Loneliness at the bench

Is the PhD experience as emotionally taxing as it is mentally challenging?

Paige Brown

On the surface, the road to completing a PhD can be a lonely one, as PhD students are faced with a hefty workload—comprising both research and other professional activities—that often leaves little time for a life beyond academia. They watch as their undergraduate colleagues advance in their careers and begin families, whilst they themselves struggle to get by with a modest stipend, unforgiving hours and limited socializing. But is the PhD experience a lonely and stressful existence, or is this a story PhD graduates tell themselves when looking back with not exactly rose-tinted glasses? Moreover, does a PhD have lasting physiological or psychological health effects?

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The answer, of course, is that ‘it depends’. For some, the PhD experience is a thrilling first foray into discovery and adventure; for others, it is a trial of misery and isolation; for most, it is somewhere in between. Many factors contribute to the emotional experience of the PhD, and although good practice, management and education—of students and mentors—can address many of the stresses and strains, at its heart, a PhD is not an easy undertaking. No matter how much care and support is given to students, there comes a point when the student will have to get on with it himself or herself.

“Grad school is hard. Beyond the academics, it takes an emotional toll,” Jordan, a second-year neuroscience PhD student

at Penn State College of Medicine (USA), commented. Jordan is living alone whilst working on her PhD, a state away from ‘home’ and her boyfriend. “I came straight to my programme from a small, close-knit college community,” she said, noting that she quickly saw a few major differences between her undergraduate and graduate experiences, especially in terms of friendship groups and social clubs. “The only thoughts in your head are your own. Rumination is a big problem.” She explained that she tries to do things that get her mind off science and academics, such as exercise, voluntary work and music. “All of these activities keep me energized and allow me to re-focus on school and science when I need to do so,” she said.

Ravi, a PhD student in theoretical physics at the Institute of Mathematical Science in Chennai, India, has a similar coping tactic: “The antidote to loneliness, at least in my case, is to stay engaged with things I like doing,” he said. Yet, Ravi considers his loneliness to be more of a fundamental condition than a product of his PhD experience. “I’ve had those feelings earlier too, only they are more accentuated now for some reason, and I’m trying to understand them,” he explained. In fact, he believes that being alone as a PhD student is not all bad. “I think a PhD is the right thing for me because it gives me that space to think and reflect upon things.”

Audrey, now a graduate of a programme in the life sciences, had a more troubling experience as a PhD student: months of failed experiments, primary advisor changes and a difficult advisor–student relationship. “I felt lonely because the ‘system’ was obviously broken and there was nobody to stand up for me,” she said. However, she found emotional support

in her friendships and continued doing what was required for graduation. “Shortly after I had defended, I was exhausted and honestly, disgusted by research. It took me almost a full year to stop being afraid, look for a post-doc position and go back to the bench.”

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In her case, Audrey believes that age had a lot to do with her feelings of loneliness as an academic student. “The older I get, the less I see loneliness as an issue,” she said, even though she still lives far from her family and many of her friends. “I think that young people, especially those who lack self-confidence, feel a huge need for attention. They can feel lonely pretty easily [...] I am sure that the minute I stopped being so self-centred and started feeling comfortable with myself, in my own company, I stopped finding loneliness painful. In the end, I think that the feeling of loneliness is a side effect of something deeper.”

Jordan’s view of the value of good peer-group friendships is similar; her classes are small and focused, which can be both a good and bad aspect of graduate programmes. “In some cases, you’re the only grad student within your sub-department [...] And sometimes you just really, really need someone there at your beck and call who can sympathize with you.” As most of Jordan’s friends in the PhD programme are in different classes with different lab schedules, they keep touch by organizing monthly dinner parties.

Sidebar A | PhD tweets

Do PhD students on Twitter think that their experience is a #lonely one?

@RimRK: It's different but I wouldn't describe it as lonely. I started liking spending time alone during my PhD.

@Chemjobber: Yes, I think so. In the end, gaining deep expertise and performing bench research is ultimately a singular task.

@ThInKchem: Generally true that most are happy, but people don't acknowledge the loneliness part very often.

@tomwphillips: Not for me. Work with fun, intelligent people. Lab/office are quite lively. Still have a 'personal' life, for example, girlfriend.

@ThInKchem: Definitely, odd hours, usually no one to come home to, and working on a project alone. Thus the invention of happy hour.

@ChemistLN: I'm not lonely! I'm married and have an awesome research group! I spend 50 hours in the lab a week and maintain a life outside of there too.

@Macrophagic: It can be, but you have to make time for social interactions. Build a social network.

@vinylogous: PhD work is only lonely until hexane fumes make you hear voices from the HPLC.

Tweets were sent to @FromTheLabBench—Paige Brown's Twitter username.

Time seems to be a huge factor in the degree to which PhD students experience loneliness. As Jordan pointed out, not having a set lab schedule can be tough. "Some are confined to incubation times, animal behaviour recordings or waiting for that forgetful human participant to return the packets they were supposed to drop off two hours ago. We're often alone, or working with the same four or five people every day." It becomes difficult for graduate students to coordinate with their peers, much less their friends outside the programme. "There's no telling whether you can hang out with so-and-so tonight, much less set up something next week," Jordan said. As such, she finds that even academic peers can find it difficult to understand and empathize with each other's unique responsibilities and stresses.

Another source of isolation is that not many people outside academia can empathize with the PhD experience, as Ravi explained. One of the hardest aspects of being in a PhD programme, he said, can be trying to explain your work to friends and family: "In fact, I barely succeeded in explaining what quantum mechanics is to

my dad, and although he seemed curious, I'm not sure he understood more than just the word 'quantum'," he said.

Audrey has had a similar experience. "So, in the end, you have this weird status that your family and friends don't really fully understand, no matter how many times you try to explain what the heck you do," she said. "Who, except another PhD student, can get the importance of a time-course experiment? Who can get that you take better care of the cells in the incubator than you take care of yourself? [...] I wish I had seen fewer incredulous eyes and more supporting faces when I expressed dedication to my work and why I did not have much time to spend with people."

But it is not all bad. "I don't always feel lonely in a bad way," Ravi said. "In fact, I like being by myself most of the time. I look upon grad school as perhaps the only time of my life when I have the freedom to pursue everything I want to, without having to worry about practical matters. And it gives me the time to get ready for the 'real' world."

These personal experiences are informative, but are they representative of PhD students throughout the world (Sidebar A)? David Herzog and colleagues have referred to the prolonged experience of the school environment, dependence on academic faculty and financial underdevelopment of PhD students as a 'prolonged adolescence' [1]. Indeed, according to Herzog, although graduate students are not generally known for vulnerability to emotional disorders, evidence suggests that loneliness, anxiety and alienation are common maladies among graduate students [1,2]. The question is, from where do these emotions come and is everything possible being done to support PhD students who experience them?

John Cacioppo, Director of the Center for Cognitive and Social Neuroscience at the University of Chicago in Illinois (USA) and an expert in the field of social neuroscience and loneliness, agreed that levels of depression in academic programmes are fairly high. After four years, many PhD students tend to not be excited about their work or their life, or both. But he pointed out that, "there may be another lesson to learn here [...] How can you be really devoted to your work and spend time on it and also have a rich and meaningful social life? The answer is: you don't have a lot of different people whom you have to spend time with. You prioritize."

According to Cacioppo, great scientific work neither benefits from nor requires social isolation. "A life of the mind doesn't mean you are living a solitary life," he said. The real solution, he suggested, is for PhD students to answer the question: "how do I maintain quality relationships—and not very many, because I need the extra time for dissertation?" This, he said, is a recipe for better living throughout one's life: "quality of relationships matter. It is not numbers." Cacioppo himself spends a great majority of his time thinking about his work and research, but has a great family life and enjoys time with his family and friends.

As such, Cacioppo rejects the apparent trade-off in academia between research and family, or research and teaching. When Cacioppo spends time with his wife, he is better able to turn back to work. "My wife inspires me. She makes me want to be a better person. That facilitates my work, it doesn't take away from it." He also finds that teaching complex ideas in simple ways to enthusiastic students subsequently helps him to write about his research in a more accessible way.

Although the PhD experience therefore need not be isolating, many students still find challenging the transition from student to fledgling scientist. They apparently lack the experience and knowledge of seasoned researchers such as Cacioppo.

Amey Reynolds, Associate Dean of Graduate Studies & Research in the Manship School of Mass Communication at Louisiana State University (USA), believes that PhD students should be encouraged to seek help if they are struggling. "Some of the psychological effects I see are anxiety, depression, loneliness, feelings of self-doubt," Reynolds said. "I think this has a lot to do with the individual, though. I don't think the PhD experience causes this in people who aren't already predisposed, but certainly the PhD experience heightens these things. It really depends on the person."

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"Based on my experience, I would estimate that only about 10–15% of students reach a breaking point caused by stress. When students do reach the point that stress is overwhelming to them, what I usually see is the emergence of psychological effects, usually in the form of withdrawal—an inability to finish things, to maintain relationships, to generally cope with people and to accept constructive criticism or even help from others. Some students need to seek counselling for depression, anxiety and other health conditions, both mental and physical."

Despite the stresses of a doctoral degree, however, Reynolds does not believe that the PhD experience is unique. However, she

suggested that the same personality traits that make someone a good doctoral student might also make them prone to deal with stress and rejection in a personal way. "Remember, doctoral students are hard-working, very smart, highly motivated, over-achieving people," she said. "Lots of control freaks, lots of people with OCD [obsessive compulsive disorder]. That's why they succeed—this tremendous drive and dedication and intellectual ability—but it's also why rejection and other failures hit harder."

A 2005 study of graduate students found that sociotropy—excessive need for interpersonal acceptance and nurturance—perfectionistic beliefs and a negative inferential style around academic failure

were associated with a more chronic history of depression [3]. Also, researchers have shown that delay or failure to complete dissertations is associated with procrastination stemming from internal reasons including low self-esteem and high dependency needs [4]. However, there seems to be a dearth of social science and psychological research investigating the characteristics of struggling PhD students or problematic aspects of the doctoral programme itself.

"It's not the slackers from undergrad who pursue a PhD," Reynolds said. "It's the student who was distressed she earned an A⁻ instead of an A⁺, and cares deeply about her research and how people

perceive her academic work. I think this creates a weird dynamic—everyone gets rejected, it's part of the process. Yet the experience of rejection is entirely new in the academic context. I think most doctoral students only know how to deal with rejection in a personal way. It just takes time and experience to develop a healthier attitude and response to what can be a very demoralizing process."

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From her own experience, Reynolds advises PhD students to "remember not to take yourself or your work so seriously at all times [...] Don't be afraid to seek help from counsellors or other professionals if you feel like you need it. Be aware of your own patterns of behaviour, and take note if you find you're losing your enthusiasm for activities or people outside your studies/research."

Reynolds also said that faculty and graduate school administrators should be on the lookout for struggling graduate students: "we need to make sure that if we witness a student struggling with these issues, that we do what we can to connect that student to the resources he or she needs."

However, there is a tendency to expect students to sort themselves out and get on with their research without pastoral care. Whilst no one is suggesting that PhD students should be nursed through their research projects as fragile children—they will certainly get no such care in the 'real world'—an awareness of basic human psychology and emotional needs is important to any manager. Christopher Cramer, Distinguished McKnight University Professor at the University of Minnesota (USA), has had personal experience with the mental-health struggles of a PhD experience. Moreover, he served as a military officer in between his PhD and his faculty position, and thus has considerable insight on personal management problems in doctoral programmes.

"I guess that I would be willing to admit (unhappily) that there is a lot of bad management in academic research groups,"

Cramer said. "There's almost a fraternity hazing aspect to it: I suffered, and you'll grow by suffering just like me. [I think] it has to do with having relatively few examples of good personnel management from which to learn."

Cramer likens the intensity of the doctoral programme to the intensity of high-level athletic, artistic and spiritual training. "All of these are very demanding activities that burn out sizable fractions of the individuals who undertake them," he said. "Continuing that analogy, many great players turn out to be awful coaches—the qualities that set apart the former are not necessarily those most needed by the latter. Indeed, I'd say the one quality most needed by the mentor compared to the mentee is empathy, and for many highly driven individuals, that's not an enormous strength."

The task of the faculty mentor, however, is also difficult. "Many stories focus on the hardships of the PhD while adopting something of a caricature for the research advisor," Cramer explained. "Each advisor is at least as complex as any individual student, and often advisors are coping with far higher levels of stress and isolation than they ever were as graduate students. Does that mean that academic science is 'broken?' I'm not sure that I'd subscribe to that idea—there are some pretty poisonous workplaces in private industry and government agencies, too."

Cramer therefore suggests that the faculty mentor or research advisor probably has a large impact on the PhD experience. Administrators are now suggesting the undertaking of leadership training for PhD students and faculty members, although many of these hardworking individuals might be hard-pressed to find the time for such training.

The question is whether the more traumatic PhD experiences—even if they eventually turn out positive—can have lasting or damaging effects on the young people involved. Loneliness itself has been described as a debilitating psychological condition [5,6] and a "chronic experience" for more than 20% of the US population, which influences "how people perceive and think about the world" [5]. Clearly, then, it is not isolated to PhD students. Scales to measure loneliness, such as the UCLA Loneliness Scale [7], include questions such as "How often do you feel as if nobody really

understands you?" and "How often do you feel you are unable to reach out and communicate with those around you?" The same questions are often found in loneliness tests and quizzes online. Chronic loneliness also has physical health implications. Cacioppo and colleagues have revealed evidence that lonely people have elevated blood pressure, elevated molecular markers of stress including cortisol and adrenaline, and elevated genetic activity within pathways for inflammation [8,9]. Loneliness can also be contagious [10].

Cacioppo argues that despite its prevalence, loneliness today is socially stigmatized. People, especially males, do not like to admit that they are lonely. Indeed Ravi commented that, "sometimes I talk to someone around, but most often I don't," explaining that he hesitates to seek emotional support. "I feel I can handle it myself," he said. "That, I suppose, is also related to loneliness."

Thus, instead of thinking of loneliness as a warning sign as with pain—an indication that something is wrong in our bodies or in our environment—people often ignore loneliness as a socially undesirable characteristic. "That would be like if you're hungry, and you thought, 'well, I just have to get over it,'" Cacioppo said in a 2008 'CornellCast' published interview (<http://www.cornell.edu/video/index.cfm?VideoID=357>). "We are an inherently social species." He suggested that evolution and natural selection bred characteristics such as empathy, altruism, cooperation and attachment into human beings. "I'm suggesting that the nature of humans, the collectively connected humans, is so critical to our ability to survive, and for our genes to survive, that we have a pain signal that signals [that] we're becoming disconnected," he said during the interview. "Historically, evolutionarily, we need others."

...great scientific work neither benefits from nor requires social isolation

But this sociality seems to break down in lonely people. In a 2008 study of female University of Chicago undergraduate students, Cacioppo and colleagues found evidence that lonely people actually derive less pleasure from social observations and encounters than do non-lonely individuals [5]. The differences mapped to areas of the brain including the ventral striatum,

often referred to as the reward centre of the brain. Daily social uplifts seem to have less impact on lonely people than on non-lonely individuals. Individual differences in loneliness seem to predict differences in regional brain activity to social stimuli.

According to Cacioppo and colleagues, the study results also raise an interesting alternative possibility. Loneliness “may result from reduced reward-related brain activity in the ventral striatum in response to social (relative to nonsocial) rewards” [11]. That is, different brain activity might make pleasant social stimuli less rewarding and compelling to lonely individuals. Cacioppo and collaborators suggest that individual differences in loneliness might influence how individuals perceive events in their everyday lives, as well as how they interact with others. Indeed, “it seems to be the subjective experience of loneliness that’s important for people’s well-being rather than any objective measure of social connectivity (the number of close contacts someone has, for example)” [8].

But what does this mean for PhD students? Where loneliness has been described as a “state of social distress that arises when there is a discrepancy between one’s desired and actual social relationships” [12], the desire for social relationships is crucial. Could it be that happy PhD students are those who desire and find purpose in introspection and isolation more than their unhappy fellows?

A 2012 study in *Brain, Behaviour and Immunity* shows that mindfulness meditation training, based on increasing awareness of aspects of the self, can reduce feelings of loneliness and downregulate pro-inflammatory pathways upregulated in lonely, older adults. These results support evidence that one’s “subjective perception of isolation and not one’s objective number of social contacts” [9,12] predict the health-compromising effects of loneliness. Perhaps the nature of a PhD and

the late, thoughtful nights in the lab can lead to both feelings of loneliness as well as changing psychological perceptions of one’s social connections. As Ravi said, “perhaps the best remedy is to not think too much about it, and focus on what you do rather than on how you feel.”

From her own experience, Reynolds suggests that PhD students should take breaks, keep up regular exercise and sleep regimes, eat balanced meals and maintain healthy relationships with friends and family. “Remember the basics, and treat yourself with respect,” she advised.

“I don’t think the PhD experience causes [psychological problems] in people who aren’t already predisposed, but certainly the PhD experience heightens these things”

As with one’s diet, balance and quality in life and relationships might ultimately be crucial to a healthy PhD experience. Cacioppo describes that later in life, elderly people start to realize that spending time with lots of people is not necessary. “They limit who they spend time with to those whom they like,” Cacioppo said. “And their quality of life goes up. And it’s not just age. People who have terminal disease that are younger do the same thing. They just figure out: spending all this obligatory time? Not worth it.” PhD students, Cacioppo suggests, could learn something from that lesson: “It’s not about being popular. It’s about making contributions in a context in which you enjoy your life. To me, the dissertation is not just about turning out a scientific product. It’s also about learning how to live a life of the mind.”

CONFLICT OF INTEREST

The author declares that she has no conflict of interest.

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