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ARTICLE

Initial findings of a longitudinal study of wellbeing and mental health among graduate students around the world: The intra-individual impact of a pandemic

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Abstract: This paper explores the impact of the COVID-19 pandemic on the mental health and wellbeing of graduate students at universities and research institutions around the world. In so doing, it assesses the intra-individual effects of pandemic-related restrictions on a key cohort in academia: doctoral candidates. We trace this cohort's ability to adapt to the pandemic over a two-year period by investigating their quality of mental health, indicators of mental health disorders, and indicators of wellbeing and resilience. A consensual qualitative research methodology was adopted when analyzing data gathered during April 2020 and February 2022. The study uses Ecological Systems Theory as a framework, providing insights into how the COVID-19 pandemic affected the wellbeing and mental health of graduate students in myriad ways. The researchers found that while the pandemic negatively affected cognitive processes, a significant proportion of doctoral candidates exhibited remarkable levels of resistance and reconfiguration resilience and short-term improvements in mental health during the period under investigation.

Keywords: Wellbeing; mental health; Consensual Qualitative Research; COVID-19; graduate students

1. Introduction

The COVID-19 pandemic redefined social norms and practices, such as mask-wearing and social distancing (Horne & Johnson, 2022). The pandemic also culminated in lockdowns, curfews, and wide-ranging restrictions on local and global mobility. This in turn had long-term effects on the academic performance, mental health, and wellbeing of graduate students at universities around the world (Cahusac de Caux, 2021; Cahusac de Caux et al., 2022). This study examines the impact of the pandemic on the mental health and wellbeing of graduate students in a number of countries. It draws on data gathered during the early and later stages of the pandemic, and thus represents the initial findings of a longitudinal overview of the effects of the pandemic on graduate students. The study draws on data from a research project examining the academic writing output and strategies of graduate students. At the time of writing (late 2022), the World Health Organization (WHO) continues to treat the COVID-19 pandemic as a global health emergency—the highest classification of alert reserved for public health concerns (WHO, 2022).

Though the mental health and wellbeing impacts of the pandemic on graduate students have been explored at length (Borgogna et al., 2021; Jones-White et al., 2021; Naumann et al., 2022), few longitudinal studies of the social psychological effects of the pandemic can be found. This is particularly problematic, given the long-term social psychological ramifications of the pandemic

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for this cohort. The lack of research in this area is predominantly due to the relatively short period of time that has elapsed since the pandemic began. The majority of studies are restricted to particular geographic locations. For instance, several studies of graduate students enrolled at American institutions can be found in the literature (Chirikov et al., 2020; Jones-White et al., 2021). There are also studies of graduate students in Europe (Kowalczyk et al., 2021) and other parts of the world (Marahwa et al., 2022). This paper explores the social psychological impact of the pandemic on graduate students from several countries, including the United States, the United Kingdom, Australia, Canada, and Malaysia.

An increasingly important question relates to the societal cost or impact of wellbeing and mental health degradation within academia. While this question is complex in nature, attention is directed at carefully evaluating the roles that universities and research institutions play in social, cultural, economic, and political developments. This paper limits itself to a discussion of the roles that universities play in the context of the development of graduate education, based on the findings of our intra-individual study of wellbeing and mental health among graduate students. The main objective of this study is therefore to assess the ways in which doctoral candidates experienced and processed the pandemic over a two-year period.

Ecological Systems Theory (EST) is the theoretical framework guiding the analysis in this paper (Bronfenbrenner, 1992; Bronfenbrenner, 2005). EST has been applied in social psychological research for decades and provides researchers with a versatile framework that helps predict and explain the ways in which individuals develop (in this case, doctoral candidates) (McLinden, 2016). According to the EST framework, multiple social environments (systems) operate in ways that exert influence on the individual, which necessitates adaptation and/ or resistance on the part of individuals.

In this study, we focus on the microsystem, mesosystem, and chronosystem that doctoral candidates inhabit. The microsystem (activities and roles associated with studying for a doctoral degree; relationships with colleagues, supervisors, etc.) is part of a mesosystem (research institution, home), which in turn falls within an exosystem consisting of other research institutions, departments, conferences, and seminars. The aforementioned systems all exist within the macrosystem, "a broader social context, *with particular reference to the developmentally instigative belief systems, resources, hazards,* [and] *lifestyles*" that influence individuals (Bronfenbrenner, 2005, p. 149). Due to the scope of this paper, the exosystem is not considered in this study. The broader social context this paper investigates is the COVID-19 pandemic and its associated effects on the resources, hazards, and lifestyles of individual doctoral candidates.

Doctoral candidates are distinguished by their cognitive abilities, which are in turn shaped by their activities, roles, relationships, and positionality. In the chronosystem, we examine the developmental changes that occurred in the doctoral students' mental health and wellbeing over the course of approximately two years (April 2020 and February 2022), during a "life transition" occurring in the short-term (Bronfenbrenner, 2005, p. 120). By examining different systems involved in the psychosocial development of doctoral candidates, we minimize the risk of generating arguments that are simplistic and reductionist in nature.

2. Literature review

Currently, more studies exist about mental health among undergraduate students (e.g. Bono et al., 2020), while data related to PhD students are more difficult to retrieve. However, data from the Higher Education Statistics Agency show a 210 percent increase in the number of students dropping their studies due to mental health-related issues (Marsh, 2017) and an increase in use of professional counseling support (Thorley, 2017). In addition, the number of students

committing suicide has significantly increased (Thorley, 2017). Other studies indicate that PhD students are six times more likely to experience depression and anxiety than individuals in the general population (Evans et al., 2018). Lau and Pretorius (2019) also examined the intrapersonal dimensions of wellbeing amid what they term an "academic mental health crisis" (p. 37).

At present, there is no single satisfactory definition of mental health. Mental health was traditionally understood as the absence of mental illness, which significantly limits its meaning and application. Some definitions include biological, social, and psychological factors. According to the definition provided by WHO, mental health includes community contributions, individual potential, and the ability to cope with life stress (WHO, 2022). Alternative definitions place importance on emotional, intellectual and spiritual development (Health Education Authority [HEA], 1997). Definitions of mental health in positive psychology paradigms suggest the importance of a sense of self-worth, positive self-perception, and physical health (Bhugra et al., 2013; Mental Health Foundation [MHF], 2008), as well as intra-individual harmony (Alonso, 1960). According to a study by Manwell et al. (2015), 30 percent of respondents (global experts in mental health) claimed that none of the existing definitions of mental health satisfy their expectations and needs, while 46 percent perceived the definition provided by the Public Health Agency of Canada as the most satisfactory; only 20 percent rated the WHO definition as satisfactory. The Public Health Agency of Canada defines mental health as

> the capacity of each and all of us to feel, think, and act in ways that enhance our ability to enjoy life and deal with the challenges we face. It is a positive sense of emotional and spiritual well-being that respects the importance of culture, equity, social justice, interconnections and personal dignity (Public Health Agency of Canada, 2020)

The concept of wellbeing is related to an individual's welfare and can include mental, physical, social, financial, and personal subcategories (Keller, 2020). According to Rath and Harter (2010) wellbeing consists of five essential interconnected components, such as career, social, financial, physical, and community. Aked et al. (2008) argue that individuals can adopt five strategies to improve their wellbeing: developing social connections, being active, learning, changing routines, and practicing acts of kindness. Wright and Huang (2012) indicated three following descriptives of wellbeing: subjective cognitive evaluation of life (life satisfaction), subjective beliefs which create reality (phenomenological event), and evaluation of emotions as pleasant or unpleasant. Wellbeing is a broad concept which can be measured according to psychological, physical, emotional, or subjective criteria. According to Diener (2000), subjective wellbeing can be measured as a combination of individuals evaluating their lives and the intensity of experiencing positive and negative emotions. Eudaimonic wellbeing is defined as a dynamic process of personal growth, flourishing, and self-actualization by being involved in activities demanding an individual's resources and subjective meaning (American Psychological Association, 2022; Boniwell, 2008). Psychological wellbeing is measured by six components: life purpose, self-acceptance, positive relationships with others, personal growth, autonomy, and life and environment management skills (Ryff & Singer, 2006). In this paper we define wellbeing as positive experiences in the past, present, and an optimistic attitude towards the future that may be based on subjective experiences and emotional states, individual character traits, and positive institutional or community support.

La Placa et al. (2013) interrogate the discourse surrounding wellbeing in academia and argue that it can be found on several levels: individual, family, community, and societal. Mental wellbeing is used in parallel with the concept of positive mental health, showing the relationships

with competence, engagement, emotional stability, optimism, meaning, positive emotion, self-esteem, positive relationships, resilience, and vitality (Huppert & So, 2013). The impact of resilience on improving wellbeing is significant, as it helps individuals cope effectively with negative emotional experiences (Tugade et al., 2004). According to Lepore and Revenson (2006), researchers should consider three different types of resilience including recovery, resistance and reconfiguration, where the last one is the most beneficial in terms of improving mental health and psychological wellbeing. In the context of higher education, Vailes (2017) provides numerous guidelines regarding the development of resilience among students while also describing the prevalence of mental health issues in higher education across the United Kingdom.

Van Tienoven et al. (2022) studied PhD students' satisfaction with supervisor support during the COVID-19 pandemic in Belgium. Supervisor support has a significant impact on PhD student success (Lee, 2008) and overall wellbeing (Dericks et al., 2019), regardless of the discipline of the PhD student. Furthermore, according to a study by Evans et al. (2018), PhD students with anxiety and/or depression tended to exhibit low levels of satisfaction with supervisor support. The effects of COVID-19 on PhD students' mental health and satisfaction with the PhD program was explored by Naumann et al. (2022). The study indicated a decrease in overall wellbeing and satisfaction with PhD training. More than 20 percent of respondents experienced depression; 25 percent experienced severe loneliness, and the whole study population registered high burnout scores. This has implications not only for research output and doctoral thesis completion, but also for student-supervisor relations and, by extension, PhD students' motivation to connect with other academics in their fields.

Gonzalez-Betancor and Dorta-Gonzalez (2020) studied the relation between mental health (anxiety, depression, discrimination, and bullying) and risk of PhD interruption (change of study area, change of supervisor). They concluded that poor mental health is the leading contributor to the interruption of doctoral studies. Winter et al. (2021) conducted a longitudinal study of mental wellbeing among students who commenced their PhD studies. They demonstrated that commencing a doctoral degree does not necessarily negatively impact the mental health of doctoral candidates. Babb, Rufino, and Johnson (2022) focused on evaluating the COVID-19 impact on non-traditional students' wellbeing and mental health, reporting (compared to pre-pandemic data) higher levels of anxiety, depression, insomnia, and sleep disturbance. Scott and Takarangi (2019) conducted a systematic review of the effectiveness of existing tools for measuring PhD students' wellbeing, claiming that the majority of them measure mental health symptoms, self-determination, or subjective wellbeing.

Kowalczyk et al. (2021) conducted a study of mental health among PhD students in Poland. According to their study, half of the respondents indicated a decrease in their mental health. Anxiety and insomnia were more spread among female students, while depression was more common among single students. The highest reported results were anxiety and social dysfunction, followed by somatic symptoms and depression. The most common stressors among PhD students are academic, relationship, and financial (Jones-White et al., 2021). Suart et al. (2021) analyzed PhD students' concerns and grouped them into three main categories: personal concerns, career impact, and disruption or changes in research activity. Intense stress was considered a reason contributing to an increase in the possibility of experiencing depression among PhD students (Guthrie et al., 2017). A study by Borgogna et al. (2021) indicated lower depression among clinical, counseling, and psychology PhD students, but higher financial stress among clinical psychology PhD students.

Marahwa et al. (2022) explored the psychological impact of COVID-19 on students in Africa and China, indicating high levels of depression and anxiety among respondents, in addition to

the impact of gender, religion, and educational background. Ahalli et al. (2022) systematically monitored the mental health of first-year doctoral candidates at a French university, and concluded that at least 34 percent of their sample (n=161) exhibited mild depression. Brooks et al. (2020) reported on the effects of isolation and quarantine, uncertainty, economic crisis, and insufficient information on students' mental health. Lee, Jeong, and Kim (2021) studied stress, depression and anxiety among students during COVID-19 and their use of mental health support. Their results indicated that 88 percent of students experienced intense stress; 44 percent suffered from severe anxiety, and 36 percent experienced moderate to severe depression.

An, Brashears, and Johnson (2020) studied the impact of the pandemic on the development of social networks. Social distancing was recognized as an important challenge among early PhD researchers (Naumann et al., 2022). Humphries et al. (2021) indicate a disproportionate impact of family duties and personal responsibilities on female PhD students.

Positive socialization (Stubb, Pyhältö, & Lonka, 2011), positive relationships (Soysa and Wilcomb 2015; Tong and Song 2004), and positive mentorship (Stubb et al., 2011; Al Makhamreh & Stockley, 2019; Ives & Rowley, 2005) were associated with increased research performance, lower anxiety, and increased mental wellbeing. Conflicting responsibilities (Hyun et al., 2007), adaptation to organizational atmosphere (Lovitts and Nelson 2000; Rhode 2003), or new cultural norms (Baker & Pifer, 2015; Zhang & Goodson, 2011) were associated with lower satisfaction and mental wellbeing. Usher and McCormack (2021) focused on the relation between wellbeing and variables related to doctoral capital. Waight and Giordano (2018) explored mental health support among doctoral students in the United Kingdom and emphasized the importance of online self-help, supervisor support, and workshops. In the broader postgraduate population, psychosocial interventions (e.g. gratitude interventions; psycho-education, or cognitive behavioral therapy) were evaluated as effective in managing mental problems and enhancing wellbeing (Shubina, 2022b). Moreover, cognitive behavioral therapy has been proven to support mental health and coping with various mental disorders during the COVID-19 pandemic (Shubina, forthcoming). There is a need for more studies of the efficacy of using technology as a supportive tool in various mental- and physical-health interventions, as well as for heightened awareness of these interventions (Shubina, 2022a).

3. Method

The data used in this research paper were drawn from a research project exploring the impact of the COVID-19 pandemic on doctoral candidates' academic writing output and strategies (anonymized). Data were gathered from 134 respondents from several higher education and research institutions around the world. Three techniques were used for soliciting responses to the survey. Initially, a call to participate in the study was shared via social media platforms such as Twitter. Snowball sampling was also used. Lastly, academics at other institutions asked their departments to circulate an invitation to participate in the survey via a university mailing list. In the case of the mailing list, it was not made clear who had requested the circulation of the invitation. We analyzed a subset of unpublished and unused data gathered during the course of this research project. The data came from responses to three questions included in a questionnaire about academic writing output, strategies, and self-reported mental health. These questions, along with the other questions included in the questionnaire, can be found in the Appendix.

We employed thematic analysis to interpret the social psychological effects of the pandemic on graduate students' mental health and wellbeing. Responses to two survey questions were coded according to a glossary of terms associated with mental health (Table 1) and wellbeing (Table 2). The DSM-5-TR (Diagnostic and Statistical Manual of Mental Disorders) informed the

selection of the majority of the terms included in the glossary (American Psychiatric Association 2013). We took into consideration a recent systematic review of common mental health disorders when deciding what disorders to code for in our analysis (van Ballegooijen et al. 2016). When assessing wellbeing, coding for "Positive Experience" and "Positive Institutional Support" allowed us to examine the impact of the microsystem and mesosystem on the doctoral candidates.

Table 1. Glossary of mental health disorders

Disorder	Descriptors
Depressive Mood	sadness, emptiness, hopelessness, tearfulness, irritability, guilt, worthlessness, frustration
Anxiety	worry, fear, distress, lack of emotional control, irritability, withdrawal
Maladaptive Behavior	eating disorders, lack of organization, procrastination
Cognitive Processes (malfunction)	concentration problems, memory problems, low decisiveness, destructive thoughts
Negative Self-perception	negative changes in the way in which people view themselves

Table 2. Glossary of wellbeing

Category	Descriptors
Positive Emotions	enjoyment, accomplishment, fulfillment, joy, happiness, satisfaction
Positive Experiences	physical activity, hobby, socializing, mindfulness
Positive Institutional Support	meetings, events, guidance/ counseling, financial aid
Resilience	adaptive behavioral strategies

While coding, we followed Braun and Clarke's (2006) approach to thematic analysis. Elements of consensual qualitative research were also used to verify the validity and reliability of the coding (Hill and Knox 2021). This involved adhering to a three-step process. Firstly, we coded the data independently and free from input from external sources. Secondly, we met and compared our coding. The second step involved identifying discrepancies and reaching a consensus. In cases where discrepancies were observed, we discussed how to code the datum in question. Finally, a glossary and coding master-document was created and shared with an expert who reviewed our coding.

After completing the three steps outlined above, descriptive statistics were used to analyze the coding of mental health disorders and wellbeing in order to interpret the findings. Descriptive statistics are also used to analyze self-reported mental health quality among the graduate students. When the survey was administered, all respondents were asked to rate their mental health since the start of the pandemic from 1 ("Very Poor") to 5 ("Very Good") using a Likert scale. We used the data gathered from the responses to this question to investigate whether any correlations existed between mental health/wellbeing and self-reported mental health.

Two types of triangulation were used in order to ensure the validity of our findings. Method triangulation, which refers to the collection of data through multiple methods (Carter et al. 2014), was used in the research project itself. This involved the collection of data through a survey and follow-up interviews with doctoral candidates. Investigator triangulation, which "involves the

participation of two or more researchers in the same study to provide multiple observations and conclusions" (Carter et al. 2014, 545), was also used at two distinct levels. As highlighted above, the co-authors coded data independently. They then compared their coding (first level). They subsequently sought the feedback of an external expert and researcher in order to confirm findings and incorporate divergent perspectives (second level).

Taguette, an online open-source qualitative data analysis tool, was used to code data that were generated in this research project. Data were stored securely and personal information was anonymized. Similarly, data presented in the findings section of this paper are anonymized.

4. Findings

Consensus regarding coding was reached through consultation between ourselves and subsequently with an expert who had no prior connection to the research. The expert who reviewed our coding reported no issues with the coding master-document created by the researchers.

Our data comes from the responses of doctoral candidates at universities around the world. The majority of respondents were pursuing their doctorates at English-speaking universities in Australia, UK, and USA (Table 3). Though many of them were enrolled in a Humanities Arts and Social Sciences (HASS) program, a significant minority were pursuing a degree in a Sciences, Technology, Engineering, Mathematics, Medicine (STEMM) discipline. We received responses from doctoral candidates enrolled at institutions in the Republic of Ireland, Germany, Switzerland, Portugal, India, Malaysia, and China.

Table 3. Geographic and disciplinary distribution of respondents

Country of Affiliation	HASS	STEMM
Australia (n=60)	58	2
United Kingdom (n=31)	12	19
United States of America (n=11)	5	6
Other (n=15)	8	7

Of the mental health disorders coded for in this study, "Cognitive Processes (malfunction)" and "Maladaptive Behavior" were the most widely observed (Table 4). A significant proportion of the doctoral candidates had trouble concentrating amid sudden and unpredictable changes precipitated by the pandemic. For instance, one doctoral candidate noted how they were "having a harder time staying focused" (Respondent 15) on their research, while another stated that they were experiencing "full paralysis" leading to an inability to write (Respondent 41).

"Maladaptive Behavior" manifested itself in a variety of ways among the candidates. Some complained of a lack of consistency: "it is hard to keep consistent in how I am working" (Respondent 18). Others postponed work (Respondent 26), procrastinated (Respondents 31 and 42), and avoided work altogether (Respondent 118). In some cases, the candidates associated these issues with family responsibilities (Respondents 47 and 117) and deteriorating mental health (Respondent 58).

Table 4. Instances of mental health disorders

Disorder	Count	Examples
Cognitive Processes (malfunction)	54	"A *battle to concentrate* amid unmanageable stress" (Respondent 3)
Maladaptive Behavior	45	"it is hard to sit down and write" (Respondent 82)
Negative Self-perception	29	"not being as productive as I think I should be" (Respondent 133)
Anxiety	23	"I feel even more anxious about my ability to do well" (Respondent 17)
Depressive Mood	22	"the pandemic makes me feel 'stale'" (Respondent 115)

Resilience was the most widely observed trait among the candidates (see Table 5). Approximately 58 percent (n = 78) exhibited signs of resilience in their responses to the survey questions. Resistant resilience n = 79; reconfiguration resilience n = 24. The second most frequent observation was "Positive Experiences," which included active participation and involvement in a variety of different activities and events. While this paled in comparison to "Resilience," it seemed to play a significant role in the academic life of approximately 12 percent of the candidates (n = 16). "Positive Emotions" were the least observed in the study, indicating that the candidates may have developed resilience but were nevertheless unable to overcome the emotional burden placed upon them by events related to the COVID-19 pandemic.

Table 5. Instances of wellbeing

Category	Count	Examples
Resilience	103	"never let a day go by without writing at least 100 words" (Respondent 11)
Resistance	79	"complete breathing exercises when I notice the frustration" (Respondent 99)
Reconfiguration	24	"I now allocate a block of time in the morning and a block of time in the evening when I am at my best (but would normally be commuting) specifically to write" (Respondent 120)
Positive Experiences	23	"I attended a master class organized by the Australian Book Review (and was selected to write a book review)" (Respondent 129)
Positive Institutional Support	19	"Checking in & setting goals with my cohort and lab colleagues" (Respondent 20)
Positive Emotions	14	"I enjoy my project topic very much and so it has not been challenging to write" (Respondent 125)

Self-reported mental health evaluation was also analyzed in this study in the period between 2020 and 2022 (Table 6). The difference between measurements submitted at the beginning of the

pandemic and in 2022 showed a significant decrease in "neutral" and "very poor" scales, a significant increase in "good" mental health, and no changes in "poor" and "very good" scales. The cumulative score showed that the majority of respondents evaluated their wellbeing as "neutral" (n = 46) or "poor" (n = 43), while only 7 individuals measured their mental health as "very good." Several notable changes in self-reported mental health were observed in the data. A smaller percentage of the candidates reported "very poor" mental health in 2022 compared to 2020. Reports of "good" mental health increased threefold between 2020 and 2022, indicating an improvement in mental health among the candidates during this transition in their academic and personal lives.

Table 6. Self-reported measurement of mental health

Scale	Change between 2020 and 2022	Total Count (cumulative)
1 = Very Poor	16% → 6% (decrease)	20
2 = Poor	32% → 31% (unchanged)	43
3 = Neither Poor nor Good	36% → 18% (decrease)	46
4 = Good	10% → 37.5% (increase)	18
5 = Very Good	5% → 6% (unchanged)	7

5. Discussions and early conclusions

This indicates that the chronosystem exerted an overall positive influence on mental health among the candidates, as they felt mentally healthier in 2022 compared to 2020. Their "life transition" during the COVID-19 pandemic resulted in a notable decrease in "very poor" mental health and an increase in "good" mental health.

Comparatively low scores in anxiety and depression combined with high scores in cognitive processes (malfunction) and maladaptive behaviors resulted in searching for effective strategies and tools that help PhD students manage their problems caused by COVID-19. Some strategies might be classified as psychosocial interventions which are considered as effective in managing difficulties related to cognitive processes (Shubina 2022b).

One of the dominant themes that emerged from this study was the resilience displayed by doctoral candidates around the world, both during the beginning of the pandemic and after a lapse of at least two years. Significant changes in the macrosystem necessitated the development of resilience as a social psychological resource that allows doctoral candidates to cope with the challenges of conducting research during a global health crisis. Another longitudinal study demonstrated the importance of resilience in terms of managing mental health and failure (Sendroiu et al., 2021).

The initial findings of our longitudinal study indicate that doctoral candidates are able to adapt to the new norms of COVID-19. Shifts in mental health and wellbeing, from poor and negative to relatively good and positive, demonstrate that given time, doctoral candidates are able to work under challenging conditions. Combined with the salience of reconfiguration resilience exhibited by respondents (comprising 23.3% of all instances of resilience), it is safe to assume that doctoral candidates not only readjusted to the new norms imposed on them by the pandemic, but that they are also actively making meaningful changes to the way in which they manage their daily lives.

High scores in cognitive processes malfunction might be related to experiencing the lack of

balance between the demands of the COVID-19 situation and available resources to address these demands. Changes in lifestyle, precipitated by the macrosystem, may have contributed to these high scores. Similar issues related to cognitive processes were indicated in a study by Hazell et al. (2020).

High scores in maladaptive behaviors might be the result of feeling isolated, when the number of social connections and support decreased, which was also indicated in the study by Hazell et al. (2020). The results of the current study align with other reports stating that positive mental wellbeing is traditionally associated with positive emotions, positive experiences, and resilience (Huppert and So 2013), as well as studies showing high level of stress, but comparatively low levels of anxiety and depression (Lee et al., 2021).

It is worth noting that a positive relationship does not always exist between mental health and wellbeing. In other words, an improvement in mental health may not equate to a similar improvement in wellbeing. Indeed, there are cases where wellbeing may decline in spite of improvements in mental health, and vice versa. For instance, autistic researchers and academics (including doctoral candidates) noted how the lockdowns and mask-wearing mandates led to improvements in mental health because of the decrease in the threat of misinterpretation of social cues and gestures, but similarly wellbeing was negatively impacted because of the sudden disappearance of structure or routine in everyday life (Cahusac de Caux et al., 2022).

The positive experiences and positive institutional support documented in this study align with Zhang et al. (2022), which highlights the importance of socialization as a supportive factor in terms of academic development, satisfaction with work and supervising, feeling of belonging, and as a significant predictor of higher scores in mental health. Though not directly investigated in this study, positive experiences and positive institutional support may also be connected to research performance and lower levels of anxiety (Stubb et al., 2011). Moreover, strong support networks and group membership mentioned by PhD students as examples of positive experience and positive institutional support might improve their mental wellbeing, a factor also stated in studies by Hazell et al. (2020).

The microsystem (relationships with colleagues and supervisors) and mesosystem (research institution, home environment), therefore, play a pivotal role in determining wellbeing outcomes for doctoral candidates. As Berry et al. (2021) highlight in their study of mental health issues among doctoral candidates, "social and relational factors" play an important role in shaping intra-personal mental health and wellbeing (p. 9).

The impact of the COVID-19 pandemic has broader societal implications for the personal and professional livelihoods of doctoral candidates. Among socioeconomically underprivileged and marginalized groups, the completion of a doctoral degree by one (or many) of its members can be culturally transformational. The status and prestige that accrue through the attainment of a doctoral degree is both a source of inspiration for other members of the community and a catalyst for community-wide change at a broader level. This is one reason higher education institutions and government agencies in countries such as the United Kingdom are beginning to closely trace who is engaged in doctoral education (McCulloch & Thomas, 2012). Similar arguments of empowerment have been made regarding first-generation doctoral candidates (Mitic, 2022). This is a reflection of broader interest in empowering first-generation university students across all levels of study (Gable, 2021).

The present study has several limitations. We could have generated more data by surveying doctoral candidates for a third time during the year 2021 or after the second round of surveys. This will be addressed with an additional round of surveys in early 2023. Another limitation is that the use of EST as a theoretical framework, although powerful in terms of mitigating the

chances of resorting to reductionist arguments, can be too broad in scope and too dependent on environmental factors. Bronfenbrenner (2005) himself laments the fact that EST has "more to say about the nature and contribution of the environment than about the organism" (p. 108). Future research should focus more on individual development and traits and their contribution to doctoral candidates' wellbeing and mental health. Given the myriad intra-individual and social psychological impacts of the pandemic, there are numerous avenues of inquiry relating to the question of mental health and wellbeing among doctoral candidates.

Additional recommendations include applying more detailed measurement of mental health with detailed evaluation scales for doctoral candidates, such as intellectual, emotional, and spiritual development and physical and social health (Manwell et al., 2015), or more specifically satisfaction with PhD training, work-life balance and career-oriented perspectives (Naumann et al., 2022). Gendered differences in the ways individuals respond to and cope with stress may also be taken into consideration, since female students may be more vulnerable to mental health issues such as depression (Lee et al., 2021) and more heavily influenced by isolation during a pandemic (Hazell et al., 2020). However, it is worth noting that gender-based differences are not always recognized as essential in this matter (Kowalczyk et al., 2021). Lastly, in the near future we aim to gather data that will help us explore the extent to which reconfiguration resilience is developed by different cohorts of university students (doctoral candidates, master's degree students, and undergraduate students).

Conflict of interest statement

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Data availability statement

Data can be accessed by contacting the corresponding author by email.

Author contributions statement

All authors contributed to the study conception and design. Material preparation and data collection were performed by BC. The first draft of the manuscript was written collaboratively by BC and IS and both authors commented on previous versions of the manuscript. Both authors read and approved the final manuscript.

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