Work in Progress: Exploring the Landscape of Stressors Experienced by Doctoral Engineering Students

Introduction

Stress profoundly affects the experience of doctoral students, who suffer attrition rates as high as 43% [1], and experience stress, anxiety, and depression at a rate which is both rising and is much higher than that in the general population [2], [3]. While the rates of attrition are somewhat lower for doctoral engineering students than for other doctoral students [4], experiences of stress have been reported to perhaps be even higher for doctoral students in STEM disciplines [3], particularly for graduate students of minoritized identities [5], [6]. Doctoral student stress has been linked to both attrition and broader mental health issues by previous research [3], [7], [8], yet studies of doctoral student mental health are rare [9].

Research on doctoral student experiences of stress has typically identified and studied specific stressors such as lab culture (e.g., [6]) financial stress (e.g., [10]), and writing related stress (e.g., [11]), or has studied stress for particular populations of doctoral students such as African-American students, (e.g., [12]) and non-native English language speaking international students (e.g., [13]). Limited work has been done to compare many different stressors across a broad range of student populations. However, recent work has endeavored to categorize coping strategies employed by graduate students [4].

To help straddle the breadth of research on doctoral student stress, our team sought to explore the landscape of doctoral student stressors by interviewing an intentionally stratified sample of doctoral students four times during the course of an academic year. We present an overview of our research process and the top 10 most reported stressors from analysis of our interview data. Further, we report on the most frequent coping strategies used by students in our sample, contributing additional coping strategies used by engineering doctoral students. Understanding the most common factors which contribute to the stresses experienced by doctoral students and these students effective coping strategies can support students, advisors, and departments to develop proactive interventions and strategies that support well-being and retention.

Research Questions

This project is part of a larger, mixed methods project with the guiding question: *What is the nature of stressors experienced by doctoral engineering students?* For this work in progress paper, we consider two contributing research questions:

RQ1: What stressors do doctoral engineering students most frequently report?

RQ2: What strategies do doctoral engineering students use to cope with these top stressors?

Methods

Participants were 55 doctoral students in engineering programs at a single university. Table 1 describes the participants' demographics. We recruited an intentionally stratified cohort of students to interview four times and survey eight times throughout an academic year.

Table 1. Participant demographics

		Longitudinal Study Sample (N = 55)
Department Size*		
	Small	20
	Medium	18
	Large	17
Stage in Program		
	Early (pre-qualifying exam)	21
	Middle (between qualifying exam and preliminary exam)	23
	Late (post-preliminary exam)	11
Gender Identification**		
	Male	31
	Female	23
	Nonbinary	1
Enrollment Status		
	International	26
	Domestic	29
Race**		
	White, Caucasian	26
	Asian or Pacific Islander	20

Black, African American	2
Hispanic	7
Indian Subcontinental	5
Arab, Middle Eastern	2
American Indian	1

Note: All demographic information collected was optional, however participation was complete from longitudinal participants. Options from the demographic questionnaire with no responses have been omitted from this table.

*Cutoff values for department size were determined by the team before recruiting participants. The site institution's large departments were considered to be Mechanical Engineering, Electrical and Computer Engineering, and Computer Science (approximately 500 students or more); the medium departments were considered to be Civil and Environmental Engineering, Materials Science and Engineering, and Physics (~150-450 graduate students); all other departments were considered to be small size (fewer than 150 graduate students).

** For Race and for Gender, multiple options could be selected.

Procedure. Consent and demographic information were conducted online using the Canvas LMS [14]. We conducted audio-recorded interviews with the participants four times during the 2021-2022 academic year. Forty-minute initial interviews were conducted in October; 10-20-minute follow-up interviews were conducted in December, February, and April. Participants were compensated with $40 Amazon.com gift cards for the initial interviews and $10 gift cards for each follow-up interview. Some participants did not complete all three follow-up interviews; 157 of a maximum possible 165 follow-up interviews were conducted. Five participants decided to depart the institution with a Master's degree. In addition to interviews, participants completed monthly questionnaires from October 2021 through May 2022. Participants were compensated with $20 gift cards for completing all questionnaires, however the results of these questionnaires will be reported in a future manuscript.

Data analysis. We conducted a thematic analysis [15] of interview data with six members of our team completing coding. One coder, who also conducted the interviews, coded the full corpus of data, discussing disagreements with the project team using a negotiated agreement approach for reliability purposes [16]. The research team began deductively by reviewing the interviews and developing codes grouped within themes representing major categories of stressors that were determined *a priori* from literature. These themes included advisor relationships, course-taking, finances, interpersonal stressors (e.g., family, friends), lab and research environments, microaggressions, presenting research, and writing. Individual members of the team created lists of subordinate codes for each of these major themes, including definitions after thoroughly reading the transcripts. Then, the entire team provided modifications to that code list including example quotes and usage guides in meetings. The full codebook was created by combining each of these major themes, their associated codes, definitions and usage guides, and example quotes. The full data corpus was then coded by the application of expanded code lists to all transcripts by one team member; the other team members each coded additional transcripts for some themes

based on that team member's experiences and positionality: for example, experienced instructors applied the teaching codes and student team members applied the taking classes codes. Negotiation of disagreements between the team member who coded the full dataset and the rest of the team were conducted until agreement on all coded segments was achieved. The major themes uncovered in the analysis are presented in Table 2.

Table 2. Coding System – Major Themes

Major Theme	Number of subordinate codes	Definition/Description
Advisor	10	Stressors concerning advisors, relationships between participants and their advisors, expectations of the advisor, and advisor's influence on the direction of participants' PhDs
Campus/Town	3	Stressors related to living on or near campus, including weather, available community resources, and requiring a car
Classes	21	Stressors related to taking coursework, navigating course curricula, interacting with others in classroom settings, views and opinions of courses in doctoral programs
COVID-19	32	Stressors related to the COVID-19 pandemic and its effects on participants, their research and classes, their lives, and others who they care for
Family and Friends	2	Stressors related to family, partners, roommates, and friends outside of graduate school
Financial Stressors	3	Stressors related to financial wellness, graduate stipends, and opportunity costs
International Student Experience	4	Stressors specific to graduate students, including cultural differences, differences between collegiate and home cultures in home countries and the US, and visa issues
Lab/Research	8	Stressors regarding completing research tasks and being a researcher, including research direction, workload, setbacks, writing for publications, and training
Microaggressions	2	Stressors specific to experiencing or witnessing microaggressions in doctoral program settings
Milestones	6	Stressors related to completing milestones, e.g., qualifying exam, final dissertation defense, required to complete a PhD
Other, Miscellaneous	14	Miscellaneous stressors such as current world events or time management brought up consistently by participants but not closely or uniquely related to another topic in this table
Self-Initiated	4	Stressors which are initiated by an individual's attitudes, self-talk, feelings, and beliefs (even when these are exacerbated by someone else's behaviors)

In addition to the coding of the above major themes, one member of the project team created a code list for coping strategies used by our participants. Like the stressors as themes, this code list was refined by team discussions and then applied to the transcripts by two investigators. This theme included 23 codes, each representing a type of coping strategy used by participants (e.g., socializing, exercise, using a routine).

Measures. The initial interview protocol (Appendix A) was 16 questions long and asked about campus life, self-reported highest sources of stress, follow-up questions about specific sources of stress that we derived from the literature, symptoms of stress, coping strategies, and feedback on strategies for improving graduate education. The interview was designed to be conducted for 30-60 minutes. Follow-up interviews (not reported here) were 5-9 questions long and checked in on students' goals, accomplishments, new or changed stressors, and future plans. Each follow-up interview included a unique question or set of questions related to themes actively being uncovered in the previous interview's analysis, including the effects of the COVID-19 pandemic (reported elsewhere) and views on role conflict between teaching and research. Interviews were audio recorded on Zoom and transcribed verbatim by an approved external service.

Results

We present an overview of our qualitative results, including the top ten most frequently reported stressors in our sample and a list of coping strategies, accompanied by the percentage of participants who described these strategies in their initial interviews.

RQ1: Top Stressors.

Our analysis thus far has produced more than 5,000 coded interview segments applying 173 total codes, with 117 codes specifically referencing sub-stressors within larger themes of stress. Appendix B lists the top 30 stressors reported by participants, their superordinate theme, and the total number of instances those stressors were coded in the initial and follow-up interviews. We report on the top ten stressors below: a descriptive title and superordinate category of stressors, with a brief description. Table 3 provides an example quote, definition, and total reported instances of the top 10 stressors.

Table 3. Definitions and Examples of Top 10 Codes

Code Name	Example Quote	Definition	Times Coded
1. Research Work/ Expectations	"The main one for me was mostly just the nature [of research], that there's uncertainty in it. You know obviously, everyone wants to get good results of research. But it's hard to see whether or not that's going to happen, or if it's ever going to happen."	The participant describes the actual lab or general research work they do or expectations for completing that work, such as doing X amount of research work or writing in a certain time, having weekly presentations to a lab group, deadlines imposed by funding agencies or industry partners, direction of the work, etc.	192
2. Writing for Research	"We need to express our ideas clearly, and that makes me feel pressure because I think – yeah. I was bad because I don't have a	Participant describes writing for research in contexts that do not include their advisors, including getting writing feedback from collaborators, meeting writing deadlines,	146

	good expression or good writing skill. But my advisor, without me saying anything, my advisor told me that it is normal."	navigating the review process, the participant's own writing habits or writing style, learning norms about paper style or writing in the participant's field, includes conference papers, dissertation	
3. Expectations of Working Hours/Vacation	"There was a lot of sort of vague expectations that were communicated, and so it's always kind of an internal battle of, 'is this good enough?'"	The participant describes how the advisor explicitly or implicitly sets expectations for how much the participant should work, including hours per day or per week, setting goals on working time for the semester, describing the amount of vacation time, weekends with/without required work, etc.	144
4. Family/ Couple/Partner Stress	"So, we're all very close. But yeah, there's been like a little bit of stress around like one of my siblings getting back together with an ex that we all don't like. And so that's just been like, a more personal like, frustration in my life."	Stress due to family, including any birth family, BF/GF, partner, children; here and/or travel, understanding of what it is like to be GRAD and when degree will be completed, family, children, or partners interrupting work, travel for family, children, or partners affecting work, etc.	122
5. Balancing Research/Other Responsibilities	"I felt like I was really making progress over break at a, well, I'll say is like a leisurely pace because it is a break. But now that all my classes are started, it's frustratingly difficult to find time for research when the classes I'm in are hard."	The participant describes their commitment (e.g., time, energy) to their lab and/or their commitment to research as interfering with other aspects of their grad student lives, e.g., TAing, taking classes, preparing for quals or prelim, job interviews, work-life balance, etc.	114
6. Research Direction	"And then another stressor that I have is like if – so I obviously am not the most happy in my program just because I don't really like the research, I don't really like the chemical engineering as a topic, I guess, I've discovered."	Participants describe their "journey" or "path" as a researcher, including what topics or projects they want to devote time to, fear of failure or choosing a bad project/topic, wondering if their research will be fruitful, figuring out what they would want to research later in their career, etc.	109
7. General Relationship/ Traits of Advisor	"I just think his, probably his way of working and my way of work it sound -- I think he, he's so work centered, that he doesn't realize that other people maybe are not working over the break or something."	The participant describes their relationship with their advisor, e.g., in a positive or negative way such as details of professionality, or personal/impersonal relationship, character and traits of the advisor, being supportive/ unsupportive, overall quality of relationship, etc.	109

8. Qualifying Exams	"Yeah, because it's quite popular [knowledge] that our program has kind of like a difficult qualifying exam. And so I think that's one of the thing that we are – we feel stressed a lot."	Mention of preparing for, taking, retaking, passing, failing university-required qualifying exams. Mention of the format. Mention of scheduling the quals (finding a date when all are available), etc.	101
9. Choice of Advisor	"I guess the research thing is still a bit of a stressful thing. I don't have a research group yet and I feel like my time is sort of ticking here. I need to pick somebody so that I don't have to keep TAing every semester."	Participant wants to explore options between multiple advisors, is stressed about finding an advisor or timelines of finding advisors by a certain time, filling advisor contracts required by departments, participants meeting advisors before programs and feeling unsure about ability to explore, participants attending multiple lab group meetings, taking preliminary projects, etc.	99
10. Balancing Coursework and Other Tasks	"And I wake up during the night a lot because of the stress. And I haven't been able to clean or cook this week yet. But yeah, this is the first time that it's been this bad. I think it's just because of these homeworks."	Participants describe interactions between their classwork with other tasks, like research, TAing, their personal lives, grants or fellowships, etc.; include balancing and work-life/life-work balance, "not having time", time management, spending too much or not enough time on coursework, prioritizing coursework or not prioritizing coursework, etc.	88

Below, the ten stressors described in Table 3 are briefly summarized.

Research Work/Expectations. *Theme: Lab/Research*: In the most frequently applied code, participants described the expectations for completing work in their lab, not explicitly set by advisors, as a stressor. Participants described the stress of expectations to consistently make research progress, often with a need to present and make findings on a weekly basis. Particularly salient within participant discussions of this code were making preparations for team meetings, setting hours and timelines for conducting research, weekend and evening research work (particularly for students with chemical and biological samples), and keeping up with the expectations (set individually or by funding sources) for research progress.

Writing for Research. *Theme: Lab/Research:* In the next most frequently applied code, participants described the stress of writing, especially getting started with writing or making consistent progress. Participants described stress in receiving feedback and being critiqued, including informal critiques experienced when collaborating with coauthors. Participants also described experiencing stress when writing grant proposals, navigating the peer review process, and waiting for feedback from collaborators. This stress was particularly high for students for

whom English was not a native language and for students who had not yet published their research. For some participants, this stress was grounded in experiences of receiving feedback on writing, while other participants described worrying or ruminating about the potential of their work to be seen as low quality or not meeting expectations.

Expectations of Working Hours/Vacations. Theme: Advisor: Participants described unclear or unarticulated expectations from advisors for their time off on weekends or during vacations, often complicated by the COVID-19 pandemic. For some participants, advisors required lengthy weekly working hours or weekend working hours. The focal institution had no clear policy for working hours, thus policies varied by advisors and varied in terms of how implicit or explicit policies were. Some advisors pressured participants to not take holidays abroad, which was a particularly salient source of stress for our international participants.

Family/Couple/Partner Stress. *Theme: Family and Friends:* Participants experienced conflict with family and partners more often than they did with friends. These codes were especially frequent during the first and second follow-up interviews, which occurred around major holidays. Participants with spouses or live-in partners expressed stress when job demands conflicted with spending time with their partners. Some participants described frustration or "lashing out" against partners while stressed or overwhelmed, adding to times of high stress.

Balancing Research/Other Responsibilities. Theme: Lab/Research: Participants struggled to make consistent progress in both research and other responsibilities, particularly when conducting research while both taking classes and working as a teaching assistant. While a stressor of this type appeared in most categories of stressors, participants described struggling to balance research in particular due to the lack of fixed deadlines within research activities, compared to coursework. For participants whose labs required long working hours, research also interfered with personal commitments such as exercise, family and friends, home upkeep, and hobbies.

Research Direction. Theme: Lab/Research: Participants struggled with ownership of their research projects including determining a thesis topic, anticipating the timeline and expectations of research, choosing new research topics, and developing identities or research paths separate from their advisor and other research mentors. For one participant, discovering less interest in research than anticipated resulted in a decision to depart the program with a Master's degree.

General Relationship/Traits of Advisor. Theme: Advisor: The advisor's advising style was a potential source of stress, particularly related to alignment with participants' expectations of mentorship and of the quality of conversations and interpersonal interactions with advisors. Mismatch between a students' preferred advising style and the advisor's mentorship was the most major concern within this code, however advisors who were more impersonal *or* more friendly than a participant preferred or who were abrasive or poor communicators could also cause stress when it came to interactions.

Qualifying Exams. Theme: Milestones: Preparing for and completing the qualifying exam was a major stressor for participants; students in later stages of their programs also reflected on their stressful experiences with qualifying exams. Oral exams were generally described as more acutely stressful compared with written exams. Preparing for the exam led to conflicts with research progress or course deadlines, while the risk of consequences of failure (such as being removed from the program) led to stress due to the high stakes nature of the exams. A few participants failed initial attempts at their qualifying exams and described very high stress in terms of repeating preparations for the exam, increased stakes, feelings of inadequacy, and balancing exam prep with other responsibilities.

Choice of Advisor. Theme: Advisor: First year participants in some departments in the focal institution are admitted without first selecting an advisor and are expected to find one during their first year. Some participants were experiencing or reflected back on the high stress of finding an advisor, considering the important implications of committing to an advisor. For participants who struggled to match with an advisor, stress was added from feeling behind peers who had started research work already or fears of losing visa eligibility for international students. Finally, some participants wondered if they chose the advisor best suited to their interests or preferences yet felt stressed by being "locked in" to their choice.

Balancing Coursework and Other Tasks. Theme: Classes: Similar to experiences with research, participants reflected on the coursework they completed and struggled to balance coursework with other personal and professional responsibilities, particularly during periods with examinations and final projects. Participants often prioritized coursework due to the clear deadlines and structure of classes and felt that their coursework was taking away from their capacity to do research.

RQ2: Coping strategies.

Participants described a variety of strategies used for coping with the stressors described in their interviews. Consequently, this section was coded more inductively compared to the stressors above, which are familiar from the literature regarding doctoral student stressors (e.g., [1], [4], [5], [10], [12]). Participants were prompted during the initial interviews to reflect on the types of things they do to lower their stress levels or to relax and were not prompted to associate coping strategies with specific stressors above. However, some participants specified that certain strategies such as making progress on responsibilities or pausing other activities to focus on work, planning and scheduling, and sticking to routines specifically targeted their top work-related stressors. Table 4 shows the 23 types of coping strategies expressed by our participants and the percentage of participants who discussed that strategy for coping in their interviews. In follow-up interviews, participants were prompted to reflect on if their coping strategies had changed during the two-month period between interviews.

Some participants described strategies which were coded to fit two or more categories simultaneously. For example, one participant described themselves going out to drink at campus

bars with friends and their spouse to relax on weekends, which was coded as “Alcohol use”, “Family/partner time”, and “Socializing” simultaneously. The broadness or specificity of codes below is reflective of the language typically used by participants to describe the associated coping strategy.

Table 4. Coping Strategy Occurrence

Coping strategy	Percentage of participants using strategy (*N*=55)	Coping strategy	Percentage of participants using strategy (*N*=55)
Alcohol use	11% (*n* = 6)	Music/art/performance/ movies (not at home)	4% (*n* = 2)
Caffeine use	5% (*n* = 3)	Pet(s)	7% (*n* = 4)
Eating to relax	35% (*n* = 19)	Planning or scheduling	24% (*n* = 13)
Errands/shopping	4% (*n* = 2)	Reading	16% (*n* = 9)
Exercise/walking	73% (*n* = 40)	Religion or spirituality	5% (*n* = 3)
Family/partner time	84% (*n* = 46)	Routines	13% (*n* = 7)
Games/puzzles	20% (*n* = 11)	Sleeping	11% (*n* = 6)
Hobbies	16% (*n* = 11)	Socializing (with friends)	95% (*n* = 52)
Journaling/writing	11% (*n* = 6)	Taking a break	87% (*n* = 48)
Making progress/working	13% (*n* = 7)	Therapy/counseling	27% (*n* = 15)
Medical (e.g., anti-anxiety medicine)	7% (*n* = 4)	TV or streaming services	16% (*n* = 9)
Mindfulness/ meditation/relaxation breathing	11% (*n* = 6)		

Discussion

Our results show alignment with the literature partially cited above regarding doctoral student experiences. However, the prevalence of some stressors reported by our participants varied in our sample compared with the prevalence reported in the literature, suggesting that contextual effects are especially important in researching student stressors. For example, our diverse

participant pool reported a relatively small number of witnessed or experienced microaggressions and reported financial stressors more infrequently and less severely than other reports in the literature, despite prompting to both topics during initial interviews. Microaggressions did not appear in the top 30 most frequently recorded codes and financial stressors were also less commonly reported. Participants more frequently described hearing about microaggressions then they did experiencing or witnessing them, though for the participants who did experience or witness one or more, the stressor was described as severe, if not frequently occurring. While the interviewer was a graduate student who was open about their own stresses as a student, it is possible that these more personal issues were not easily or openly discussed by participants. However, future research observing doctoral student stressors within a single field or department should address issues of context, e.g., location, time, and policy. For example, it is also possible that the relatively low cost of living, large number of international students in engineering, and the existence of prominent clubs and policies to support inclusive environments at this study's focal institution reduced the frequency of reports for these stressors. Thus, future work describing the landscape of doctoral stressors should consider both the broad, existing literature and local contexts. Further work characterizing the landscape of doctoral student experiences with stress, including the landscape of coping strategies [4] can also support these students.

The most frequently described stressors related to experiences with lab and research settings, advisors, and balancing responsibilities, consistent with prior literature in engineering doctoral programs (e.g., [3]-[8]). In particular, participants reported balancing research with other work to be a major stressor. Promoting initiatives which build doctoral students' skills in time management, offer students protection when navigating choices of advisors, and provide mentorship on setting realistic workload and research expectations can support these students. Moreover, re-considering the timing and format of these resources, often given at the start of programs before students begin to struggle or even understand doctoral student workplace environments, may increase the use of these resources. Further, programs should continue to encourage social support structures, which were shown to be frequently utilized by our participants.

We saw alignment between the landscape of coping strategies used by participants in our sample and many of the strategies reported in the work reported by Sallai et al. [4] including the abundance of support-seeking coping strategies (e.g., social strategies) in both our sample and in the work by Sallai et al. While Sallai et al. used an inventory of coping strategies developed *a priori*, our study developed a list of strategies *a posteriori* using thematic analysis; capturing a few elements beyond those reported in Sallai et al., such as eating (e.g., making a special dish) to relax, and a multitude of recreational activities. We view our top stressors and list of coping strategies as both supplementing, and being supplemented by, this work and we encourage future researchers to investigate the landscape of stressors and coping strategies in other local contexts. Further investigations which continue to explore a variety of research methods into how students experience stress and cope with stressors can continue to define and refine these categories of experiences and behaviors used by students. Understanding how students are (or currently are

not) coping with stressors can improve how interventions are tailored to meet students' needs. Based on these results, we consider the search for *the* top stressors among graduate engineers, without consideration of local context or individual differences, to be a misguided approach.

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Appendix A. Graduate Stress Interview Protocol

Initial Debrief to be Used in the Actual Study

Thank you for consenting to take part in this study and agreeing to be audiotaped. I'm going to ask you a series of questions about what it's like to be a doctoral student. Some of the questions ask about what stresses you out, and how you cope with those stresses. You are free to skip any questions for any reason, or to stop the interview for any reason. Everything you say in this interview will remain confidential unless you reveal that a crime has been committed; we are extremely careful to make sure that only the research team knows you participated, and only the research teams will know what you say in this interview. Remember that you have contact information for the university counseling center and other mental health resources on your consent form, which you can access from Canvas any time. This interview will last approximately one hour.

Is it okay if I start to record this call?

Great, okay. [Start recording]. This is [interviewer name] with [participant number]. It is [TIME] on [DATE].

To confirm verbally for our records, do you consent to take part in this interview study?

Finally, before we start, is there a pseudonym you would like to use? If not, we will generate one randomly for you.

Part 1 - Background Information and Top Stressors

1. Tell me a little bit about yourself: What graduate program are you in? How did you end up in your current program? What year are you in your program? and What is your current living situation?
   Probe for came straight from undergraduate vs. worked [if so, what kind of work]?
   Probe for currently living alone or with roommates/family? Probe for year in program & whether participant has passed comprehensive exam(s), prelims, etc.

2. In terms of living in the [Town] area, do you feel you have places where you can buy the kind of groceries you want, afford rent, find recreation or entertainment, connect with people—things that make for a good quality of life?

3. In terms of work for pay, tell me about any research assistantship, teaching assistantship, or other work for pay that you are doing now.

Probe for 10-hour vs 20-hour vs hourly appointment

4. In terms of your academic performance in classes, how would you assess your progress – how are you doing?

5. Similarly, in terms of your research performance and progress, how would you assess your performance?

6. Tell me about your advisor or advisors. How would you describe your relationship with them?

Probe for communication – how often, about what, often enough or not?

7. Sometimes doctoral students get stressed by things at the university or outside the university. What would you say are the things that stress you out?

Probe for any other stresses around courses, writing, presenting, in lab, with family, finances, etc. (Take notes on the stresses listed by participants in this section.)

8. You mentioned [repeat stressors], which would you say are the most serious? What makes these things the most stressful?

Probe about things like time management: what does it look like when it is a problem, what about when it isn't? Probe for each stressor: What might happen to cause this stress? (E.g. they may say they're stressed out by family – what specifically causes it?)

9. And again, you mentioned [repeat stressors]. Are any of these stressors more minor? What makes these things less stressful?

Probe: Can you think of other minor stressors that come up in your program or in your life?

10. You mentioned the following as major sources of stress for you: [Repeat the participant's top stressors]. How do you respond to being stressed by these things? How do you feel, what sorts of physical and mental responses to stress do you have?
    Probe for how often these stressors occur.

11. For these most severe stressors, how much control do you feel you have over the sources of stress?

Probes: What can you change to experience the stress less? What can't you change?

12. People have all kinds of ways of coping with stress. What do you do to help you deal with the stress we've been talking about? [Take notes on coping mechanisms]
    Probe for exercise, social, university supports such as career center, organizations in the community, sources inside the university/outside the university. Probe how often do you

manage to accomplish daily upkeep needs: eating enough meals, sleeping well, exercising, cleaning as needed?

13. You mentioned [repeat coping strategies]. How frequently do you use these methods to cope with stress? How effective are these methods at dealing with your stress?

14. Are there ways of coping that you have thought about but haven't done? What could help you access those; is there information you could use?
    Probe for the opposite: what prevents you from accessing those?

15. If you had the power to change anything - university rules, lab policies, etc, what kinds of changes could you make to your department or research lab to reduce the effects of your top stressors?

16. Is there anything else you would like to share that we haven't discussed already? Is there anything important about your experience as a graduate student that you'd like to share?

Appendix B. Top 30 Coded Stressors, Ordered by Most to Least Frequently Coded

Stressor/Code	Category/Theme	Times Coded	Stressor	Theme	Times Coded
1. Research Work/Expectations	Lab/Research	192	2. Writing for Research	Lab/Research	146
3. Expectations of Working Hours/ Vacations	Advisor	144	4. Family/Couple/ Partner Stress	Family and Friends	122
5. Balancing Research/Other Responsibilities	Lab/Research	114	6. Research Direction	Lab/Research	109
7. General Relationship/Traits of Advisor	Advisor	109	8. Qualifying Exams	Milestones	101
9. Choice of Advisor	Advisor	99	10. Balancing Coursework and Other Tasks	Classes	88
11. Individual Meetings or Communication with Advisor	Advisor	87	12. Workload as a TA	TA	85
13. Self as a Source of Stress	Other	77	14. Public Speaking and Presentations	Other	73
15. Academic Advising and Academic Mentorship	Advisor	71	16. Working Hours	Lab/Research	69
17. Interpersonal Relationships with Labmates	Lab/Research	62	18. Other Employment	Financial Stressors	49
19. Midterms and Finals	Classes	48	20. Prelim/Thesis/ Dissertation Process	Milestones	48
21. Size of Graduate Stipend	Financial Stressors	47	22. Travel Challenges	COVID-19	46

23. Balancing TA Work with Other Responsibilities	TA	46	24. Career Direction	Other	46
25. Completing All Coursework	Milestones	46	26. Miscellaneous	Other	45
27. Total Workload	Classes	42	28. Final Thesis Defense	Milestones	40
29. Receiving Training/Mentorship	Lab/Research	40	30. Characterizations of Poor Instructors	Classes	40