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Towards an ecological systems approach to doctoral student resilience: qualitative evidence from the Covid-19 pandemic

Abstract

Purpose

This study contributes to the growing body of literature documenting responses to short- and long-term impacts of the COVID-19 pandemic on doctoral students. We examine support practices at different levels of the education system in which doctoral students are embedded, drawing on Bronfenbrenner's ecological systems model to better understand how these contribute to doctoral students' degree of resilience under stress.

Design

Using online group interviews, we explore the experiences of 21 doctoral students from 7 universities across Europe, Africa and Asia.

Findings

Our analysis revealed that the quality of supervisor support at the microsystem level was the most crucial factor determining how severely the doctoral students experienced negative impacts from the pandemic. However, broader institutional and systemic challenges - including inadequate online infrastructure and lack of incentives for additional mentoring - limited the support options available to students. In settings with fewer institutional resources, students exhibited adaptive resilience by actively seeking alternative sources of support at the mesosystem level, particularly through peer networks and external mentors.

Originality

The study extends the literature on resilience in higher education settings. We apply Bronfenbrenner's ecological systems model to understand doctoral students' experiences during the COVID-19 pandemic. We illustrate how the model can help understand the sources of individual resilience that are facilitated at different levels of the support systems. We use a sample of doctoral students with diverse characteristics in personal situations. Based on the

findings, the article provides policy recommendations and identifies venues for further research needed in the field in order to understand the longer-term impact of the pandemic across different regional settings.

Keywords: PhD students, COVID-19 pandemic, supervision, mentoring, resilience, doctoral students

1. Introduction

The unprecedented challenges posed by the COVID-19 pandemic have fundamentally reshaped higher education, reflected in both immediate emergency responses and enduring systemic changes (Treve, 2021). Research on early pandemic-related experiences of various groups in tertiary education settings reveals that the pandemic response created and exacerbated multiple pressures affecting both PhD students and early career researchers, as well as the academic faculty and professional service staff that support them in universities. The pandemic's effects became evident across multiple domains. These included decreased well-being, diminished motivation for research and study, reduced academic productivity, and heightened stress levels. Moreover, these effects were particularly pronounced among groups with intersecting vulnerabilities, where multiple pandemic-related stressors compounded existing challenges (identifying reference; Hardman et al., 2022; McGaughey et al., 2022; Pebdani et al., 2023; Pyhältö et al., 2023a; Scharp et al., 2021). Specifically for doctoral students, there is a growing body of evidence documenting negative impacts which still need to be monitored post-pandemic. Some of these negative effects include mental health deterioration (Sideropoulos et al., 2022), burnout (Andrade et al., 2023), increased anxiety, and decreased overall well-being (Pyhältö et al., 2023a; Smith et al., 2023; Sverdlik et al., 2023). Despite these challenges, some positive effects, such as increased access to international education opportunities and collaborations, flexibility and accessibility of online and hybrid education delivery, and resilience of students and staff in the times of crisis have been reported (Abdelsattar et al., 2021; Gherardi et al., 2021; Jamali et al., 2023; Kunaviktikul et al., 2022; Lokhtina et al., 2022; Oliveira et al., 2021; Scharp et al., 2021). Most of these studies, however, did not explore to what extent these outcomes were

short-lived or may be extending into post-pandemic period. This paper contributes to the growing body of literature exploring both the immediate but also longer-term impacts of the pandemic on doctoral students, offering insights on enhancing the support of doctoral students during crises and beyond.

The research questions guiding the study are as follows:

1. How did the doctoral students experience the shift to online and hybrid education during the COVID-19 pandemic in relation to their research progress and overall well-being?
2. How did the doctoral students perceive the change in the student-supervisor relationship and practice during the emergency response?
3. What elements of supervisory and mentoring practice did the doctoral students perceive as supporting their resilience?

We begin with the premise that disruptions to the research process may have led to decreased research productivity and motivation among doctoral students. At the same time, online and hybrid forms of supervision and mentoring have introduced novel, and potentially innovative forms of support, which could also offer opportunities for research growth together with increased academic performance, as well as participation in global research communities. To better understand how interpersonal support shapes resilience within different contexts, we examine the support practices at various levels of the system in which doctoral students were embedded.

2. Conceptual Background

Resilience – which we define as the capacity to bounce back and recover in the situations of adversity, being able to thrive beyond merely surviving or coping – has gained more attention during the Covid-19 pandemic and the post-pandemic recovery. While there is a growing body

of literature exploring resilience in higher education settings (for existing literature reviews on the topic, see Ang et al., 2022; Borazon and Chuang, 2023; Brewer et al., 2019; identifying reference; McGowan and Murray, 2016; Sanderson and Brewer, 2017; Stoffel and Cain, 2018), there are fewer studies which explore specifically the resilience of doctoral students (Casey et al., 2022; Parker, 2018).

The literature on resilience in higher education identifies intrapersonal, interpersonal, and contextual factors which contribute to individual resilience. However, when considering specifically the interpersonal factors, our understanding of how these relationships unfold and influence individual resilience remains limited. Extant literature has established that supportive communication, bidirectional lines of feedback, and support from faculty, peers, and academic staff are all contributing to the resilience of students (Borazon & Chuang, 2023; identifying reference). However, more in-depth studies untangling the specific ways that interpersonal support has a positive impact, especially in the context of fostering doctoral students' resilience, are needed. Adjacent literature on doctoral students' well-being is also helpful here, as it identifies similar factors important not only for individual resilience, but also for well-functioning systems of doctoral student support (Schmidt & Hansson, 2018; Watson & Turnpenny, 2022). Our analysis extends the existing literature by applying Bronfenbrenner's (1977) ecological systems theory to examine how doctoral students developed resilience during the pandemic emergency response. This theoretical framework allows us to systematically analyze how interpersonal support is enacted across multiple levels: from dyadic relationships (with supervisors and external mentors) to group interactions (within peer communities and supervisor-led teams), to broader institutional networks. By examining both formal and informal support structures and relationships, we reveal how doctoral students were embedded within

interconnected systems of support that influenced their capacity for resilience. In addition, we examine how sources of support facilitating doctoral student resilience emerge across multiple interconnected levels: from immediate microsystems (like supervisor relationships), through mesosystems (peer networks), to broader exosystems and macrosystems that shape institutional and cultural contexts.

In line with Bronfenbrenner's ecological system, the doctoral student's environment is a nested system within which support at different levels is available – interpersonal relationships between the student and supervisory team, peers, external mentors, or family (microsystem), relationships between the various actors within the student's microsystem (mesosystem), support practices available at the level of department or university (exosystem), and national policies, or academic cultures within the discipline or higher education in general (macrosystem). As a result, individual-level resilience is not only dependent on intrapersonal sources (i.e., individual characteristics), but is also enabled by the nested system of support surrounding the individual (i.e., interpersonal sources of resilience in communities of practice, or support systems in the exo- and macro-systems of university and national policies). This ecological systems model has been applied to examine how individual development occurs within interconnected social contexts - from immediate communities to broader institutional structures - where people's roles, relationships, and interactions collectively shape their identity and trajectory. In higher education settings, and doctoral education specifically, some of the recent examples include studies by Beasy et al. (2021), Elliot and Kobayashi (2018), Jackman et al. (2022), Xu et al. (2021). Based on this literature, our initial expectation suggests that the presence of supportive professional relationships and practices at different levels within the nested environment around the doctoral student acted as a mediating factor, mitigating negative effects related to the

pandemic. Via a qualitative exploratory study design, we are able to zoom in on specific mechanisms through which interpersonal factors supporting resilience are manifested, while simultaneously investigating at which levels of support systems they occur across different contextual doctoral student circumstances.

3. Methodology

This study is part of a larger research project, covering various aspects of mentoring[a] and supervision of doctoral students.[b] For the larger project we surveyed 571 doctoral students and 264 supervisors in 9 universities across Europe, Africa, Asia and Oceania. From this larger pool of participants, we selected a diverse group of doctoral students and invited them to engage in group interviews. The invitations took place based on the following guidelines, to ensure diversity among participants in each interview:

i. In the survey, students should have indicated willingness to engage in follow-up interviews, and their registration records needed to be complete;

ii. PhD students from each of the 9 participating institutions in the research project were to be invited to at least 2 group interviews;

iii. Within each interview, participants came from different universities to ensure they did not know each other;

iv. Groups were diverse in terms of gender, dates of starting the PhD, and disciplines represented.

[a] We define supervisory responsibilities as overseeing the quality and progress of doctoral research and outputs, whereas mentoring includes activities that involve supervisors, peers, other staff, external partners that assist the doctoral student in the research project process, overall well-being related to their role as doctoral student, and/or professional development opportunities beyond PhD. In this sense, mentoring can sometimes be also done by the supervisor. Conversely, supervision cannot be done by mentors.

[b] Ethics approval has been obtained from [identifying information] and adheres to the local regulations of each collaborating institution.

A hundred and twenty-eight (128) students fulfilled these criteria, out of which 6 online groups, each consisting of 6 students, were formed. In the invitation process, however, non-response became a serious issue. To support data collection, we in the end slotted eleven (11) interview sessions, including 21 participants from 7 of the participating universities[c]. The majority (7) were interviews with two students, complemented by interviews with a group of three participants. The interviews on average lasted for an hour, but because of complicated assignment to groups due to time zone differences, we also held two individual interviews which lasted for half an hour. The interviews were moderated by one of the researchers, and notes were taken during the sessions by a second researcher. The sample was diverse in terms of represented disciplines, types of PhD (part-time or full time), as well as personal family situations (as shown in Table 1).

[Table 1 near here]

[c] There were 5 participants from the University of York, 5 from Maastricht University, 5 from Makerere University, 2 from the University of Bristol, 2 from Sheffield University, 1 from the National Cheng Kung University, and 1 from the University of Ghana.

Table 1. Description of participants' backgrounds (linked to survey answers).

Study participant	Commencement of doctoral study	Discipline	Gender (self-identified)	Caring responsibilities	Study status	Home/ international student	University
Interview 1, participant 1.1	2017	Social Sciences	Male	Yes	N/a	N/a	University of Ghana
Interview 1, participant 1.2 (and follow-up interview 11)	2015 or earlier	Arts and Humanities	No gender	No	Part-time PhD	Home country student	University of Bristol
Interview 1, participant 1.3	2018	Law	Non-binary	No	Full-time PhD	International student	Maastricht University
Interview 2, participant 2.1	2018	Arts and Humanities	Female	No	Part-time PhD	Home country student	York University
Interview 2, participant 2.2	2017	Medical and Health Sciences	Female	Yes	Full-time PhD	Home country student	Makerere University
Interview 3, participant 3.1	2020	Social Sciences	Female	Yes	Part-time PhD	International student	Makerere University
Interview 3, participant 3.2	2017	Arts and Humanities	Male	No	Full-time PhD	Home country student	York University
Interview 3, participant 3.3	2017	Social Sciences	Female	No	Full-time PhD	International student	Sheffield University
Interview 4, participant 4.1	2019	Social Sciences	Female	Yes	Part-time PhD	International student	Maastricht University
Interview 4, participant 4.2	2020	Social Sciences	Male	No	Full-time PhD	Home country student	Sheffield University
Interview 5, participant 5.1	2018	Social Sciences	Female	No	Full-time PhD	International student	York University
Interview 5, participant 5.2	2019	Social Sciences	Female	N/a	Full-time PhD	International student	Maastricht University
Interview 6, participant 6.1	2020	Social Sciences	Female	No	Part-time PhD	International student	Maastricht University
Interview 6, participant 6.2	2020	Social Sciences	Female	No	Part-time PhD	Home country student	National Cheng Kung University
Interview 7, participant 7.1	2020	Social Sciences	Female	No	Full-time PhD	International student	Maastricht University
Interview 7, participant 7.2	2020	Social Sciences	N/a	No	Full-time PhD	International student	York University
Interview 8, participant 8.1	2021	Social Sciences	Male	Yes	Part-time PhD	Home country student	Makerere University
Interview 8, participant 8.2	2018	Social Sciences	Male	No	Part-time PhD	Home country student	York University
Interview 9, participant 9.1	2018	Social Sciences	Male	No	Full-time PhD	International student	University of Bristol
Interview 9, participant 9.2	2021	Arts and Humanities	Male	Yes	Full-time PhD	Home country student	Makerere University
Interview 10, participant 10.1	2019	Formal Sciences	Male	Yes	Part-time PhD	Home country student	Makerere University

Fully taped interviews were transcribed and coded by two researchers using AtlasTI, who during the process of coding met on a weekly basis to ensure consistency in coding of data segments. The initial coding framework was designed based on the research questions informing the study, and included the following coding categories: challenges during the pandemic, positive aspects of the pandemic, research motivation, research performance, overall well-being, supervision and mentoring (by supervisory team), relationship with supervisor, other mentoring and support (by actors other than the supervisory team), and resilience. One coding category – longer-term impact – was added inductively during the coding of the transcripts. In the analysis, we structured the themes, guided by the three research questions informing the study. Three major themes emerged from the data.

4. Findings

4.1 The experiences of doctoral students with research progress and general well-being

During the interviews, all participants seemed open and willing to share their experiences, positive or negative. Most interviewees relayed their personal experiences but at times they also shared their contextual setting or stories from peers.

Research engagement

Research engagement was a theme that sparked diverse discussions and perspectives, depending on whether engagement was understood in terms of productivity and continued performance, or whether it was linked to engagement in terms of motivation to continue research. On the positive side, a few students reported being able to continue their research uninterruptedly, at times even dedicate more time to their PhD (mainly those doctoral students who had a paid job outside their PhD) despite the stressors introduced by the pandemic.

> I joined the PhD program because of COVID-19, because of the world lockdown […]. According to my working background, I have to fly a lot to do some marketing research. But since everywhere

> was locked at that moment, so I got plenty of time for myself. […] But since this year, our business travel is starting over again. So yeah, now I have to ask for temporary leave from the PhD study. I'm getting busier at my full-time job (Participant 6.2, interview 6).

Flexibility and accessibility to create new collaborations afforded by the online environment were highlighted among factors boosting research engagement. In addition, and perhaps paradoxically, some doctoral students experienced an increased ownership of their research without frequent supervision, despite the common desire for more support from their supervisors.

> It made me more independent and rely on myself, and take more control and ownership (Participant 2.2, interview 2).

Despite some of the positive aspects brought up by the participants, doctoral students also reported feeling demotivated as intellectual stimulation waned. This was evident especially for those whose circumstances meant that the research process was severely affected. Being tasked to work on research yet lacking access to logistical assistance or intellectual support made the task more isolating.

> My reading groups really stopped for a while at [university affiliation]. And I found it very hard to engage. […] I'd say definitely the first few months were for me rather demotivating because I just couldn't see the way forward (Participant 9.1, interview 9).

Well-being and risk factors

Besides a decrease in research motivation, general well-being related to doctoral student experience was also affected severely. In all interviews, participants emphasized experiencing heightened anxiety and stress during the pandemic lockdowns. The experiences were widespread with doctoral students openly sharing their stories of struggles with overall well-being – stories which were echoed by the other students in the groups.

> I started having anxiety attacks, also I think it was because I come from this social environment and then my supervisor left this university and I had new supervisors. But, at the time I started having therapy. I had lots of friends who also started having therapy at the time […] (Participant 3.3, interview 3).

Most participants reported being able to continue with their research projects during and after the pandemic, however, their well-being was weakened. Even for those participants who did not report experiencing symptoms of lockdown fatigue in the short term, burnout symptoms were felt in a delayed manner.

> I think, to be honest, the impact came later. I think in the early stages of the pandemic I was quite focused on my work. Towards the end of my PhD, I found it much more difficult to engage with research (Participant 1.3, interview 1).

The observation shared by the study participant is concerning, as it suggests that the long-term effects of the pandemic may have impacted not only those who experienced negative impacts during the lockdowns or immediately after, but also those who initially seemed unaffected by the disruptions. The excerpt above also highlights the potential costs of relying on short-term resilience, as it may deplete emotional and psychological reserves, disrupting sustained performance.

For some who found themselves in circumstances with overlapping contextual stressors, pandemic's adversity was felt particularly strongly, with compounding factors working simultaneously. Table 2 below describes the factors which were linked to the risk of experiencing negative pandemic effects for the study participants in our sample. We note that this evidence is to be interpreted with caution given the small sample for the study. While we did observe that these factors were associated with a risk of experiencing negative pandemic effects by our study participants in diverse contexts, we are not able to make generalizations to other contexts, and the presented evidence is to be treated as illuminating the particular contextual circumstances of our participants.

[Table 2 near here]

Table 2. Risk factors for experiencing negative effects of the pandemic.

Factor and representative quote
Caring responsibilities (for students and/or supervisors) […] I have two small children, and they were at home, so that was very difficult when they were there (Participant 4.1, interview 4).
Health affected by COVID-19 […] the staff, some of the supervisors […] that would interact with contracted COVID-19 and they went into isolation for the 14 days follow-ups. They went for self-quarantine. Some of them were taken to government quarantine centers […] (Participant 9.2, interview 9).
IT connectivity You would find that you are living in a distance of about 200 kilometers from your supervisor, and the only remedy to save the situation was to have a virtual meeting […] And yet in most of our parts in East Africa, this remote part, we don't have Internet. So, you would find that you could look for a place where Internet is so that you can have the interaction with supervisor (Participant 8.1, interview 8).
International students … family was also an ocean away, there were challenges of traveling, it was difficult to find direct flights anyway, I would be at a gate in the airport all by myself, trying to get home to be with my family. It was just something else, it was out of worldly (Participant 1.1, interview 1).
Insufficient workspace at home It was also very challenging for me to adapt to work from home because I lived in a studio before, so I have to work on the kitchen table because I did not have also my laptop. I miss coming to the office and dedicated space where I can work. (Participant 5.1, interview 5).
Pre-pandemic difficulties in the supervision process exacerbated During pandemic, the situation became even more toxic. I did not receive any comments to my work, when I shared it with the supervisors (Participant 2.2, interview 2).
Students starting the PhD during the online emergency response (without prior links to the community) I think the physical interaction was really missing, because it is not so easy to reach out to people via email. There is also a lot of expectation that something productive will come out of the meeting, ad hoc discussions of ideas were missing. Was hard in the beginning (Participant 7.1, interview 7).

Access to data

Whether the lockdown restrictions hindered data collection depended on the specific field, sometimes discipline, or methodological approach initially planned for the project of the student. In cases where data were already collected and doctoral students were in the analysis stage of the study, data access was not an issue. As a result, some participants in the study reported not being affected at all. At times, they were able to relatively easily switch to an alternative plan of data collection online:

> So, basically COVID-19 did not have much impact on my research topic because even before the outbreak of COVID I was able to see my participants not face-to-face but in a virtual sense [...] (Participant 5.1, interview 5).

For others, projects requiring access to data which were no longer available due to pandemic restrictions, caused severe hindrance to the research. This hindrance was due to participants not being able to collect primary data, not being able to access already collected data, or only being able to collect data using different modes which led to a loss of quality:

> I wanted to, you know, spend time in some of the communities to do extensive interviews, observation on certain community organization processes. And then suddenly with the pandemic, all of that was off the table. Could not happen even if it could be done safely or feasibly. So I had to find ways to adapt, to continue doing research remotely. And so that was a big challenge (Participant 9.1, interview 9).

> […] the most challenging side is because my major is a cross-cultural issue, so I cannot do the interview in person and to feel the cultural difference in person (Participant 6.2, interview 6).

Infrastructure for the emergency move online

When reviewing the role of digital services, learning platforms and digital conference software, it became clear that institutional facilities were crucial. Doctoral students with weaker digital infrastructure were worse off. Some participants reported that they experienced difficulties due to online infrastructure being not ready for a pivot to remote access. For others, sophisticated digital infrastructure allowed the supervision process to continue largely unaffected:

> And yet in [country of the PhD program], we had not yet started to digitalize education. This so-called internet remote learning was not yet initiated in our universities, so it really became hard on my side (Participant 8.1, interview 8).

> Him being on the ground in South Africa and me in [country of the PhD program] is working well, we meet over zoom and email and occasionally by phone call. There are 1000 miles between us, yet it feels like it was before. Technology makes this possible (Participant 2.1, interview 2).

At the same time, the new online opportunities were reported to be beneficial in terms of accessibility. Investments were made by universities into digital infrastructure and software. The absence of geographical distance allowed affordable online access to expertise globally, not constrained by physical travel. This benefited doctoral students with less dense research networks at their home university, but also those students who were less able to travel physically:

> Now I am less frightened of changes in technology, to use and connect with people. Tech made the world feel a much smaller place. As disabled, physically the places are not always accessible for me. Sometimes I cannot get into lecture halls due to physical hurdles. Now being able to join online, so the fact that the field moved to online education more often, has been a bonus for me. (Participant 2.2, interview 2).

Informal interactions with colleagues

At the same time, despite new benefits that the move to online settings has brought, all participants expressed missing the feeling of collegiality and opportunities for informal professional interactions.

> I think that when universities and conferences were doing online programs which had an online networking thing, I never really thought that worked very well myself. I think it does seem really far more artificial than speaking to people in person (Participant 4.2, interview 4).

This social isolation affected opportunities to interact not only with supervisors, but also with peers. Specifically, students who started their PhD during the pandemic and did not have previously established collegial relationships in their department neither with peers nor staff, experienced this most strongly:

> Never met my supervisor in person, which is quite disappointing to be honest. She was always very helpful, even before the pandemic, in providing support, etc., but it felt very different from physical interaction. Also, I did not know anyone from the department, even though I went to online departmental meetings. Then stopped going because not everyone interacted (Participant 7.2, interview 7).

The impact of this social isolation was mitigated for those who proactively connected with peers and colleagues in online spaces which were available. In addition, the virtual connection was at times easier for people than in-person. An example is those who mentioned shyness as a personal trait for which online interactions were actually helpful:

> But I have to say that I'm a very shy person actually, so I find it hard to initiate conversations, things like that. Funnily enough, Zoom is much better for me than face to face (Participant 1.2, interview 1).

4.2 Supervisory relationships and communication during the pandemic

For supervision during the pandemic to be functional, many participants felt that the relational dimension of the process was a critical factor. Good relations and communication with the supervision team, ideally already established before the pandemic, served as buffers against the challenges, which ameliorated negative pandemic-related dynamics:

> For me, I don't think my relationship with my supervisor changed that much because of COVID. I was quite lucky because I knew my supervisor a few years before I started my PhD […] (Participant 5.1, interview 5).

On the other hand, poor communication in the team or lack of feedback and input from the team to the student created or exacerbated barriers, which as a result affected not only the professional relationship between student and supervisor, but also research performance, as indicated:

> One thing that should have been done much better is just communication. The value of communication cannot be overestimated. I don't actually mind if the supervisor tells me I'm having a lot of difficulty right now, it's going to take me several months to get back to you, as long as I know that, but when every week I'm checking my e-mail wondering when I'm gonna hear from them, then, you know, I can't do other things instead […] And that's something that I think everyone could do better, especially if you have supervisory responsibility for someone (Participant 1.3, interview 1).

Not only communication, but also the quality of feedback and support of the supervision team was brought up as an issue by the participants. In this respect, institutional policies providing clarity on the tasks and responsibilities of supervisors and rules supporting the supervision process for both students and their supervisors are extremely important. Some of the concerns expressed by students are visible in the excerpt below:

> My demotivation was that each time I approached my supervisors, they were not available. They are doctors in hospitals, and we could never meet. Also, online meetings never happened. When I complained, I was told that I was the bad student (Participant 2.2, interview 2).

Those who reported that their supervision process was not affected much by the pandemic identified some good practices, such as regular communication with their supervisory teams, clear regulations on the supervision process with guidelines for both students and their supervisory team, and trainings for supervisors on how to support their doctoral student best.

4.3 Support strategies in online settings

In addition to supervision support, students also received other types of assistance that helped them in their research progress. Examples mentioned were peer-to-peer mentoring, support of external mentors, institutionally provided support, or self-directed strategies. Institutional best practices included the existence of various mentoring and professional development

opportunities, the availability of coaching or confidential advising, writing sessions, workshops and career training opportunities.

> We have some services offered. Some of them are offered at the faculty level and some are offered by the graduate school specifically for PhDs. We have regular weekly meeting in our faculty looking at how things go, where anybody could say anything to everybody including the dean in attendance. […] And by the graduate school we also have some writing sessions organized […] there was a confidential advisor for PhDs. So, whatever we felt like, whether you are stuck and want to talk about it or about what they are going through or not, there is this person whom you can speak to. I really used this service at some points [...] (Participant 5.2, interview 5).

However, while some report to have benefited from institutional support, such services were not present for all. Not all institutions were able to support their students, and even in cases where specific support policies at the level of the institution were available, we identified reservation of some students to use them. Participants flagged that often they were unaware that the services existed at the time they needed them. In addition, those services required a time investment from the participants, which may not have been possible in practice:

> There was an institutionalized "Research buddy scheme", for students after the first year to support the newbies. I was assigned to that program, but because of the pandemic, we rarely had a chat. We met in person once, she was very nice, although also very busy. Was not that helpful as a service by the university. […] Not many people I know at the university focus on similar topics of interest (Participant 7.2, interview 7).

> […] Basically, there was psychological support for undergraduates and Master students, but not for PhDs and not for staff. The only option was a coach […] There are also people that don't do this because they are afraid of mental health services within the [country of PhD program] medical system […] (Participant 1.3, interview 1).

Few participants noted that informal mentoring opportunities were unevenly structured, and communication about existing support options was not always clear.

> In terms of mentoring. I'm not sure I've seen any of that in my time here. I mean I'm a part-time student and therefore my trajectory was up till seven years. A strange thing happened last week that both my supervisor and I discovered that for part-timers, the university has actually made a change to the regulations without telling anyone, so I actually have another year now […] (Participant 1.2, interview 11 – follow-up with the participant from interview 1).

Among those who experienced a void in supervision and mentoring support, some resorted to external academic support. The services identified, peer groups joined, or mentoring found was largely based on self-directed strategies of coping:

> I looked for mentorship from other people that supervised their students well. There is an association (network for researchers) for African members. This network arranged for doctoral students to be grouped during the pandemic. We pay a little membership fee. The network consisted of online groups of students with multidisciplinary staff, so there was no specialist in my area of study. Yet, this group offers input, feedback and keeps up the motivation. That network kept me active in the process of the PhD and without that group I would have dropped out (Participant 2.2, interview 2).

> Reviewers of journals helped me to improve. At some point, I asked the journal editor to offer assistance from the journal reviewers – so the journal reviewer offered detailed feedback on my work. That helped me a lot (Participant 2.2, interview 2).

> When I joined my PhD, we immediately bonded [with fellow PhD students in the cohort] and created a WhatsApp group […] I think it's been useful because we could share the challenges that we were all facing and how one or the other person was trying to address them and also helps you understand, you know, the issues you may be having with your supervisors or your own research and trying to first get the encouragement that you're not the only one facing those issues. And to getting ideas also from others on how to address them […] (Participant 6.1, interview 6).

A final sub-theme under support mechanisms available and used were self-regulation strategies, used as coping mechanisms or resilience-enhancing strategies: the establishment of a routine, self-care via various approaches (daily outside walk, running, reflection journal to keep track of progress) and relying on support of friends and family members.

5. Discussion and Implications

5.1. Summary of the results

Even though we identified some positive experiences reported by doctoral students in our sample (i.e. increased opportunities for training in online spaces, new collaborations and networks which were inaccessible pre-pandemic), negative effects of the pandemic lockdowns were more prominent. Research motivation and engagement of students suffered considerably. Long-term effects in the form of burnout symptoms were reported not only by students who experienced short-term declines in motivation and research engagement, but also by some who managed to retain productivity in the short-term.

Interpersonal relationships emerged as protective buffers against burnout and decreased motivation. Supportive supervisory teams and active peer networks which offered both emotional and academic support were effective. Students for whom supervisors, peers, and external mentors provided guidance and assistance during the pandemic lockdowns managed to retain their research engagement and overcome the hindrances of the pandemic period. This finding is in line with existing research on factors affecting doctoral students' well-being (Clegg et al., 2024; Pyhältö, 2018; Rönkkönen et al., 2023; Watson and Turnpenny, 2022). Vice versa, burnout and decreased motivation were exacerbated for those students who had a prior history of difficulties in the supervision process. Existing strong professional relations and previously built trust allowed students to manage the pandemic better. This is consistent with existing evidence on the importance of relational aspects in doctoral students' supervision, which is even more crucial during the pandemic response (Guerin and Aitchison, 2021; Jacobsen et al., 2021; Lundgren-Resenterra and Crosta, 2019; Mullen, 2022). Doctoral students missed informal interactions with colleagues in the support environment. This lack of collegial relationships

proved especially detrimental for students who started their PhD during the pandemic – as the absence of peer and senior staff networks continued to affect them even when the lockdowns were lifted.

We interpret our findings with the help of Bronfenbrenner's ecological systems model (1977). According to the model, the sources that facilitate resilience can stem from micro-, meso- and exosystem levels in the nested support environment within which the doctoral students are embedded. In the interviews, we observed that students with limited support at one of the levels (e.g., void of support in the institutional practices of the exosystem, or absence of guidance from the supervisor at the microlevel) can find support at a different level (e.g., peer community and external networks of mentors at the mesolevel, or support from family and friends at the microlevel). For example, while macrolevel constraints, such as poor internet infrastructure, impacted the repertoire of possible responses at lower levels of the support systems, doctoral students demonstrated resilience by developing and leaning into support networks at both micro- and meso-levels of their environment. Additionally, our observations indicated that in settings where resilience was nurtured across all levels of support within the system, students demonstrated enhanced abilities to navigate the challenges effectively. Despite deliberately sampling for maximum variation across personal circumstances, institutional contexts, and geographical locations, we found striking similarities in how doctoral students accessed and experienced sources of resilience across different levels of support systems.

From the perspective of the PhD programs' management, it is advisable to provide training and services facilitating the supervision process, as well as a form of mentoring for doctoral students in addition to the support of direct supervisors. For students in particularly vulnerable contextual situations during the pandemic lockdowns, the presence or absence of such

support served as the key mediating factor in determining how severely they experienced negative effects. In our study sample, we identified as vulnerable those students who started the PhD during the pandemic, international students unable to travel home, students and supervisors with extra caring responsibilities, students whose health was affected, and students and supervisors with pre-pandemic supervisory difficulties. In addition, students and supervisors with difficulties in terms of IT connectivity and students for whom data collection process was disrupted by pandemic restrictions were more severely affected. In the best-case scenario, the setbacks created by the compounding pressures delayed the research project only during the pandemic and could be resolved with the policy of granting extensions. However, the effects for many students could have longer-lasting consequences affecting students' professional development opportunities, network building, and career intentions beyond the PhD (Lokhtina et al., 2022).

Students reported several institutional support practices as useful. The main ones were mentoring or coaching programs with staff or colleagues external to the immediate supervisory team, peer-writing sessions, workshops on various topics related to professional development, and regular check-ins. At the same time, institutionally provided services were frequently not or under- used despite their availability. Reasons for under-use were either because at the time of need the students were unaware of the service's existence, or students had a fear of stigmatization when accessing the provision, especially if those services were linked to mental health.

5.2. Further research venues and policy implications

Further research is needed to better understand if pandemic induced short-term risks of decreased productivity, or whether well-being of doctoral students also suffered from longer-

term negative effects. Continuous monitoring of well-being is crucial, as impacts on well-being may not manifest immediately but could surface with delays. The long-term inequities that were created or exacerbated by the pandemic for groups at-risk need to be understood better, which would allow the development of response strategies at the institutional level. We recommend further research to understand best practice types and forms of support (i.e. support by supervisor or external mentor, in an individual or group setting, self-initiated by student or initiated by mentors), taking into account not only the doctoral student perspectives, but also the supervisory perspectives, in relation to their workload, competencies' acquisition, and occupational well-being (Pyhältö et al., 2023b). Lastly, we need to be mindful that the resilience measures taken at the individual level may not be the optimal response from the institutional perspective. Future research should investigate not only how sources of individual-level resilience can be facilitated at different levels of the support systems, but also how these sources contribute to the resilience of all actors involved within the entire doctoral student educational support system.

While a lot of response strategies during the pandemic emerged out of immediate need, there were several pandemic-driven changes that created improved opportunities for certain disadvantaged groups. For example, whilst students with a disability were particularly affected by the economic and social disadvantages associated with lockdowns, some of the responses of higher education providers proved beneficial to this group of students both during and post-lockdown periods:

> "[institutions] have now been forced by the pandemic to develop the capacity to provide extensive online education, and to create new structures and models of teaching along with this. As a result, institutions have the opportunity to permanently embed these

possibilities into their teaching and learning offer going forward, including after the end of the pandemic, which could benefit disabled students now and in the future."

(Higher Education Commision, 2020)

However, as Liasidou (2022) observes, there has been a tendency to abandon many potentially beneficial online innovations that emerged during the pandemic without examining their long-term utility, while simultaneously failing to pay attention to refining existing practices to ensure they are inclusive and equitable.

As some of the more positive findings from our data highlight, the new opportunities for professional development in the online and hybrid post-pandemic research environments hold some promise which can be capitalized on. However, there remains uncertainty about how to structure these opportunities effectively within, alongside, or as a component of the formal supervision process. From the perspective of teams developing and managing support services for PhD students and their supervision teams, it is crucial to dedicate time not only to establishing a wide range of support provision, but also to train supervising staff in implementing those new didactical formats and monitoring potential bottlenecks in accessing and utilizing these services. However, even these efforts are not sufficient by themselves, given the systemic pressures deeply ingrained within academia structures and mechanisms of reward and recognition. This may require a review of the policy for reward and recognition of doctoral supervision. The lack of time and incentives for supervisors to provide additional mentoring beyond the requirements of the immediate research project is a well-known constraint at the exo- (institutional practices) and macro-level (work culture and the focus on research performance) of education systems (Beasy et al., 2021; Jackman et al., 2022; Johnson, 2016; Yin & Mu, 2023). The doctoral students in our sample echoed these concerns, reporting that while mentoring by

multiple (internal and external) parties could be helpful for professional development, there were limited structured opportunities for such mentoring in their supervision process.

There is a need for in-depth studies examining the roles, configurations, and effectiveness of both formally institutionalized and informal mentoring opportunities in the support environments within which doctoral students and their supervision process are embedded. Such studies ideally need to be informed not only by the perspectives of doctoral students, but also views of supervisors and mentors external to supervisory teams.

Disclosure statement

The authors report there are no competing interests to declare.

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