area.

2 RELATED WORK

Previous research has explored the experiences of undergraduate students living with mental health conditions from an educational psychology perspective. For instance, Kirsh et al. [14] looked at the relationship between one's self, the social environment, and the academic setting, and Markoulakis and Kirsh [18] developed a theory of students' difficulties and their influence on learning outcomes. However, these works have not investigated students' positive and negative experiences in a specific academic field, as we do here.

Other research has investigated the experiences of students living with mental health conditions from the perspective of faculty and assessing interventions. For instance, Wilson et al. [31] reported on faculty's experience in teaching students with mental health conditions in engineering departments. Savaglio and Spector [25] found in post-training interviews that a three-module faculty development program helps instructors promote an accessible environment for students with mental health disabilities, and O'Shea and Salzer [20] showed that increased perceived autonomy support in the classroom predicts higher levels of quality of life and recovery, and lower levels of distress.

While none of this previous work has focused on CS students specifically, others have looked into the experiences of students with physical disabilities in CS. For instance, Ladner et al. [15] and Ryoo et al. [23] have separately held panels consisting of CS students with physical disabilities to talk about their experiences, and Deibel [10] interviewed four students with physical disabilities and suggested applying new technologies to promote inclusion.

Despite all this important previous work, we are not aware of any research that considers the specific academic experiences of CS students living with mental health conditions, in the students' own words, as we present here. Furthermore, this research also provides insights on students' experiences in the post-pandemic era, which requires instructors to take new measures to accommodate students.

3 METHODOLOGY

In order to answer our research questions, we conducted a study in which we asked undergraduate CS students who identify as living with mental health conditions about their experiences in their CS

courses and the field of computing in general. This research was approved by the Institutional Review Board at the lead author's institution as protocol #22-043.

3.1 Recruitment

Data were collected using an online survey that was distributed nationwide in the United States via institutional partners of AccessComputing, an organization that aims to increase the participation of people with disabilities in computing fields. Partners were asked to forward the recruitment email to all undergraduate students in their department and/or CS classes, so that students could opt into the study if they felt they were in the target demographic, which we described in the call for participation as "undergraduates majoring in CS or a related subject who have completed at least two CS courses and identify as living with a mental health condition, however you define it, even if it has not been professionally diagnosed."

Note that we explicitly did not ask institutional partners to identify students who they knew or suspected were living with a mental health condition, so that students would not feel singled out or embarrassed by being recruited for the study, so that they would not feel coerced into participating, and so that participation would be entirely anonymous. Likewise, we did not list or give examples of mental health conditions in the recruitment email, so that students could self-identify and would not feel excluded if their individual condition did not meet the ones that were suggested.

Survey data was collected in May and June 2022. Participants were not compensated for completing the survey.

3.2 Survey Questions

Our survey consisted of seven questions focusing on participants' experiences in their CS courses, as shown in Table 1. Options for the multiple-choice question (Q1) are described in the Results section below. The survey was primarily based on interview questions that were used by other researchers to understand the experiences of university students living with mental health conditions [14], modified for CS-related activities, as well as a survey aimed at understanding sources of CS student struggles and factors affecting student outcomes [24].

As we sought to assure participants' anonymity, we do not know how many AccessComputing partners distributed the call for participation or how many students received it, so we do not know the response rate of the survey.

In order to provide as much anonymity as possible to the survey respondents, we did not collect any demographic or personally identifiable information aside from the type of institution that they attend, nor did we ask participants to identify their specific mental health conditions, as we did not want them to feel marginalized or distressed by being asked to do so.

3.3 Analysis

In order to analyze the responses to the open-ended survey questions, we used a phenomenographic approach [19] to create summary categories of negative experiences (based on survey questions Q2, Q4, Q5, and Q6), positive experiences (Q2, Q3, Q4, and Q5), and instructor recommendations (Q3, Q6, and Q7), so that we could

Table 1: Questions used in survey. All were open-ended except for Q1, which was multiple-choice.

Q1	In what type of institution have you taken most of your Computer Science courses?
Q2	How has your mental health condition affected your college life?
Q3	What are some moments when you felt included or supported by your CS instructors throughout your years of studying in school thus far?
Q4	What are your experiences working with your CS Teaching Assistants, for instance through TA sessions, office hours, labs, etc.?
Q5	What are your experiences with going to your CS instructors' office hours?
Q6	What are some moments, if any, when you felt uncomfortable in your interactions with other people in CS?
Q7	What advice would you give to a CS instructor for working with students with mental health conditions?

present summaries of each. The procedure was as follows: First, the two lead authors independently reviewed all survey responses to identify emerging categories and themes, ensuring that there were at least two responses in each; responses may have been placed into multiple categories. Then, we discussed the categories and iteratively refined them, including the identification of further categories, until consensus was reached. Due to space constraints, in this paper we only present the four categories with the largest number of responses for the negative and positive experiences. However, we present as many categories for recommendations as space permits, so that we could provide as much actionable takeaway as possible for the reader.

We acknowledge that other approaches to evaluating the survey responses may have yielded different categories or outcomes, but given the relatively small sample size and the extent to which the reviewers agreed on the most common themes, we suspect the assessment would not have been substantially different, particularly as our focus is on students' perspectives and what each of them has experienced, and not necessarily how prevalent those experiences are among respondents.

4 RESULTS

We received 53 survey submissions, all of which were complete and valid, i.e. all questions were answered with responses that related to the prompt.

Regarding the type of institution asked in survey question Q1:

- 8% (4 responses) were from two-year colleges, e.g. community college, junior college, vocational/trade school, etc.
- 53% (28 responses) were from four-year colleges, i.e. those that offer Bachelors degrees and a small number of Masters programs, if any
- 38% (20 responses) were from universities, i.e. those that offer Bachelors, Masters, and PhD programs
- one participant did not answer

Although we did not ask participants to identify their specific mental health conditions, 17 disclosed their conditions through their responses to the open-ended questions: eight mentioned ADHD/ADD, six mentioned anxiety, four mentioned depression, three mentioned autism or Asperger's Syndrome, one mentioned PTSD, and one mentioned bipolar disorder.

In order to answer our two Research Questions – "What are the experiences of undergraduate Computer Science students who are living with mental health conditions?" and "What suggestions could be made for CS instructors to foster inclusive spaces for these students, according to their responses?" – we analyzed the responses to the open-ended questions in the survey about how students felt in their CS courses and about their interactions with other members of their CS community. The remainder of this section presents our summary of the main categorizations of the responses, organized into negative experiences, positive experiences, and recommendations.

4.1 Negative Experiences

Based on the responses to survey questions Q2, Q4, Q5, and Q6, this section summarizes the most common negative experiences and provides supporting quotes from the survey responses. [*Content warning: This section of the paper contains references to suicide.*]

4.1.1 Distress from psychiatric symptoms. Students' mental states can have a substantial effect on their academic performance [14]. For basic tasks like completing assignments, many students living with mental health conditions may struggle because of the lack of motivation brought by "feelings of despair or lack of hope for the future", as one participant specified. Another participant pointed out that even attending lectures is itself already challenging:

- "The actual act of going to class was usually the challenging part, just finding the motivation is just an extreme struggle for me unfortunately as I also have a very mentally self destructive mindset when going through a really hard time with my depression."

For those who manage to attend classes, the sudden onset of "depressive episodes" and "panic attacks" that two participants mentioned, for instance, makes it harder to focus.

From these responses, we can infer that students with mental health conditions often need to make extra effort to overcome various barriers when it comes to attending class and in finishing tasks that their peers find routine.

4.1.2 Social interactions. Common conditions like social anxiety affect not only students' interaction with peers, but may also hold students back from seeking academic help from Teaching Assistants and instructors [13]. Regarding TA hours, one participant wrote:

- "I understand that they are there to help students understand the required material, but my worries about social interactions kept me from visiting them for academic needs."

The idea of going to instructors' office hours may induce even more stress, as instructors' authority could create a mental barrier:

- "I've had good interactions during professor office hours, although generally I'm hesitant to go to them unless it's required or I have a very specific reason to go because it's

intimidating to not know what to say or feel like wasting their time."

- "Way too nervous to do this. I psych myself out each time."

Furthermore, transitioning back to in-person lectures from the pandemic-era online format was an extra social challenge for some students in our survey, and became more difficult when instructors didn't exhibit empathy:

- "Most of the professors I had at the time weren't empathetic towards students at all even though we were all going through the pandemic it's even harder now being full time in person when you were online for so long with no human interaction."

Based on all the concerns above, we could surmise that these students tend to work on assignments by themselves, thus hindering their efficiency, feelings of belonging, and engagement with the material. Further, students who are prone to stress and anxiety may be at a disadvantage in terms of networking and finding jobs and internships.

4.1.3 Microaggressions and further marginalization. Another prominent theme that emerged in the responses is the plight of students who identify as women or non-binary. These students already experience unfair treatment in many aspects of their academic pursuits [16], and we can see that many are further marginalized as students living with mental health conditions. In a field historically dominated by cis-gendered men, many participants who mentioned in their responses that they identify as women or non-binary indicated that they have felt uncomfortable in their interactions with classmates, TAs and instructors:

- "Mainly because my professors were male and I am female – I am not completely comfortable with men and my male CS instructors were clearly not comfortable with a female student. And because there was already this strange unspoken barrier, it was impossible to consider discussing my academic struggles that were linked to my poor mental health."
- "I once had a male professor in a very male gender dominated class. It was an upsetting experience because I never interacted with another woman and I was often made very uncomfortably aware of my position as a woman in that class."
- "As a female-born non-binary person in a field dominated by men, many of the men who visit my [TA] office hours are rude to me or degrade me or don't believe me to be capable."

Because of the constant exposure to unpleasant social interactions, women and non-binary students may tend to abandon the CS major [16], or perhaps even drop out of co-ed universities, which creates a vicious cycle that leaves the CS major in co-ed universities with less representation of this population.

No survey participant mentioned other aspects of their identity that are typically marginalized in CS, e.g. race or sexuality, but we can assume that the threat of additional marginalization exists for these students as well if they also identify as living with a mental health condition.

4.1.4 Lack of awareness of mental health conditions. As mental health conditions are sometimes considered an "invisible disability" [9], instructors may overlook the necessity of acknowledging

this group and their struggles, which opens the possibility of classmates and the instructors themselves making triggering comments. One participant shared their experience when an instructor didn't properly address a sensitive comment in class:

- "One time in class there was a lecture about object oriented programming. the teacher used the example of a toaster and asked what it could be used for to give an example of methods. one kid said 'bathtub suicide'. the professor didn't really say anything except 'I'm going to pretend i didn't hear that'. which is not an acceptable response to that. This made me feel really angry and sad because suicide has been a big part of my life for the last few years."

As long as this issue is not properly addressed, students with mental health conditions could be exposed to additional distress by what happens in the classroom.

4.2 Positive Experiences

Although survey participants did indicate that they had many negative experiences in their CS courses, they also described positive experiences that made them feel supported by their instructors, too. This section summarizes the most common positive experiences and provides supporting quotes based on responses to survey questions Q2, Q3, Q4, and Q5.

4.2.1 Actively checking in. Due to stigmatization and unpredictable onsets of symptoms, it is difficult for students with mental health conditions to notify instructors about their situations when issues arise, even when they want to keep up with the class. At times like this, students often appreciate that instructors actively reach out to them after noticing signs of absence or disengagement. To know that they are recognized and valued by instructors would help them gather determination to finish the course:

- "When I missed a couple classes in a row without any reporting of it, a professor reached out to say he noticed and it was okay, but he was looking forward to have me back in class. That meant a lot."
- "I have had some professors who have noticed subtle changes in my behavior and have reached out to check in with me, which I greatly appreciate."

4.2.2 Academic arrangements. Although students at US institutions living with mental health conditions, or "psychiatric disabilities," are entitled to academic accommodations according to the Americans with Disabilities Act [1], typical accommodations for things like exams, assignments, and classroom settings may not be sufficient for students who cannot reasonably predict when and how their symptoms will arise. Furthermore, such accommodations are typically only granted when the condition has been diagnosed by a medical professional [21], which may raise challenges for students who cannot afford such a diagnosis, feel there is a stigma around their condition, or may not even realize they have such a condition.

Thus, students are appreciative when instructors provide built-in flexibility in assignments and exams, which eases the pressure of having to explain their situations to their instructors so that they can manage their symptoms when needed:

- "The most impactful form of support I have received from professors is extensions/accommodations which I did not ask for. On a few occasions, professors gave me the benefit of the doubt and were unreasonably flexible despite my not communicating why I was struggling to participate in the course or complete assignments. This was crucial because I would not have reached out for help on my own."
- "A lot of the time I didn't even need to ask for an extension because they could see that I need one which was helpful in that my anxiety didn't make it hard to ask."

4.2.3 Online resources. Considering the challenges that were raised above about finding motivation to attend classes and pressure around interactions with instructors, we find that providing online resources and options has been helpful to many survey participants.

Recorded lectures and providing printed materials allow students who are unable to focus while listening to choose the format in which they feel the most productive. More directly, it could help students who sometimes were unable to attend class because of their mental health conditions to catch up with course material on their own time.

Participants also pointed out that online office hours are more efficient for both the instructor and the students:

- "But I did find actually that... formats where I'm given lectures in print form to read through are super helpful. I have hard time listening so being able to slowly read through lectures to go through at my own time were helpful. And in some ways, zoom office hours are helpful because the teacher can help many students at once and some other students questions can answer my own."
- "I had much more flexibility and I was insanely productive as opposed to in person because classes were recorded, I could section off my time properly, and office hours/etc were flexible."

4.2.4 Approachable instructors. Connecting to the point that students feel stressed about going to office hours, participants shared how their instructors make themselves appear more approachable by the simple action of talking about their own lives, thus encouraging interaction:

- "When professors are open about their own experiences and difficulties in either their academic or general lives, it makes me feel like I can depend on them more and come to them when I'm experiencing any difficulties or if I need help or an extension on an assignment for example."
- "I have not had any professor in any department make me feel motivated or welcomed enough to want to major before [instructor's name]. [They are] always accessible for meetings, down to earth, willing to write the recommendations I need, and supportive no matter what. [They] helped me enjoy a class I was sure I was going to hate from the beginning. I was probably going to drop CS if not for [them]. I didn't know how much I needed that support until my mental health actually started to improve."

An instructor's attitude can create a lasting positive impact on a student's academic and even personal life, particularly for students who struggle with their health as well as course material.

4.3 Recommendations

Based on what we learned about the negative and positive experiences of CS students living with mental health conditions, and in order to answer Research Question #2 – "What suggestions could be made for CS instructors to foster inclusive spaces for these students, according to their responses?" – this section presents some recommendations for instructors to consider, including some quotes from responses to survey questions Q3, Q6, and Q7.

4.3.1 Increase awareness of mental health conditions and resources.

As shown in the example above of the survey participant whose instructor did not address a classmate's insensitive remark about suicide, an unpleasant exchange in class may leave a student with a lasting negative impression of CS. To help these students feel included, we believe that instructors should be mindful about making or permitting comments that can be upsetting or even triggering to students living with mental health conditions.

Likewise, some survey participants mentioned experiences where they found instructors unhelpful in providing information about campus resources, for instance:

- "None of my actual professors said anything helpful. They didn't know how to direct me to any resources, and I'm not sure if any even existed."

It is hoped that instructors could familiarize themselves with support resources in the school or in the community so that they could direct students to the appropriate places:

- "They also need to provide University or community resources so the student can learn and seek out help from therapists and other personnel."

4.3.2 Be approachable. Students look to instructors not just for guidance on course-related material, but also for advice about navigating the college experience and overcoming the challenges it presents. Instructors could connect with their students and demonstrate that they are open to helping students by sharing anecdotes or small stories. Some survey participants expressed gratitude and appreciation when instructors appear to be understanding and down to earth:

- "Try to make yourself as approachable as possible. I don't just mean letting your students know when you're available for academic questions, but also trying to connect to your class. Share anecdotes or small stories to give yourself more dimensions than just 'professor' or 'computer scientist'."

4.3.3 Provide online resources. A common suggestion from participants was to continue to provide access to online resources, even after in-person classes have resumed post-pandemic. These could include recorded lectures, lecture transcripts or an option for online office hours:

- "Having a system/being open for extensions helps alleviate assignment/deadline stress, having good notes/slides/other resources offered for students to use along side their class notes."
- "Please offer Zoom office hours that can be scheduled through a calendar without having to ask by email or in-person. As someone who struggles with social anxiety, it can be difficult to reach out."

4.3.4 Provide built-in arrangements and detailed instructions. In describing their positive experiences in CS courses, participants responded that flexibility has been very helpful. When designing assignments, it is appreciated that instructors could include an amount of extension, in terms of due dates, for instance, without having the student explicitly ask for it.

Additionally, a simple way to reduce stress among students is to give clear instructions on rules, expectations and deadlines on assignments and tests, as suggested by this participant:

- "Being clear and not vague when it comes to assignments and exams are a big help too because it lowers my anxiety when I know exactly what the professor wants/requires and expects for an assignment."

4.3.5 Actively check in. Also as summarized among the positive experiences, students living with mental health conditions appreciate it when their instructors notice that they may be struggling. Having instructors actively reach out in emails and express their support can be very helpful for students and provides motivation and feelings of belonging:

- "Be patient and understanding when students aren't doing well. Maybe reach out and arrange a discussion with someone who is consistently performing poorly because they may be too afraid to reach out themselves."

4.3.6 Trust your students. Finally, students who are living with mental health conditions request that instructors trust their judgment on their circumstances and needs:

- "Listen and don't assume anything; I really appreciated that the people I sought help from gave me a chance to explain what I was feeling and didn't immediately give baseless advice."
- "Listen to them. They probably know their mental health far better than you, and the only person they're cheating by lying about their mental health for advantages is themselves. So just trust them and, as long as it isn't too much of an inconvenience, give them the accommodations they ask for without snark."

Here, the participant has shared their personal experience when their instructor didn't recognize their struggle to make this point even more convincing:

- "Just trust the student first. It's better if you let a student off, if they come up to you and say 'I'm having a bad mental health day', than it is to do nothing, and have them cry through an exam when they might be perfectly capable of excelling."

4.3.7 Summary. The suggestions listed here echo those that have been suggested in recent articles about supporting college student mental health generally, e.g. [6][11]. As is the case with many DEI efforts, initiatives aimed at a specific group will likely benefit all students, so that CS students can stay healthy while achieving course learning outcomes, and so that we can make strides to recruit and retain students living with mental health conditions as we seek to broaden participation in computing.

5 LIMITATIONS AND FUTURE WORK

As with all research, there are limitations to the study presented in this paper. Our survey was limited to 53 participants, and we do not know how representative their responses are of the presumably large number of CS students who identify as living with mental health conditions.

However, as our goal is to give these students a voice and draw attention to their lived experiences and insights, the findings and suggestions presented here still have merit even if the level of representation is small or there are other students who were unable to participate in this study. We believe that it is important for CS educators to know about these students' experiences and to consider their suggestions for making their CS courses more supportive and inclusive, as these will ultimately be to the benefit of all students.

Likewise, we intentionally did not collect demographic information aside from institution type, so we do not know the distribution of responses across institutions, nor do we know how the responses relate to students' specific mental health conditions or other aspects of their identity, such as their race or gender. As one of the goals of this exploratory project is to identify and suggest avenues for subsequent research directions in this area, future work could investigate the different experiences of students with different mental health conditions, as well as the intersectional experiences of students from other marginalized groups.

Last, we acknowledge also that this work does not provide supporting evidence regarding the recommendations presented in Section 4.3, as it is not the goal of this paper to evaluate these approaches, but rather to collect and share the experiences and suggestions of CS students living with mental health conditions. Future work could attempt to assess the effectiveness of these approaches on student learning and their sense of belonging and wellness, in addition to the impact that they may have on instructors.

6 CONCLUSION

Our survey of CS students living with mental health conditions revealed that respondents' negative experiences include stress stemming from interactions with faculty and further marginalization based on other aspects of their identity, but that they feel welcome and supported by instructors who actively check in on their students and make themselves accessible. Based on our findings, we recommend that instructors provide options for resources such as office hours and lecture recordings, build flexibility into assignments, and trust their students' judgment regarding their mental health conditions.

We hope that the suggestions presented here, as well as the directions for potential future work described above, enable the field of computing to broaden participation and be more welcoming of students living with mental health conditions.

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