

<https://helda.helsinki.fi>

---

py The influence of the COVID-19 pandemic on PhD  
study progress and study wellbeing.

Pyhältö, Kirsi

2023

---

Pyhältö , K , Tikkanen , L & Anttila , H 2023 , ' The influence of the COVID-19 pandemic on  
py PhD Candidates study progress and study wellbeing. ' , Higher Educa  
Development , vol. 42 , no. 2 , pp. 413-426 . <https://doi.org/10.1080/07294360.2022.2063816>

---

<http://hdl.handle.net/10138/355831>

<https://doi.org/10.1080/07294360.2022.2063816>

---

cc\_by\_nc\_nd

publishedVersion

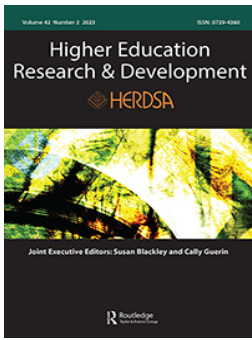
---

*Downloaded from Helda, University of Helsinki institutional repository.*

*This is an electronic reprint of the original article.*

*This reprint may differ from the original in pagination and typographic detail.*

*Please cite the original version.*



## The influence of the COVID-19 pandemic on PhD candidates' study progress and study wellbeing

Kirsi Pyhäلتö, Lotta Tikkanen & Henrika Anttila

**To cite this article:** Kirsi Pyhäلتö, Lotta Tikkanen & Henrika Anttila (2023) The influence of the COVID-19 pandemic on PhD candidates' study progress and study wellbeing, Higher Education Research & Development, 42:2, 413-426, DOI: [10.1080/07294360.2022.2063816](https://doi.org/10.1080/07294360.2022.2063816)

**To link to this article:** <https://doi.org/10.1080/07294360.2022.2063816>



© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 28 Apr 2022.



Submit your article to this journal [↗](#)



Article views: 2851



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 4 View citing articles [↗](#)

# The influence of the COVID-19 pandemic on PhD candidates' study progress and study wellbeing

Kirsi Pyhälä<sup>a,b</sup>, Lotta Tikkanen <sup>a,c</sup> and Henrika Anttila<sup>a</sup>

<sup>a</sup>Faculty of Educational Sciences, University of Helsinki, Helsinki, Finland; <sup>b</sup>Centre for Higher and Adult Education, Faculty of Education, Stellenbosch University, Stellenbosch, South Africa; <sup>c</sup>School of Applied Educational Science and Teacher Education, University of Eastern Finland, Joensuu, Finland

## ABSTRACT

The COVID-19 pandemic has had its impact on research and researchers, and hence potentially on the future of academia. Yet, empirical evidence on the impact of COVID-19 on PhD candidates is limited. This study explores the influences of the pandemic on PhD candidates' progress and wellbeing. In addition, the aim is to identify potentially particularly vulnerable candidate groups. In total, 768 PhD candidates from a Finnish research-intensive multidisciplinary university participated in the mixed method study in spring 2021. The data were collected with the doctoral experience survey. In general, the PhD candidates estimated that the COVID-19 pandemic had hindered their progress and decreased their study wellbeing. The negative impact boiled down to the reduced access to data or participants, erosion of scholarly support networks, reduced access to the institutional resources, poor work–life balance and mental health problems. Results further implied that the international candidates, those studying at the university full-time, engaging in research teams, candidates from natural sciences and those at the mid-phase of their studies employed increased risk of suffering from negative COVID-19 pandemic influences. Results can be used in building well-fitted re-creative actions in supporting the PhD candidates to overcome challenges set by the pandemic.

## ARTICLE HISTORY

Received 12 November 2021  
Accepted 18 March 2022

## KEYWORDS

Burnout; COVID-19 impact; doctoral experience; doctoral study progress; engagement; stress

## Introduction

Research and researchers have played a key role in defeating the crises posed by the COVID-19 pandemic. They also provide a core resource for societal recovery after the pandemic and building the means to face such threats in the future. Yet, the COVID-19 pandemic has also had its impact on research and researchers, and hence potentially on the future of academia (see e.g., McGaughey et al., 2021). A few position papers and reflections on the impact of COVID-19 on researchers have been published (Corbera et al., 2020; Malisch et al., 2020; Maranda & Yakubovich, 2020; Stadnyk & Black, 2020; Wang & Laquil, 2020; Winnington et al., 2020), but empirical research on the topic is

**CONTACT** Lotta Tikkanen  [lotta.tikkanen@helsinki.fi](mailto:lotta.tikkanen@helsinki.fi)

© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group  
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

still scarce (see review by Lokhtina et al., [submitted](#)). Based on the very limited empirical evidence it seems that the futures of particularly early career researchers (ECRs)<sup>1</sup> might be at stake due to the COVID-19 pandemic (Andersen et al., 2020; Donohue et al., 2021; Krukowski et al., 2021; Viglione, 2020). Yet, knowledge on how the COVID-19 pandemic has shaped the ECR experience is sparse. Even less is known about the variations in the ECRs' experiences of the impact of COVID-19. We aim to bridge this gap in the literature by exploring how PhD candidates perceive the COVID-19 impact on their study progress and wellbeing, and by identifying attributes that might increase a candidate's risk for suffering from the negative effects of the pandemic. Such understanding is key in providing well-fitted support for the PhD candidates to cope with and overcome challenges set by the pandemic, and in helping them to cultivate the potential opportunities it has provided to advance their studies and careers.

### *Impact of COVID-19 epidemic for ECRs*

The COVID-19 pandemic has been shown to have an impact on ECR progress, research productivity and their wellbeing. By drawing on socio-constructivist theories of learning (see seminal work by Vygotsky, 1980) and a strong body of evidence on the importance of scholarly community interaction, we claim that a research community provides the primary learning environment for the PhD candidates (Ali & Kohun, 2007; Gardner, 2010; Hopwood, 2010; Jairam & Kahl, 2012; Pyhältö et al., 2009). Therefore, the primary impact of the pandemic for the PhD candidates can be expected to boil down to the erosion of researcher support networks (Pyhältö, 2018; Pyhältö et al., 2017). Support network erosion has potentially severe consequences for the candidates, including impaired access to support services/institutional resources, being deprived of stimulating and enriching scholarly environments, and potentially resulting in learning loss and reduced research productivity (Corner et al., 2018; Pyhältö, 2018). Against this backdrop, we also presume that the researcher community provides the core resources for defeating the crises caused by pandemics.

So far, most COVID-19 pandemic influences detected have been negative (e.g., Atkinson et al., 2021; Aubry et al., 2021; Camerlink et al., 2021; Donohue et al., 2021; Myers et al., 2020). Negative influences of COVID-19 on progress and productivity include a decline in research productivity (Cui et al., 2021) and the number of weekly working hours devoted to research (Myers et al., 2020), delays in timelines due to lack of or reduced access to the data and participants (Adarmouch et al., 2020; Atkinson et al., 2021; Ramvilas et al., 2021), or delays in thesis submission (Stamp et al., 2021), expiry of research funding (Stamp et al., 2021), reduced opportunities for career networking (Guintivano et al., 2021) and professional development (Kappel et al., 2021), as well as reduced engagement and experienced usefulness of online events attended (Raby & Madden, 2021). Also, reduced levels of wellbeing among the ECRs due to the COVID-19 pandemic have been detected (e.g., Atkinson et al., 2021; Donohue et al., 2021). This entails increased overall stress levels (Guintivano et al., 2021), experiences of elevated levels of mental and physical fatigue caused by increased workload and decrease in quality of working conditions (Stamp et al., 2021), particularly among those ECRs working in fields of medical and health research (Adarmouch et al., 2020), poorer work-life balance (Aubry et al., 2021) and elevated levels of work stress among PhD

candidates caused by the reduced research productivity (Camerlink et al., 2021). Increased levels of stress caused by the pandemic may further increase the PhD candidates' risk of experiencing burnout symptoms such as exhaustion and cynicism (see Pyhältö et al., [submitted](#); Tikkanen et al., 2021), and reduce their research engagement (Pyhältö et al., [submitted](#)). It seems that many of the negative influences of COVID-19 on PhD candidates boil down to the erosion of their support networks, particularly on lack of or limited access to informational, co-constructional, emotional or instrumental support provided by them. Based on a recent literature review, Lokhtina et al. ([submitted](#)) concluded that pandemic influences on ECRs involve effects on academic research productivity, proposal and dissertation progress, limited data access, researcher development, wellbeing and career progress. Yet, based on the evidence available, it is still too early to evaluate potential long-term effects of the pandemic on PhD candidates' career development.

However, the COVID-19 pandemic influences on ECRs are not necessarily evenly distributed among the PhD candidates. In fact, there is tentative evidence that the COVID-19 pandemic has increased inequalities among the researchers. For instance, the productivity of women with caring responsibilities, particularly young children, those with limited access to ICT, and those engaging in the laboratory or on-site work seems to be affected most by the pandemic (Minello et al., 2020; Myers et al., 2020; Organization for Women in Science for the Developing World, 2020; Staniscuaski et al., 2021; Vincent-Lamarre et al., 2020). In their large-scale bibliometric analysis, Cui et al. (2021) showed that during the 10 first weeks of lockdown in the US, women's research productivity measured in the number of publications decreased by 14% relative to men. A similar decline was also detected in other countries, including Australia, China, Italy, Japan, the Netherlands and the UK, particularly evident among junior researchers (Cui et al., 2021; Guintivano et al., 2021).

It is also important to note that not all the pandemic influences on researchers and ECRs have been negative (Camerlink et al., 2021; Stamp et al., 2021). Lockdown(s) caused by the pandemic have accelerated the development and use of technologies for social interactions between the academics, including a significant increase in opportunities to participate in online events and conferences (Camerlink et al., 2021), and new resources for and cultivated practices of remote supervision (Mullen, 2021; Wisker et al., 2021). Due to limited access to the participants/data, the pandemic has forced the development of new opportunities for research such as creation of novel methods for collecting data during the lockdown (Rahman et al., 2021; Richardson et al., 2021). Moreover, some PhD candidates or fields of study might have even benefitted from the lockdown. For example, Kappel et al. (2021) reported that one-third of their participants reported improved work-life balance during the pandemic. In addition to individual differences in experienced COVID-19 impact, there might be contextual variations in COVID-19 impact across the universities, doctoral education systems and even countries.

## Aim

The aim of the study is to gain a better understanding on the effects of the COVID-19 pandemic on PhD candidates' progress and wellbeing and detecting potentially particularly vulnerable candidate groups.

The following research questions were addressed:

- (1) How do doctoral candidates perceive the impact of the COVID-19 pandemic on their progress and study wellbeing?
- (2) What interrelationship is there between perceived COVID-19 impact and experiencing study stress, burnout symptoms and study engagement?

Are there differences in perceived COVID-19 impact between:

- (a) international versus domestic students,
- (b) those working full-time cf. part-time,
- (c) candidates engaging in research group and those working mainly on their own,
- (d) candidates in different disciplines,
- (e) writing a monograph cf. article-based dissertations,
- (f) candidates at different phases of their doctoral studying,
- (g) candidates who had children cf. candidates who had not, and
- (h) women and men?

### ***Doctoral education in Finland***

Finland is among the European countries that have the highest rates of doctoral degree holders per capita (OECD, 2014). Finland has a nationwide graduate school system: all doctoral students belong to a doctoral school at their university, and to one of the university's doctoral programmes. Despite taking a stance towards a more structured system, doctoral education is still highly research-intensive rather than course-centred: doctoral study includes only minimal course work, and doctoral research starts from the very beginning (Andres et al., 2015). A doctoral dissertation can be written as either a monograph or a summary of published articles. Most doctoral students conduct article-based doctoral theses, including three to four peer-reviewed published international articles and a summary. The dissertation is pre-examined by two external examiners. The pre-examination is followed by a public defence. After this, the PhD degree is granted by the faculty. The target time for doctoral studies is four years studying full-time, but the average time for degree completion is 5–6 years. There are no tuition fees, but funding for doctoral study is not automatically provided by the universities, projects or foundations.

### ***Participants***

Altogether, 768 PhD candidates (67% women, 31% men) from Doctoral Schools in Environmental, Food and Biological Sciences (YEB), Health Sciences (DSHealth), Humanities and Social Sciences (HYMY) and Natural Sciences (DONASCI) responded to a survey. The response rate was 17%. The candidates were typically aged between 30 and 34 years. In terms of age distribution and the doctoral schools, the sample was a good representation of the whole population. Also, the disciplinary distribution represented the whole population of the case university well. Women were slightly overrepresented in the data. There were 152 international and 604 Finnish respondents to the survey. On

average, doctoral candidates are expected to graduate within 5.8 years, and 43% of the doctoral candidates are expected to finish their doctoral degree within 4 years. Most candidates reported studying full-time (62%) and 77% were writing their thesis in the form of a compilation of articles, and 21% as a monograph, while 2% reported that they did not know in which form they would write their thesis. About one-third of the participants (30%) reported working in a research team. Most of the candidates did not have any children (62%). Most of the candidates were in the final third of their doctoral studying (52%), while 33% were in the middle and 15% at the beginning.

## Data

The data were collected between April and May 2021 by using a modified version of the cross-cultural doctoral experience survey (C-DES) validated in previous studies (Pyhältö et al., 2016; see also C-DES manual Pyhältö et al., 2018). The data were collected via an online survey. The link to the C-DES survey was sent via e-mail to the participants by using the Doctoral Schools' PhD candidate mailing lists. All the participants were informed about the study prior to the data collection. No identifying information or incentives were used. Participation in the study was voluntary.

For this mixed method study, the following measures were utilised: (1) one item on the *COVID-19 pandemic impact on PhD candidates' study wellbeing scale*, (2) *exhaustion* (five items) and *cynicism* (six items), (3) one item *stress scale*, (4) *study engagement* (nine items) and (5) one item on the *COVID-19 pandemic impact of doctoral study progress scale*. All the scales were measured with a 1-to-7-point Likert scale. The PhD candidates were also asked to describe the key positive and negative experiences in their doctoral journey with an open-ended question. In addition, study status (full-time cf. part-time), nationality (international cf. Finnish), research group status (studying in a research team cf. alone), discipline (environmental, food and biological sciences; health sciences; humanities and social sciences; natural sciences) and dissertation format (monograph cf. article-based dissertation), study phase (1/3; 2/3 or 3/3 based on the reported enrolment year and estimated graduation year), care-taking responsibilities with minors (children cf. no children) and gender (women/men/other) were addressed.

In Finland, an ethics review is required when research involves intervention in the physical integrity of research participants; deviates from the principle of informed consent; involves participants under the age of 15 being studied without parental consent; exposes participants to exceptionally strong stimuli; risks causing long-term mental harm beyond that encountered in normal life or signifies a security risk to subjects (Finnish National Board on Research Integrity, 2019, p. 19). None of these conditions were encountered in this study.

## Analysis

### Quantitative analysis

To get the overall view of the doctoral candidates' experiences of the impact of the COVID-19 pandemic on their wellbeing and the progress in their doctoral studying, the means and standard deviations were calculated. The Pearson correlation coefficient was used to analyse the associations between the experiences of the COVID-19

impact, study burnout and research engagement. The independent samples t-tests were used to analyse differences between candidate groups based on dichotomous background variables (i.e., international cf. domestic, full-time cf. part-time, research group status, thesis format, has children or not, and gender) in the experiences of the impact of the COVID-19 pandemic to the wellbeing and study progress. Differences in such experiences between disciplines and differences between the candidates in various phases of the doctorate were analysed with one-way ANOVA. For post-hoc comparisons, the Games Howell test was used for disciplinary differences and Tukey's HSD test for differences between candidates in various phases of their doctorate.

### Qualitative analysis

Open-ended answers on positive and negative key experiences on the doctoral journey were content analysed (Drisko & Maschi, 2015; Elo & Kyngäs, 2007; Patton, 1990). At first, the key experiences related to COVID-19 pandemic ( $f = 64$ ) were coded into two exclusive categories: (1) positive ( $f = 2$ ) and (2) negative ( $f = 62$ ) COVID-19-related PhD study experiences. After this, the COVID-19 key experiences were coded into five categories by using inductive strategy (e.g., Elo & Kyngäs, 2007) based on the reported effect of the pandemic. The analysis resulted in the following five categories: (1) access to the data, (2) erosion of scholarly support networks, (3) reduced access to institutional resources, (4) work–life balance and (5) wellbeing. Finally, the differences between the candidates who had reported a key experience related to the COVID-19 pandemic ( $n = 62$ ) and those who had not ( $n = 706$ ) in the perceived impact of the COVID-19 pandemic on doctoral study-related wellbeing and study progress were analysed with an independent samples t-test.

## Results

In general, doctoral candidates estimated that the COVID-19 pandemic had a negative impact both on their progress ( $M = 4.12$ ,  $SD = 2.14$ ) and their study-related wellbeing ( $M = 4.39$ ,  $SD = 2.01$ ). Although variation between the candidates' estimates on the impact occurred (see Table 2.), most of the key experiences described by the doctoral candidates related to the COVID-19 pandemic were negative ones (97%), while positive key experiences related to COVID-19 were rarely reported (3%). The few positive experiences concerned increased opportunities to participate in online courses. Doctoral candidates reported problems and lack of progress in their doctoral research due to *limited access to the data*, including problems in data collection opportunities, and the lack of or reduced access to participants, because of the lock-down.

'The COVID-19 pandemic began, and the recruitment of the patients for the study was interrupted' (limited access to the data)

Doctoral candidates also described *erosion of support networks*, including less frequent supervision, cancelled conferences, research visits and exchange periods. Furthermore, they reported feelings of loneliness and exclusion from the scholarly community and their fellow doctoral candidates.

'During the pandemic, the meetings with the supervisor(s) became significantly less frequent and I did not meet other colleagues either. It felt like no one cared about my research.'  
(Erosion of support networks)



In addition, doctoral students reported problems related to *reduced access to institutional resources*, libraries, archives and laboratories. Furthermore, working and taking courses remotely hindered the progress of doctoral studies.

[the most negative experience during my doctoral studies was ...] The COVID-19 pandemic, and the fact that the libraries and archives were closed' (Reduced access to institutional resources)

Some doctoral candidates also reported problems in their *work-life balance*. Due to the pandemic, doctoral students needed to focus on other aspects of life (work, family, etc.) and reduce the hours devoted to doctoral research. For some doctoral students, this was due to having children at home, whereas some of the doctoral students had been forced to concentrate on work other than their research (for example those from health sciences). The COVID-19 epidemic had also hindered some doctoral students' overall motivation towards their doctoral studying.

'When on the study leave, writing did not proceed as I expected. The outbreak of the COVID-19 pandemic forced me to change plans, as the day care was closed, and I spent three weeks of the study leave at home taking care of my child(ren). I also had to spend some of the study leave on recovering from the workload of my job, which made me feel guilty and anxious [about the progress of the thesis]' (Work-life balance)

In addition, some of the doctoral students reported that the pandemic had impaired their *wellbeing* and coping radically, which further influenced their study progress.

'Even without the COVID-19 pandemic, this would probably have been a burdensome time, but due to the global state of emergency it has been very difficult. Because of my mental health, I hope that the situation will level off soon.' (wellbeing)

The candidates who reported a negative key experience related to the COVID-19 pandemic estimated that the COVID-19 pandemic had reduced their study-related wellbeing ( $t(85) = 7.58, p < .001$ ) and hindered their study progress ( $t(93) = 12.08, p < .001$ ) more often than the candidates whose key experiences were not related to the COVID-19 pandemic.

### ***Interrelationship between the perceived COVID-19 impact and study stress, exhaustion and cynicism and study engagement***

Reporting negative COVID-19 influences on study progress and wellbeing were related to increased levels of stress and study burnout, and decreased levels of research engagement (see Table 1). Accordingly, the students who estimated COVID-19 impact on their study progress and wellbeing more negatively were more likely to report being overwhelmed by their doctoral research and feeling that they were losing interest in their doctorate and were less likely to report feeling vigorous when undertaking doctoral research, feeling enthusiastic about doctoral research or bursting with energy. The negative experiences of the COVID-19 pandemic on study wellbeing and study progress were also interrelated, indicating that the more the candidates perceived that the COVID-19 had decreased their study wellbeing, the more they felt that their progress was also hindered due to the COVID-19 pandemic.

**Table 1.** Descriptive statistics of the study variables.

	1.	2.	3.	4.	5.	6.
1. COVID-19 pandemic impact on PhD candidates' study wellbeing						
2. Exhaustion	.288**					
3. Cynicism	.245**	.672**				
4. Stress	.295**	.706**	.514**			
5. Research engagement	-.131**	-.387**	-.685**	-.312**		
6. COVID-19 pandemic impact on doctoral study progress	.606**	.169**	.195**	.208**	-.087*	
<i>N</i>	755	763	763	761	762	756
Cronbach's $\alpha$	–	.839	.869	–	.950	–
Mean	4.39	3.68	3.60	4.61	4.84	4.12
SD	2.01	1.48	1.48	1.75	1.35	2.14
Min/Max	1/7	1/7	1/7	1/7	1/7	1/7

\*\*  $p < .001$ , \*  $p < .05$ .

### Perceived COVID-19 impact among various PhD candidate groups

Some differences between the doctoral candidates in COVID-19 impact experiences were detected (see Table 2). The international candidates experienced that the COVID-19 pandemic had hindered their doctoral progress more often than the Finnish doctoral candidates ( $t(747) = -2.86$ ,  $p < .01$ ). Also, the full-time candidates reported that the COVID-19 pandemic had both decreased their study-related wellbeing ( $t(580) = 8.56$ ,

**Table 2.** Perceived COVID-19 impact on study progress and wellbeing and nationality, study status, research group status, discipline, thesis format, study phase, gender and caretaker status of minors.

	Number	%	COVID-19 pandemic impact on PhD candidates' study wellbeing <i>m</i> ( <i>sd</i> )	COVID-19 pandemic impact on doctoral study progress <i>m</i> ( <i>sd</i> )
<b>Nationality</b>				
Finnish	602	80	4.31 (1.99)	4.00 (2.15)
Other	152	20	4.66 (2.08)	4.55 (2.06)
<b>Study status</b>				
Full-time	467	62	4.88 (1.89)	4.48 (2.01)
Part-time	286	38	3.63 (1.97)	3.58 (2.24)
<b>Research group status</b>				
Working in a research group	224	30	4.66 (1.93)	4.18 (2.04)
Working mainly alone	521	70	4.27 (2.03)	4.08 (2.18)
<b>Discipline</b>				
Humanities and social sciences	370	49	4.40 (2.00)	4.24 (2.14)
Natural sciences	106	14	4.94 (1.86)	4.35 (2.16)
Health sciences	209	28	4.04 (2.00)	3.76 (2.07)
Environmental, food and biological sciences	64	9	4.53 (2.16)	4.34 (2.28)
<b>Thesis format<sup>a</sup></b>				
Monograph	161	21	4.21 (2.00)	4.18 (2.18)
Summary of articles	581	77	4.41 (2.02)	4.08 (2.13)
<b>Phase of doctoral studies</b>				
In the first third	104	15	4.17 (2.00)	3.79 (2.18)
In the middle third	237	33	4.57 (2.01)	4.58 (2.05)
In the final third	373	52	4.36 (2.02)	3.94 (2.18)
<b>Gender<sup>b</sup></b>				
Male	234	67	4.46 (2.04)	4.11 (2.14)
Female	502	31	4.35 (2.01)	4.11 (2.15)
<b>Have children</b>				
Yes	286	38	3.98 (2.08)	3.99 (2.26)
No	467	62	4.63 (1.94)	4.20 (2.07)

<sup>a</sup>The proportion of 'I don't know' answers: 2% ( $n = 12$ ).

<sup>b</sup>The proportion of candidates disclosing 'other' as their gender: 2% ( $n = 18$ ).

$p < .001$ ) and hindered their study progress ( $t(744) = 5.55, p < .001$ ) more often than the part-time candidates. Moreover, the candidates who reported working in a research group reported more often that the COVID-19 pandemic had decreased their study-related wellbeing than those working mainly alone ( $t(733) = -2.45, p < .05$ ). In addition, some differences between the doctoral candidates from different disciplines in COVID-19 pandemic impact were detected ( $F(3, 740) = 4.96, p < .01$ ). The candidates in the natural sciences experienced that the COVID-19 pandemic had reduced their study-related wellbeing more often than candidates in the health sciences. There were no differences in the impact on wellbeing ( $t(733) = -1.10, p = .273$ ) or on doctoral progress ( $t(734) = .53, p = .597$ ) between the candidates who were completing their thesis as a monograph and those who were working on a summary of articles. The phase of the doctoral studies was related to the perceived impact of the COVID-19 pandemic on the progress of their doctoral studying ( $F(2, 707) = 7.97, p < .001$ ). The candidates who were in the middle of their doctorate perceived that the COVID-19 pandemic had hindered their progress more often compared to the candidates who were at the beginning or in the final third of their doctoral studying. No gender differences were detected in the experiences of COVID-19 impact on doctoral study-related wellbeing ( $t(726) = -.64, p = .522$ ) or on the progress of doctoral studies ( $t(727) = -.01, p = .992$ ). However, the candidates who did not have children more often perceived that the COVID-19 pandemic had decreased their wellbeing than candidates who had children ( $t(555) = -4.22, p < .001$ ).

## Discussion

### *Findings in light of the literature on the impact of COVID-19 on ECRs*

Our study contributes to the body of knowledge on the influences of the COVID-19 pandemic for PhD candidates by revealing how the candidates perceived the COVID-19 impact on their progress and study wellbeing. In addition, we were able to detect PhD candidate groups that are more vulnerable to the negative effects of the COVID-19 pandemic.

The results showed that the PhD candidates typically estimated the COVID-19 pandemic as having a negative impact on their doctoral study progress and study wellbeing. The negative effects reported by the candidates boiled down to impaired access to the data, erosion of scholarly support networks, reduced access to institutional resources, poor work–life balance and reduced wellbeing. Accordingly, the results highlighted the importance of informational, emotional and instrumental support provided by the researcher networks for doctoral experience (Peltonen et al., 2017; Vekkaila et al., 2018). Our results further confirmed the findings of prior studies suggesting that COVID-19 pandemic influences were primarily negative for PhD candidates' progress, productivity and wellbeing (e.g., Atkinson et al., 2021; Aubry et al., 2021; Camerlink et al., 2021; Donohue et al., 2021; Myers et al., 2020). In addition, our results showed that the perceived negative COVID-19 impact further increased PhD candidates' risk of experiencing stress, exhaustion and cynicism and diminished levels of research engagement, suggesting that the support network erosion might have a toll on PhD candidates' overall study wellbeing (Virtanen et al., 2017). The result further implies that the deprivation caused by the COVID-19 pandemic may have longer-term negative effects on the doctoral experience.

Variations between the PhD candidates in how they experienced the impact of COVID-19 were detected, implying that dynamics between a candidate and their working environment was influenced to a varied extent by the pandemic, further resulting in varied experiences. International candidates, those undertaking their doctorate full-time, engaging in research teams, candidates from the natural sciences and those in the mid-phase of their studying encountered increased risk of suffering from severe COVID-19 impact. A potential reason for such risk among international PhD candidates, the candidates studying full-time and those engaging in a research team is that the effect of support network erosion caused by COVID-19 is likely to be more pronounced for the candidates who are normally heavily involved in the research community or whose external and informal support networks are limited. The increased risk encountered by the natural sciences PhD candidates and those at the mid-phase of their doctorate detected also in other recent studies on COVID-19 (Jung et al., 2021; Lambrechts & Smith, 2020) might be explained by the fact that the former ones present many of the 'bench sciences' while the latter ones are typically engaged in data collection both limited by the lockdown.

Contradictory to previous studies (e.g., Myers et al., 2020; Staniscuaski et al., 2021; Vincent-Lamarre et al., 2020), we did not detect any gendered differences in perceived COVID-19 impact. Moreover, the PhD candidates with children reported less negative COVID-19 impact compared to those did not have children. The reasons for the results may be that care-taking responsibilities are less gendered in Finland and having children may have reduced the candidates' sense of isolation and loneliness during the lockdown, and hence contributed to a better work-life balance.

### *Implications for buffering negative effects of COVID-19 epidemic*

The results provide grounds for two main practical considerations in taking actions to overcome the negative influences of the COVID-19 pandemic on PhD candidates. First, based on our results it seems that, in general, the COVID-19 pandemic has had a negative impact on both the progress and wellbeing of the PhD candidates, suggesting that actions need to be taken on both fronts. The results imply that the re-creative measures should include re-building and sustaining eroded research community support networks, promoting the PhD candidates' access to institutional resources, by providing alternative data sources and supporting data collection, and developing easy access to mental health services for the PhD candidates in need. This calls for drawing on and re-building existing support resources as well as developing new ones. Second, as the resources to support PhD candidates are typically limited, the primary support measures should be targeted at those PhD candidate groups that have the highest risk of being negatively affected by the COVID-19 pandemic. This calls for the identification of those candidates whose progress and wellbeing are at stake in the given context, followed by developing individually tailored, well-fitted and varied support directed to all the candidates. In our case, it seems that international candidates, those in the mid-phase of their doctoral studying, those in the natural sciences, those studying full-time, and those working in the group had a higher risk of negative COVID-19 impact.

## Limitations of the study

A cross-sectional mixed methods design was applied in studying the impact of COVID-19 on PhD candidates. The main limitations of our study are inherited by the cross-sectional design and the fact that the study was carried out in a single country. The cross-sectional design does not allow causal conclusions to be drawn from the results or to evaluate the long-term impact of the COVID-19 pandemic on PhD candidates. Regardless of the relatively good representativeness of the sample and engaging participants from varied disciplinary backgrounds, one should be careful in generalising the findings across the doctoral education systems and countries due to the socio-cultural differences. Accordingly, further longitudinal and cross-cultural studies are needed to detect the potential long-term impact of COVID-19 on the doctoral experience and ECR careers and contextual variation in this regard.

## Note

1. ECR is generally considered to be someone who is within eight years of having been awarded a PhD (European Commission, 2011).

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This work was supported by University of Helsinki.

## ORCID

Lotta Tikkanen  <http://orcid.org/0000-0003-0338-2414>

## References

- Adarmouch, L., Sebbani, M., & Amine, M. (2020). Research activity among academic medical staff during the COVID-19 pandemic in Marrakesh. *Education Research International*. <https://doi.org/10.1155/2020/6648406>
- Ali, A., & Kohun, F. (2007). Dealing with social isolation to minimize doctoral drop-out - A four stage framework. *International Journal of Doctoral Studies*, 2, 33–49. <https://doi.org/10.28945/56>
- Andersen, J. P., Nielsen, M. W., Simone, N. L., Lewiss, R. E., & Jagsi, R. (2020). Meta-research: COVID-19 medical papers have fewer women first authors than expected. *eLife*, 9. <https://doi.org/10.7554/eLife.58807>
- Andres, L., Bengtsen, S. S. E., Gallego Castaño, L. D. P., Crossouard, B., Keefer, J., & Pyhältö, K. (2015). Drivers and interpretations of doctoral education today: National comparisons. *Frontline Learning Research*, 3(3), 1–18. <https://doi.org/10.14786/flr.v3i3.177>
- Atkinson, M., Brodie, A., Kafcaloudes, P., McCarthy, S., Monson, E. A., Sefa-Nyarko, C., Omond, S., O'Toole, M., Pavich, N., See, J., Ty, A. A., & Yu, W. (2021). Illuminating the liminality of the doctoral journey: Precarity, agency and COVID-19. *Higher Education Research & Development*. <https://doi.org/10.1080/07294360.2021.1968354>

- Aubry, L. M., Laverty, T. M., & Ma, Z. (2021). Impacts of COVID-19 on ecology and evolutionary biology faculty in the United States. *Ecological Applications*, 31(2). <https://doi.org/10.1002/eap.2265>
- Camerlink, I., Nielsen, B. L., Windschnurer, I., & Vigors, B. (2021). Impacts of the COVID-19 pandemic on animal behaviour and welfare researchers. *Applied Animal Behaviour Science*, 236, 105269. <https://doi.org/10.1016/j.applanim.2021.105255>
- Corbera, E., Anguelovski, I., Honey-Rosés, J., & Ruiz-Mallén, I. (2020). Academia in the time of COVID-19: Towards an ethics of care. *Planning Theory & Practice*, 21(2), 191–199. <https://doi.org/10.1080/14649357.2020.1757891>
- Corner, S., Pyhälto, K., Peltonen, J., & Bengtson, S. S. E. (2018). Similar or different? Researcher community and supervisory support experiences among Danish and Finnish social sciences and humanities PhD students. *Studies in Graduate and Postgraduate Education*, 9(2), 274–295. <https://doi.org/10.1108/SGPE-D-18-00003>
- Cui, R., Ding, H., & Zhu, F. (2021). Gender inequality in research productivity during the COVID-19 pandemic. *Manufacturing & Service Operations Management*, 24(2), 707–726. <https://doi.org/10.1287/msom.2021.0991>
- Donohue, W. J., Lee, A. S.-J., Simpson, S. Y., & Vacek, K. (2021). Impacts of the COVID-19 pandemic on doctoral students' thesis/dissertation progress. *International Journal of Doctoral Studies*, 16, 533–552. <https://doi.org/10.28945/4818>
- Drisko, J., & Maschi, T. (2015). *Content analysis*. Oxford University Press.
- Elo, S., & Kyngäs, H. (2007). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115. <https://doi.org/10.1111/j.1365-2648.2007.04569.x>
- European Commission . (2011). *Towards a European framework for research careers*. [https://cdn5.euraxess.org/sites/default/files/policy\\_library/towards\\_a\\_european\\_framework\\_for\\_research\\_careers\\_final.pdf](https://cdn5.euraxess.org/sites/default/files/policy_library/towards_a_european_framework_for_research_careers_final.pdf)
- Finnish National Board on Research Integrity. (2019). *The ethical principles of research with human participants and ethical review in the human sciences in Finland*. Finnish National Board on Research Integrity TENK guidelines 2019. [https://tenk.fi/sites/default/files/2021-01/Ethical\\_review\\_in\\_human\\_sciences\\_2020.pdf](https://tenk.fi/sites/default/files/2021-01/Ethical_review_in_human_sciences_2020.pdf)
- Gardner, S. K. (2010). Contrasting the socialization experiences of doctoral students in high- and low-completing departments: A qualitative analysis of disciplinary contexts at one institution. *The Journal of Higher Education*, 81(1), 61–81. <https://doi.org/10.1080/00221546.2010.11778970>
- Guintivano, J., Dick, D., & Bulik, C. M. (2021). Psychiatric genomics research during the COVID-19 pandemic: A survey of psychiatric genomics consortium researchers. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*, 186, 40–49. <https://doi.org/10.1002/ajmg.b.32838>
- Hopwood, N. (2010). A sociocultural view of doctoral students' relationships and agency. *Studies in Continuing Education*, 32(2), 103–117. <https://doi.org/10.1080/0158037X.2010.487482>
- Jairam, D., & Kahl, D. H. J. (2012). Navigating the doctoral experience: The role of social support in successful degree completion. *International Journal of Doctoral Studies*, 7, 311–329. <https://doi.org/10.28945/1700>
- Jung, J., Horta, J., & Postiglione, G. A. (2021). Living in uncertainty: The COVID-19 pandemic and higher education in Hong Kong. *Studies in Higher Education*, 46(1), 107–120. <https://doi.org/10.1080/03075079.2020.1859685>
- Kappel, S., Schmitt, O., Finnegan, E., & Fureix, C. (2021). Learning from lockdown - assessing the positive and negative experiences, and coping strategies of researchers during the COVID-19 pandemic. *Applied Animal Behaviour Science*, 236. <https://doi.org/10.1016/j.applanim.2021.105269>
- Krukowski, R. A., Jagsi, R., & Gardel, M. I. (2021). Academic Productivity differences by gender and child Age in science, technology, engineering, mathematics, and medicine faculty during the COVID-19 pandemic. *Journal of Women's Health*, 30(3), 341–347. <https://doi.org/10.1089/jwh.2020.8710>

- Lambrechts, A., & Smith, K. (2020). *Impact of the COVID-19 pandemic crisis on doctoral researchers in the UK*. White Rose Research Online. <http://eprints.whiterose.ac.uk/168633/>
- Lokhtina, I. A., Castelló, M., Lambrechts, A. A., Löfström, E., McGinn, M. K., Skakni, I., & van der Weijden, I. C. M. (submitted). The impact of the COVID-19 pandemic on early career researcher activity, development, wellbeing, and careers: The state of the art.
- Malisch, J. L., Harris, B. N., Sherrer, S. M., Lewis, K. A., Shepherd, S. L., McCarthy, P. C., Spott, J. L., Karam, E. P., Moustaid-Moussa, N., McCrory Calarco, J., Ramalingam, L., Talley, A. E., Cañas-Carrell, J. E., Ardon-Dryer, K., Weiser, D. A., Bernal, X. E., & Deitloff, J. (2020). Opinion: In the wake of COVID-19, academia needs new solutions to ensure gender equity. *PNAS*, 117(27), 15378–15381. <https://doi.org/10.1073/pnas.2010636117>
- Maranda, V., & Yakubovich, E. (2020). The biomedical lab after COVID-19: Cascading effects of the lockdown on labbased research and graduate students in Canada. *FACETS*, 5(1), 831–835. <https://doi.org/10.1139/facets-2020-0036>
- McGaughey, F., Watermeyer, R., Shankar, K., Suri, V. R., Knight, C., Crick, T., Hardman, J., Phelan, D., & Chung, R. (2021). ‘This can’t be the new norm’: Academics’ perspectives on the COVID-19 crisis for the Australian university sector. *Higher Education Research & Development*. <https://doi.org/10.1080/07294360.2021.1973384>
- Minello, A., Martucci, S., & Manzo, L. K. S. (2020). The pandemic and the academic mothers: Present hardships and future perspectives. *European Societies*, 23(1), 82–94. <https://doi.org/10.1080/14616696.2020.1809690>
- Mullen, C. A. (2021). Online doctoral mentoring in a pandemic: Help or hindrance to academic progress on dissertations? *International Journal of Mentoring and Coaching in Education*, 10(2), 139–157. <https://doi.org/10.1108/IJMCE-06-2020-0029>
- Myers, K. R., Tham, W. Y., Yin, Y., Cohodes, N., Thursby, J. G., Thursby, M. C., Schiffer, P., Walsh, J. T., Lakhani, K. R., & Wang, D. (2020). Unequal effects of the COVID-19 pandemic on scientists. *Nature Human Behaviour*, 4(9), 880–883. <https://doi.org/10.1038/s41562-020-0921-y>
- OECD. (2014). *Education at a glance 2014. OECD indicators*. <https://doi.org/10.1787/eag-2014-en>
- Organization for Women in Science for the Developing World. (2020). *The impact of COVID-19 on women scientists from developing countries: Results from an OWSD member survey*. <https://owsd.net/resources/news-events/impact-covid-19-women-scientists-developing-countries-results-owsd-member>
- Patton, M. (1990). *Qualitative research and evaluation methods*. Sage Publications.
- Peltonen, J., Vekkailla, J., Rautio, P., Haverinen, K., & Pyhältö, K. (2017). Doctoral students’ social support profiles and their relationship to burnout, drop-out intentions, and time to candidacy. *International Journal of Doctoral Studies*, 12, 157–173. <https://doi.org/10.28945/3792>
- Pyhältö, K. (2018). Function of supervisory and researcher community support in PhD and post-PhD trajectories. In E. Bizer, M. Fourie-Malherbe, L. Frick, & K. Pyhältö (Eds.), *Spaces, journeys and new horizons for postgraduate supervision* (pp. 205–222). Sun Media.
- Pyhältö, K., Castello, M., McAlpine, L., & Peltonen, J. (2018). The Cross-country Doctoral Experience Survey (C-DES). User’s Manual. Manual Version, 2018.
- Pyhältö, K., McAlpine, L., Peltonen, J., & Castello, M. (2017). How does social support contribute to engaging post-PhD experience? *European Journal of Higher Education*, 17(4), 373–382. <https://doi.org/10.1080/21568235.2017.1348239>
- Pyhältö, K., Peltonen, J., Anttila, H., Frick, L., & de Jager, P. (submitted). Association between the Engagement-Burnout profiles and drop-out intentions, time-to candidacy, study status and gender of Finnish and South-African doctoral students.
- Pyhältö, K., Peltonen, J., Rautio, P., Haverinen, K., Laatikainen, M., & Vekkailla, J. (2016). *Summary report on doctoral experience in UniOGS graduate school at the University of Oulu* (Acta Universitatis Ouluensis. F, Scripta academica; Nro 11). University of Oulu. <http://urn.fi/urn:isbn:9789526210841>
- Pyhältö, K., Stubb, J., & Lonka, K. (2009). Developing scholarly communities as learning environments for doctoral students. *International Journal for Academic Development*, 14(3), 221–232. <https://doi.org/10.1080/13601440903106551>

- Raby, C. L., & Madden, J. R. (2021). Moving academic conferences online: Understanding patterns of delegate engagement. *Ecology and Evolution*, 11(8), 3607–3615. <https://doi.org/10.1002/ece3.7251>
- Rahman, H. Z., Matin, I., Banks, N., & Hulme, D. (2021). Finding out fast about the impact of COVID-19: The need for policy-relevant methodological innovation. *World Development*, 140, Article 105380. <https://doi.org/10.1016/j.worlddev.2020.105380>
- Ramvilas, G., Dhyani, S., Kumar, B., Sinha, N., Raghavan, R., Selvaraj, G., Divakar, N., Anoop, V. K., Shalu, K., Sinha, A., Kulkarni, A., Das, S., & Molur, S. (2021). Insights on COVID-19 impacts, challenges and opportunities for India's biodiversity research: From complexity to building adaptations. *Biological Conservation*, 255, Article 109003. <https://doi.org/10.1016/j.biocon.2021.109003>
- Richardson, J., Godfrey, B., & Walklate, S. (2021). Rapid, remote and responsive research during COVID-19. *Methodological Innovations*, 14(1). <https://doi.org/10.1177/20597991211008581>
- Stadnyk, T., & Black, K. (2020). Lost ground: Female academics face an uphill battle in post-pandemic world. *Hydrological Processes*, 34(15), 3400–3402. <https://doi.org/10.1002/hyp.13803>
- Stamp, L. K., Cameron, V., Woodfield, T. B. F., Walker, L., Currie, M., Templeton, E., Pilbrow, A. P., Tabakakis, K., Phillips, E., & Lim, K. S. (2021). Impact of COVID-19 on health research in New Zealand: A case study of a research-intensive campus. *Journal of the Royal Society of New Zealand*, 51(Suppl 1), 75–85. <https://doi.org/10.1080/03036758.2020.1867202>
- Staniscuaski, F., Kmetzsch, L., Soletti, R. C., Reichert, F., Zandonà, E., Ludwig, Z. M. C., Lima, E. F., Neumann, A., Schwartz, I. V. D., Mello-Carpes, P. B., Tamajusuku, A. S. K., Werneck, F. P., Ricachenevsky, F. K., Infanger, C., Seixas, A., Staats, C.C., & de Oliveira, L. (2021). Gender, race and parenthood impact academic productivity during the COVID-19 pandemic: From survey to action. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.663252>
- Tikkanen, L., Pyhältö, K., Bujacz, A., & Nieminen, J. (2021). Study engagement and burnout of the PhD candidates in medicine – A person-centered approach. *Frontiers in Psychology*, 12, Article 727746. <https://doi.org/10.3389/fpsyg.2021.727746>
- Vekkaila, J., Virtanen, V., Taina, J., & Pyhältö, K. (2018). The function of social support in engaging and disengaging experiences among post PhD researchers in STEM disciplines. *Studies in Higher Education*, 43(8), 1439–1453. <https://doi.org/10.1080/03075079.2016.1259307>
- Viglione, G. (2020). Are women publishing less during the pandemic? Here's what the data say. *Nature*, 581(7809), 365–366. <https://doi.org/10.1038/d41586-020-01294-9>
- Vincent-Lamarre, P., Sugimoto, C. R., & Laviere, V. (2020). *Monitoring women's scholarly production during the COVID-19 pandemic*. [http://projets.initiativesnumeriques.org/monitoring-scholarly-covid/methods\\_final.pdf](http://projets.initiativesnumeriques.org/monitoring-scholarly-covid/methods_final.pdf)
- Virtanen, V., Taina, J., & Pyhältö, K. (2017). What disengages doctoral students in the biological and environmental sciences from their doctoral studies? *Studies in Continuing Education*, 39(1), 71–86. <https://doi.org/10.1080/0158037X.2016.1250737>
- Vygotsky, L. S. (1980). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Wang, L., & Laquil, T. (2020). The isolation of doctoral education in the times of COVID-19: Recommendations for building relationships within person-environment theory. *Higher Education Research and Development*, 39(7), 1346–1350. <https://doi.org/10.1080/07294360.2020.1823326>
- Winnington, N. S., Cunningham, R. M., Katz, R. H., Lidstrom, M. E., Moler, K. A., Wirtz, D., & Zuber, M. T. (2020). *Moving academic research forward during COVID-19*. Policy Forum. <https://www.science.org/doi/pdf/10.1126/science.abc5599>
- Wisker, G., McGinn, M. K., Bengtsen, S. S. E., Lokhtine, I., Cornér, S., Ho, F., Leshem, S., Inouye, K., & Löfström, E. (2021). Remote doctoral supervision experiences: Challenges and affordances. *Innovations in Education and Teaching International*, 58(6), 612–623. <https://doi.org/10.1080/14703297.2021.1991427>