

## Article

# Three Stressed Systems: Health Sciences Faculty Members Navigating Academia, Healthcare, and Family Life during the Pandemic

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**Abstract:** The purpose of this study was to explore the impact of the COVID-19 pandemic on the academic productivity of health sciences faculty members in one graduate school in the United States. Thirty-two faculty members completed an electronic survey comparing academic productivity in the year prior to the pandemic to a year during the pandemic. In total, 90.7% of respondents agreed or strongly agreed that time dedicated to teaching increased, and 81.2% agreed or strongly agreed that they prioritized teaching over research during the pandemic. Participants presented an average of 2.72 peer-reviewed papers at an academic conference the year before and 1.47 during the pandemic, with females more adversely affected than males. Journal submissions with survey participants as the first or last authors decreased during the pandemic. Twelve faculty members including genetic counseling, nursing, occupational therapy, physical therapy, and speech and language pathology participated in one-to-one interviews. Three themes emerged from qualitative data analysis: stressed systems, balancing act, and meaningful connection. Faculty members were faced with an external locus of control during the pandemic and noted a lack of autonomy and pressure to help students graduate on time and maintain the quality of teaching while dealing with uncertainty in both their professional and personal lives. The pandemic disproportionately impacted women and junior faculty members as connectedness and mentorship declined. Collaboration and research mentorship must be prioritized moving forward to continue to advance healthcare and health sciences education.

**Keywords:** health sciences; academic productivity; pandemic



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## 1. Introduction

The novel coronavirus 2019 outbreak was declared on 30 January 2020, by the World Health Organization [1] and has been ongoing for more than 2 years [2]. There have been more than 260 million confirmed cases of COVID-19, over 5 million deaths worldwide, and five variants of concern [2]. Omicron, the fifth variant, was identified in November 2021 in more than 60 countries and spread rapidly [3]. In late 2021 and early 2022, there was rapid transmission in the United Kingdom and the United States. To stop the spread of the variant, mandatory masking and stay-at-home orders were reimplemented in the UK and the US [4,5]. In the US, some colleges and universities reverted to remote learning in January 2022 to help reduce community spread [6].

Throughout the pandemic, health sciences programs transitioned to virtual or hybrid models of curriculum delivery. These programs were uniquely challenged due to the required hands-on skills and apprenticeship in the clinical environment [7]. Transitioning to this type of educational model required adapting pedagogy in real-time while trying to maintain expected levels of excellence [7,8]. Distance learning, taking models to scale, and personalized instruction were the biggest challenges facing educators, in addition to providing students with the opportunity to practice their new skills [9]. The closure of campuses and the transition of classes to virtual models required that the faculty complete

teaching and other academic responsibilities from home. On average, 88.5% of Americans have at least one child during their working years [10]. While social distancing measures were in place, schools and childcare facilities were also closed, and faculty members worked from home while simultaneously teaching, caring for children and providing substantial assistance with schoolwork [11]. There were also gendered differences in the pandemic's impact on the working parent [12]. Restricted access to childcare during the pandemic and increased work demands took a greater toll on women at early stages in their careers [13]. The health sciences (clinical practice and academia) have a workforce that is predominantly female [14], so the pandemic may have uniquely impacted this field, warranting further study.

Health sciences faculty members have responsibilities outside of teaching also dedicating time to clinical practice, community outreach, administration, committee work, and research [15]. Many supervise students in the clinical environment and are responsible for securing clinical placements for students in an overburdened health system. Demands and the challenges of the pandemic led to poorer quality of life, burnout, and the motivation to leave academia for some faculty members [7,15,16]. Work-from-home orders and a lack of childcare contributed to a gender gap in perceived work productivity and female academicians reported being less satisfied with their job [11]. The pandemic has continued to amplify the gender gap in the publication of medical literature [13]. Health sciences faculty members aim to advance healthcare and health professions education through their research [17] and the impact of the pandemic on their scholarly productivity has far-reaching implications for advancing patient care and education. However, to date, no study has examined the effect of the COVID-19 pandemic on the productivity of health sciences faculty members outside of academic medicine. Additionally, few studies have used qualitative methodology to explore how the pandemic affected health sciences faculty members' productivity. Therefore, the purpose of this mixed methods study was to explore the impact of the COVID-19 pandemic on the academic productivity of an interprofessional group of health sciences faculty members in one graduate school in the northeast region of the United States.

### *Theoretical Framework*

Changes in personal and professional life can greatly impact perceived quality of life. During the pandemic, educational challenges and increasing student needs significantly increased the demand and expectations placed on faculty members. When the relationship between one institution's nursing faculty's quality of life, resilience, and associated factors during the pandemic was examined, resilience was the strongest predictor of physical health as well as psychological and social relationship quality of life domains [15]. Resilience was defined as, "the ability to recover from perceived adverse or changing situations, through a dynamic process of adaptation, influenced by personal characteristics, family and social resources, and manifested by positive coping, control, and integration" [18]. While there has been increased attention paid to burnout during the pandemic, researchers have encouraged shifting attention away from burnout and wellness and instead focusing on the interplay between individual and organizational resilience [19]. When investigating the factors affecting resilience in health professionals, four main themes emerged: (1) individual factors such as individual traits, sense of purpose, and self-determination; (2) environmental and organizational factors such as workplace culture; (3) specific approaches to one's profession, and (4) educational interventions that foster resilience [20].

There is a dynamic interplay between resilience, self-efficacy, and self-determination [20–23]. Whereas self-efficacy is the individual's belief in their ability to succeed in a given situation [24], self-determination entails not being overwhelmed by feelings of hopelessness [23]. When faced with adversity (such as a pandemic), individuals must be motivated to act and persevere; hence, the theoretical framework which guides this study is self-determination theory [25,26]. Self-determination theory distinguishes between different types of motivations, the goals and drivers of action, and captures the

continuum from amotivation to extrinsic motivation to intrinsic motivation. Intrinsic motivation involves completing a task for satisfaction because it is inherently interesting, compared with extrinsic motivation where one feels externally pressured. The three basic psychological needs that support intrinsically motivated behaviors include competence, autonomy, and relatedness. Individuals feel competent when they are developing skills and mastering those skills. Autonomy differs from independence and is instead linked to the internal locus of causality which is the belief that human beings have influence over their own lives [27]. Along with autonomy, task value can be heightened if there is a sense of connectedness to a peer group, society, or family. To promote internalization, there must be relatedness, i.e., the sense of belonging, or connectedness to a group and goal [26]. Both resilience and self-determination encompass how social and environmental factors influence the individual [21,22,26]. We hypothesize that due to pandemic-related changes to the academic and clinical environments where health sciences faculty members work, the three basic needs were not met, and intrinsic motivation and productivity were negatively impacted. A secondary hypothesis is that health sciences faculty members who identify as female faced increased changes to their immediate environment with the closure of schools and childcare facilities. We anticipate that female faculty members will report additional changes to their motivation and productivity. This study will therefore explore the health sciences faculty members' experience of the pandemic through the lens of resilience and self-determination.

## 2. Materials and Methods

This study leveraged a sequential mixed methods (qualitative dominant) study design to enroll health sciences faculty members from one graduate school. Located in the northeast region of the US, the context is a non-tenure track institution with a Carnegie classification of special focus institution: other health professions schools. The promotion criteria at the institution were revised in 2010 with greater emphasis placed on scholarly dissemination and impact. Expectations for promotion differ by rank.

The research questions in this study were:

- (1) What was the effect of the pandemic on the scholarly productivity of faculty members in health sciences programs?
- (2) What types of motivation served as barriers/facilitators to health sciences faculty members' academic productivity during the pandemic?
- (3) How did the experience of producing scholarship during the pandemic differ for faculty members who identified as female vs. those who identified as male?
- (4) How did a sense of connectedness or lack thereof contribute to faculty motivation to produce scholarship during the pandemic?

Inclusion criteria for faculty members included full-time and part-time core faculty members employed at the institution since April 2019 (approximately one year prior to the start of social distancing measures in the US). Subjects were recruited to complete an electronic survey and indicate whether they would be willing to participate in a one-to-one interview. All faculty members who completed the survey and agreed to participate in a one-to-one interview were interviewed by the first author. To eliminate the effect of coercion between the researchers and fellow faculty members, program staff distributed all recruitment materials via email.

Quantitative data were collected using an electronic survey adapted from Krukowski et al. [12] exploring scholarly productivity in the 12 months preceding the pandemic (1 April 2019–31 March 2020) compared with 12 months during the pandemic (1 April 2020–31 March 2021). During the first stage of survey validation, researchers conducted a cognitive interview with an adjunct faculty member at the institution. The survey was then modified based on this virtual interview. Thereafter, the survey was pre-tested by a survey design expert and two of the researchers. After final revisions, the survey included 33 items.

The interview protocol used in the qualitative arm of the study was modified from a protocol used in a prior study examining the effects of the COVID-19 pandemic on physical therapist faculty members [7]. After revisions, the final interview protocol included three consent questions and seven open-ended questions (see Appendix A). The brevity of the interview protocol helped to keep the focus on the participant's experience of the phenomenon under study, i.e., the effect of the pandemic on academic productivity [28].

Ethical approval was granted by the institution's Human Research Committee Institutional Review Board. Data collection began in September 2021 and ended in December 2021. Subjects provided consent electronically, completed the survey, and scheduled a one-to-one virtual interview. Subjects reviewed the interview protocol in advance of the interview which was audio-recorded and transcribed. Researchers descriptively analyzed survey data using IBM SPSS version 25.0 (IBM Corp, Armonk, New York, NY, USA). Each survey item was interpreted on its own (and not collapsed into scales). Two of the researchers checked the qualitative data (transcripts) for accuracy, removed any identifying information and then thematically analyzed the interview data and field notes using NVivo qualitative software (QSR International Pty Ltd., Doncaster, Australia, 2020). The researchers independently coded two interview transcripts using descriptive coding to summarize the data in short words or phrases. Each researcher kept separate codebooks which included codes, descriptions, and data excerpts. The researchers then met to share their codebooks, resolve conflicts, and agree on one set of predetermined codes before completing first cycle coding of the remaining transcripts. However, the authors also used open coding to allow for new codes to emerge from the data analysis. After second cycle coding, the researchers met to collapse codes into pattern codes which formed the basis of data-driven themes [29].

The researchers leveraged researcher triangulation, data triangulation, and an audit trail to increase trustworthiness [30]. Researcher triangulation included two researchers coding independently and then meeting to achieve intercoder agreement. Data triangulation included the use of multiple sources of data (survey data, interview data, and researcher field notes,) to inform data analysis. Finally, all research materials were kept in a central location, which produced an audit trail that allows for the study process to be replicated.

### 3. Results

#### 3.1. Survey Data

Recruitment materials were distributed to 103 faculty members a total of three times. Thirty-two completed surveys were received, representing a 31% response rate. The majority of participants were at the rank of Assistant Professor (43.8%), had a full-time equivalent of 1.0 (93.8%), identified as female (81.3%) and identified as White (non-Hispanic) (90.6%) or Black/African American (6.3%) (See Table 1). The mean respondent age was 49.03 years and 90.6% were married/living with a partner. Twenty-one participants (65.6%) had children younger than 18 years of age living at home.

**Table 1.** Demographic characteristics of survey respondents.

| Demographic Characteristics ( <i>n</i> = 32) |               |
|--|---------------|
| Age [M, (SD)]                                | 49.03 (11.26) |
| Married or living with a partner [M, (%)]    | 29 (90.6%)    |
| Rank [Number, (%)]                           |               |
| Instructor                                   | 5 (15.6%)     |
| Assistant Professor                          | 14 (43.8%)    |
| Associate Professor                          | 9 (28.1%)     |
| Professor                                    | 3 (9.4%)      |

**Table 1.** *Cont.*

| <b>Demographic Characteristics (n = 32)</b> |            |
|---|------------|
| FTE (Full-time equivalent) [Number, (%)]    |            |
| 0.25  | 1 (3.1%)   |
| 0.75  | 1 (3.1%)   |
| 1.0   | 30 (93.8%) |
| Race/ethnicity [Number, (%)]                |            |
| Black; African American                     | 2 (6.3%)   |
| White (non-Hispanic)                        | 29 (90.6%) |
| Other                                       | 1 (3.1%)   |
| Gender identity [Number, (%)]               |            |
| Female                                      | 26 (81.3%) |
| Male  | 5 (15.6%)  |
| Prefer not to respond                       | 1 (3.1%)   |

Prior to the pandemic, most participants with children relied on school (28.1%) or a childcare center (18.8%) as their primary means of childcare most days of the week. While stay-at-home orders were in place most participants either shared childcare responsibility with a partner/co-parent (43.8%) or took primary responsibility for childcare (15.6%) (see Table 2). In total, 100% of those who took primary responsibility for childcare identified as female. Three participants (9.4%) had a dependent other than a child living at home during the pandemic and either cared for the dependent themselves (6.3%) or shared caregiving responsibilities with a partner (3.1%).

**Table 2.** Characteristics of faculty members with children living at home between 1 April 2020 and 31 March 2021.

| <b>Faculty with Children Younger than 18 Years Old<br/>[n = 21 (65.6%)]</b>                                   | <b>Number (%)</b> |
|---|-------------------|
| Number of children younger than 18 years at home  |                   |
| 1 child   | 6 (18.8%)         |
| 2 children  | 6 (18.8%)         |
| 3 children  | 8 (25.0%)         |
| 5 children  | 1 (3.1%)          |
| Primary means of childcare <b>before</b> stay-at-home orders/social distancing measures in place [Number (%)] |                   |
| Care was provided by a relative (may include older siblings)  | 2 (6.3%)          |
| Shared responsibility with a partner/co-parent  | 3 (9.4%)          |
| Relied on a childcare center  | 6 (18.8%)         |
| School  | 9 (28.1%)         |
| Primary means of childcare <b>while</b> stay at home orders/social distancing measures in place [Number (%)]  |                   |
| Care was provided by a babysitter/nanny   | 1 (3.1%)          |
| Shared responsibility with a partner/co-parent  | 14 (43.8%)        |
| Took primary responsibility for childcare   | 5 (15.6%)         |

RQ 1: To what extent did the pandemic affect the scholarly productivity of health sciences faculty members?

### 3.1.1. Transitioning to Virtual Models of Teaching

Between 1 April 2020 and 31 March 2021, participants reported that between one and six courses of their courses transitioned from fully in-person to a virtual or hybrid learning format (M 3.06, SD 1.26) (see Table 3). One participant reported that 100% of the clinical education courses they were responsible for transitioned to a virtual format. Most participants (90.7%) either agreed or strongly agreed that the time dedicated to teaching

(including course preparation) increased. In addition, 81.2% of participants either agreed or strongly agreed that they prioritized teaching over research and 78.2% of participants either agreed or strongly agreed they prioritized teaching and course preparation over activities outside of work. When asked whether they had more time to dedicate to teaching because of little to do outside of work due to social distancing measures, 56.3% of participants either disagreed or strongly disagreed.

**Table 3.** Transition to virtual modes of learning.

| Likert Style Questions:<br>(1-Strongly Disagree, 5-Strongly Agree)  | Mean<br>(SD) | Strongly<br>Agree<br><i>n</i> (%) | Agree<br><i>n</i> (%) | Neither Agree<br>Nor Disagree<br><i>n</i> (%) | Disagree<br><i>n</i> (%) | Strongly<br>Disagree<br><i>n</i> (%) |
|---|--------------|-----------------------------------|-----------------------|---|--------------------------|--------------------------------------|
| For courses I was involved in (as a primary or secondary instructor or guest lecturer), the time I dedicated to teaching (including course preparation) increased                             | 4.56 (0.84)  | 23 (71.9%)                        | 6 (18.8%)             | 1 (3.1%)                                      | 2 (6.3%)                 | 0                                    |
| When I think about how I spent my work hours, I prioritized teaching (e.g., transitioning courses to a virtual platform) over research (either planning, implementing or writing up research) | 4.25 (0.98)  | 17 (53.1%)                        | 9 (28.1%)             | 3 (9.4%)                                      | 3 (9.4%)                 | 0                                    |
| When I think about how I spent my time, I prioritized spending time teaching or preparing to teach (e.g., transitioning courses to a virtual platform) over activities outside of work        | 4.13 (0.97)  | 14 (43.8%)                        | 11 (34.4%)            | 4 (12.5%)                                     | 3 (9.4%)                 | 0                                    |
| I had more time to dedicate to teaching while social distancing measures were in place because there was little to do outside of work   | 2.56 (1.43)  | 4 (12.5%)                         | 6 (18.8%)             | 4 (12.5%)                                     | 8<br>(25.0%)             | 10 (31.3%)                           |

### 3.1.2. Scholarly Productivity

In the year prior to the pandemic, participants attended an average of 2.29 in-person conferences. In contrast, during the pandemic period under study, participants attended zero in-person conferences and 1.74 virtual conferences (see Table 4). While participants presented an average of 2.72 (SD 2.21) peer-reviewed works at an academic conference the year before, this number dropped to 1.47 (SD 1.58) during the pandemic, with female respondents more adversely affected than the male participants. Journal submissions with survey participants as first or last authors also decreased from 1.10 to 0.97 and 0.91 to 0.59, respectively. Co-authored articles increased from 1.34 in the year before the pandemic to 1.50 during the pandemic. Grant submissions remained stable between the two time periods with an average of 0.26 submitted in the year before the pandemic and 0.25 submitted during the pandemic year, although male respondents submitted no grant applications during the pandemic.

**Table 4.** Faculty productivity changes from pre-pandemic (1 April 2019 and 31 March 2020) to post-pandemic (1 April 2020 and 31 March 2021).

| Academic Productivity                    | Pre-Pandemic<br>M (SD); Range | Pandemic<br>M (SD); Range |
|--|-------------------------------|---------------------------|
| Number of conferences attended in-person | 2.29 (1.488); 0–7             | 0                         |
| Female                                   | 2.12 (1.333)                  | 0                         |
| Male                                     | 2.20 (0.447)                  | 0                         |
| Prefer not to respond                    | 7                             | 0                         |

Table 4. Cont.

| Academic Productivity   | Pre-Pandemic<br>M (SD); Range | Pandemic<br>M (SD); Range |
|---|-------------------------------|---------------------------|
| Number of conferences attended<br>virtually                               |                               | 1.74 (1.264); 0–6         |
| Female  |                               | 1.64 (1.036)              |
| Male  |                               | 1.40 (0.894)              |
| Prefer not to respond (gender identity)                                   |                               | 6                         |
| Presented peer reviewed work at an<br>academic conference                 | 2.72 (2.129); 0–8             | 1.47 (1.586); 0–7         |
| Female  | 2.58 (2.176)                  | 1.12 (1.211)              |
| Male  | 2.60 (0.894)                  | 2.20 (1.095)              |
| Prefer not to respond   | 7                             | 7                         |
| Served as a peer reviewer on a journal<br>article                         | 2.88 (4.689); 0–25            | 2.22 (2.636); 0–10        |
| Female  | 2.96 (4.919)                  | 2.08 (2.399)              |
| Male  | 2.40 (4.336)                  | 2.00 (3.464)              |
| Prefer not to respond   | 3                             | 7                         |
| Served on a review panel for funding                                      | 0.16 (0.448); 0–2             | 0.97 (4.099); 0–23        |
| Female  | 0.12 (0.326)                  | 1.08 (4.525)              |
| Male  | 0                             | 0                         |
| Prefer not to respond   | 2                             | 3                         |
| Submitted a new journal article as the<br>senior author                   | 0.91 (1.467); 0–5             | 0.59 (1.160); 0–5         |
| Female  | 0.96 (1.587)                  | 0.62 (1.235)              |
| Male  | 0.60 (0.894)                  | 0.20 (0.447)              |
| Prefer not to respond   | 1                             | 2                         |
| Submitted a new article as a co-author<br>(not as a first or last author) | 1.34 (1.807); 0–9             | 1.50 (1.741); 0–7         |
| Female  | 1.38 (1.981)                  | 1.46 (1.772)              |
| Male  | 1.00 (0.707)                  | 1.00 (0.707)              |
| Prefer not to respond   | 2                             | 5                         |
| Submitted or resubmitted a research<br>grant                              | 0.26 (0.682); 0–3             | 0.25 (0.568); 0–2         |
| Female  | 0.20 (0.50)                   | 0.31 (0.618)              |
| Male  | 0.60 (1.342)                  | 0                         |
| Prefer not to respond   | 0                             | 0                         |

“Prefer not to respond” indicates any participant who declined to share gender identity.

### 3.2. Qualitative Findings

Twelve subjects (four instructors, four assistant professors, three associate professors, and one full professor) participated in a one-to-one interview with one of the researchers. Participants from the following programs: genetic counseling, nursing, occupational therapy, physical therapy, and speech and language pathology, had held academic appointments between 2–27 years ( $M = 11.33$  years). Three themes emerged from the analysis of qualitative data which included interview transcripts and research field notes: stressed systems, balancing act, and meaningful connection.

RQ 2: What types of motivation served as barriers/facilitators to health sciences faculty members’ academic productivity during the pandemic?

#### 3.2.1. Theme 1: Stressed Systems

Participants described the initial adrenaline rush in March 2020 when campus closed to limit the spread of the virus. As health care providers and public health specialists, many participants were aware that the pandemic would not be short-lived. Even so, while participants anticipated needing to temporarily prioritize teaching over research, they did

not anticipate that two years later they would still be facing challenges. The workload related to converting fully in-person classes online and securing fieldwork placements for students in an already overburdened health care system increased exponentially:

*The first word that comes to mind is challenging. Because it is. We're already pulled in so many different directions in terms of expectations, both in terms of what we by necessity have to spend time on and then also what expectations are and [we] have to do it all well. But no matter what, at the end of the day, the student experience and teaching . . . needs to be first.* (Participant 11)

Faculty members described how much cognitive load (which pre-pandemic time could be devoted to research) went into teaching. Participants pointed out that the overused term “pivot” described not only a change in direction but also a necessary halt. Many aspects of their personal and professional lives paused to prioritize teaching. Faculty members in newly established programs or who were novice educators were teaching courses for the first time online. Others were converting courses in the space of one week:

*Most evident is just how much cognitive energy had to be spent. It wasn't even just time spent on things like switching courses to virtual, or researching new methods or platforms, or all these things, but it was just how much of our mental effort had to be spent on it. It was like all of the days had to go towards figuring out these problems . . . there was no easy task at that point.* (Participant 9)

Faculty members were creating and innovating teaching health sciences online. The small nimble nature of the institution lent itself well to innovation, and the need to research these innovations was not lost on the faculty. However, participants described lacking the time and bandwidth to dedicate to research. Once the semester was over, it was time to start planning the new semester without investigating whether the “pilot project” had worked:

*Working on what seems like 100 projects that are all innovative twists and necessary adaptations to the pandemic. But the challenge is not having time to bring them to the scholarly phase. The constant stream of change clearly is fodder for study. Is it better than it was? Worse than it was? Did we successfully meet our curricular objectives for our students who had to go through these changes? All of those questions need to be answered and studied. I feel like that is where I'm missing out. Perhaps haven't had the time to be as thoughtful about that as I would like.* (Participant 8)

Many participants were also working as clinicians in an overburdened healthcare system. Those not directly involved in patient care were collaborating with clinical partners who were also facing competing demands on their time and prioritizing patient needs. Faculty members also lost research opportunities in the stressed healthcare system where patient care took precedence. Supervising students either in clinical or research environments was not a priority for clinical partners. However, faculty members persisted because student learning needs were a priority: “When we are reaching out to our pool of health professionals for field work, or scholarship, they were like “Are you really asking us to keep hosting students right now?” But that absolutely had to be our focus” (Participant 11). Conducting research was often outside of the typical workday to begin with, but became increasingly deprioritized during the pandemic as faculty members dedicated time to keep students progressing and on track for graduation.

RQ3: How did the experience of producing scholarship during the pandemic differ for faculty members who identified as female vs. those that identified as male?

### 3.2.2. Theme 2: Balancing Act

Faculty members defined themselves as scholars in everyday life, engaging and innovating in the classroom but acknowledged that scholarship is often defined by deliverables that can be listed on a curriculum vitae, like grant applications and manuscripts. Senior faculty members described that when they first entered the academy, producing disseminated materials felt like an ego-driven race. However, with time they came to appreciate

scholarship as having a larger impact and value. Through research, participants were able to advance not only their careers but also the health sciences field. Research helped to meet the institution's mission to transform healthcare and meet the needs of a diverse society. Participants described thinking about scholarship in terms of both process and product, "I define scholarly productivity by advancing research, meaning you are submitting a grant, submitting a paper, advancing a study from one stage to the next, moving from completing data collection to data analysis, data analysis to writing" (Participant 3). Newer faculty members described that tangible products helped increase their perception of job security during the pandemic. They described feeling as if the product (like a manuscript) showed how they had been spending their time:

*It's something that can't be taken away from you. I felt that pressure to get stuff out. But that's what has stuck with me, it has been so memorable. Fear isn't the right word, but wanting to kind of show your worth in some way . . . I did something. Not like I [just] taught my classes and I survived the last six months. (Participant 5)*

While some participants were driven by a self-described imposter syndrome, others struggled to balance research and service commitments. Participants lost growth and networking opportunities that come from serving on national committees and engaging in research due to a lack of time and cognitive bandwidth. Faculty members felt that their lives were mirroring their students. They were advising students to keep regular engagement with research projects but were having difficulty taking their own advice because they were also managing childcare responsibilities as schools and childcare facilities were closed. Childcare seemed to disproportionately fall on female participants, even those with supportive partners:

*I had to just focus on courses, literally at midnight, or three or four in the morning. Not work on my own research track. I know I've heard of folks saying that they during the pandemic, when they are able to take away their commute time, allowed them more time to do research. I did not find those people to be women, particularly not women who have small kids. (Participant 11)*

Words like "chaotic", "uncertain", "scary", and "stressful" came to participants' minds. The uncertainty surrounding the pandemic extended into all facets of faculty life. Participants described being concerned about their family's health and well-being as new variants emerged. Children were exposed to the virus and needed to quarantine. Female participants described being responsible for the schedule of the family while at the same time not knowing when schools and childcare facilities would reopen. One participant described: "You can't plan when you don't know what's coming". Like conductors in an orchestra, faculty members were managing their family's needs, students' needs, course redesigns, clinical education challenges, as well as research and committee work. Another participant described that "Trying to hold all of this new information in your head, to be able to use it effectively is just a crushing kind of weight because you invariably get it wrong" (Participant 3). For many, the experience was described as an emotional roller-coaster where they were never quite hitting the mark in any aspect of this balancing act. Their children (often much younger than the college-age students they were dealing with in their professional lives) were also facing fear and anxiety and had significant needs. The systems they relied on to be able to work were non-existent:

*The learning pods which [are] supposed to protect us actually infiltrated with COVID. One of the families did end up getting COVID and the son brought it into our home. And he was asymptomatic. Then my husband got COVID . . . That same week, our dog died. It was just unreal. I remember being on my Zoom call for my PhD class, and the Massachusetts contact tracing is trying to call me and my son couldn't go to school. It was just difficult. (Participant 2)*

There were days when faculty members felt that despite the hard work and exhaustion, they had accomplished nothing and felt like they were always failing someone (family, students, work colleagues) in an effort to prioritize, "That was like one of the lowest

periods I can think of” (Participant 6). As social distancing measures were eased, faculty members then devoted time to converting classes again, this time into hybrid formats, and prioritizing students’ emotional needs which escalated as the pandemic dragged on. Caring for students was described as “all-encompassing”. The ongoing pandemic, combined with the uncertainty as new variants emerged, took a toll on both student and faculty mental health:

*If I give attention to my kids, then something is going to fall off at work. And that was more significant during the pandemic, I felt because the needs were so much higher for everyone. And the conversations were longer, and who you needed to involve, and there was more regular need for support. So it was always who do I prioritize in this moment?* (Participant 1)

Participants were aware that their students were experiencing loss of the graduate school experience they were anticipating and perhaps the loss of a clinical experience:

*Caring for our students during this time of change has occupied a lot of everybody’s time, mine included because with every change that comes our way there’s a lot of questions and lack of clarity and it becomes anxiety and fear and concern that they’re not getting what they’re paying for. And that’s not just their only concern. Their major concern is, Am I going to be able to be a safe and competent health care provider by the end of all of this? Those are really intense fears and anxieties.* (Participant 8)

Faculty members were experiencing loss as well. Sometimes as profound as the loss of a family member due to COVID with a lack of opportunity to stop and grieve. Their children were experiencing a loss of classroom experiences or the opportunity to celebrate milestones. Faculty members who were doctoral students themselves took leaves of absences and lost their cohort or changed their dissertation focus due to lack of time or access to a patient population. Participants described reaching a breaking point:

*I finally hit a wall. I was like, Alright, I’m not going to kill myself to live like this anymore. I tried to gain that high productivity at high outcomes for long enough. So, this fall semester, I’ve definitely been saying no a lot more. I’ve been outsourcing things a lot more . . . It’s really interesting from a psychological perspective. I’m sure there’s been studies done now on this about hitting a wal—specifically for women in academia and research.* (Participant 2)

Participants described needing to stop working at a frenzied pace, seeking mental health support, and prioritizing their well-being. In order to do this, they sought meaningful connections which had been missing during the peak of the pandemic.

RQ 4: How did a sense of connectedness or lack thereof contribute to faculty motivation to produce scholarship during the pandemic?

### 3.2.3. Theme 3: Meaningful Connection

One of the challenges of the pandemic for health sciences faculty members (and students) was that virtual interaction is contrary to the motivation to enter the health sciences:

*There’s a reason why it’s a health science and why we go into it. We’re people, people, you know? We like to be with people, we want to make people happy and feel better, and be healthier. And that’s a very human interactive thing. And so you get a bunch of people that like to do human interactive things getting shoved into Zooms, and it’s jarring!* (Participant 4)

Human interaction, a key to health sciences education, was also necessary for clinical research. Senior clinical researchers who were unable to collect patient data during the pandemic were able to turn their attention to writing. However, one participant expressed concern that the pandemic was leading junior researchers away from clinical research:

*My fear is that the young, brilliant clinical research minds that are all say, maybe 5–8 years out and less, they will just pivot and say, “I’m not doing clinical research. I don’t want to do patient research anymore” . . . Everyone wants to do health services research now because you can do that on the computer. The messy research where you’re*

*with patients and have to get people come in, I think that there is going to be a group of this generation that skipped that.* (Participant 3)

In addition to losing access to patients, faculty members also lost access to their collaborators. While there were some lonely scholarly pursuits, such as writing a dissertation, faculty members relied on colleagues' input to move a research project to the next phase and even chance encounters to generate ideas and potential collaborations. Faculty members lost access not only to research colleagues at the academic institution but at healthcare facilities as well highlighting that health sciences faculty members were working in two overburdened systems:

*Collegiality took a huge hit last year. Because it had to be intentional. Either I had to reach out to get collegiality, or somebody had to offer it to me. It wasn't just sort of there. And I did not have any realization of how much I depended on it being just there.* (Participant 4)

The loss of collegiality and research support impacted faculty members disparately depending on rank and years of experience:

*I feel very grateful because I already have a track record of success and so a blip in anything that I would do isn't going to derail my whole career. . . . If you are just starting out, it's really easy. Oh, you graduated in 2021? Oh, you get a bit of a bigger pass. But the hardest is for people who just sort of started and then got interrupted and they're trying to get the momentum going again . . . I think that group needs particular care as researchers.* (Participant 3)

Mentorship was greatly needed as faculty members emerged from the pandemic, but was described as slow to build back up, even as campus life returned to (somewhat) normal. Faculty members in terminal degree programs valued the mentorship and support they received because informal mentorship and collaboration in the academic institution had decreased. There were fewer chance encounters, decreased opportunities to collaborate, a lack of networking at conferences, and decreased motivation to attend virtual conferences as the pandemic progressed. Senior faculty members reflected on the difficulty to provide mentorship during the pandemic and how that may have affected junior faculty members more significantly because of the importance of mentors early in an academic career. Although not impossible during the pandemic, collaborations needed to be much more intentional. Junior faculty members were hesitant to reach out and add one more meeting request to mentors' schedules and this lack of support slowed their professional development. Time was seen as a precious commodity during the pandemic:

*I feel like people are seeking or they have an expectation for meaningful connectedness and that people's time has become more important. They're more attuned to not wasting their time. I do feel like I have had some really nice, meaningful connections, meaningful conversations and that things are moving forward. There's some hope that something good is going to come out on the other side.* (Participant 3)

There was a focus on other positives as well. Participants were proud of their accomplishments, particularly keeping students on track to graduate. The events of the summer of 2020 had also spurred a focus on social justice and inclusivity and while their courses had undergone multiple revisions, some participants were looking ahead to better versions of their curricula. Participants were also acutely aware of the stress that their clinician colleagues were under and were grateful that they were able to work from home and care for their families. The majority of participants in this study were married or living with a partner and were caring for children or older adults in their lives. While participants spoke about the significant draw on their time and the balancing act required, they also acknowledged the privilege of having social support from family, "I am so fortunate to have a family social connection built into my home, and I often think about people who didn't have that, you know, people who were really isolated" (Participant 8).

#### 4. Discussion

This study highlighted the unique challenges faced by health sciences faculty members charged with educating the next generation of health care providers and advancing the science of education and patient care during a pandemic. Consistent with studies of faculties' productivity in academic medicine [12,13], we found a decrease in scholarly productivity between March 2020 and April 2021 compared with the preceding year. A lack of time to engage in scholarship was a barrier for health sciences faculty members even before the pandemic [17]. It is not surprising that as time dedicated to teaching increased during the pandemic, scholarly output decreased. Staniscuaski et al. found that male faculty members' productivity was less affected by the pandemic than female academic productivity [31] which was the case in this study as well. Female scientists report having less time available to devote to research compared to their male counterparts during the pandemic [32]. Working from home is not the same when there are dependents at home who also require care. Women spend 8.5 more hours per week on domestic activities and are more likely to take time off work to provide childcare when there is a disruption of usual arrangements [33]. In this study, 100% of participants who took full responsibility for childcare while schools and daycare facilities were closed were female. Female participants described the challenges of caring for their children and meeting students' needs which increased exponentially during the pandemic and took priority over research. This finding is not surprising given that female faculty members are more likely to perform more service-related work, exert more emotional labor, and spend more time transitioning to online learning [34]. Gender, parenthood, and race have all been shown to impact the ability of faculty members to submit manuscripts and meet deadlines during the pandemic [31]. Due to a small sample of mostly White faculty members in this study, we were unable to observe for the effects of race, but the effects of gender were evident.

We also found changes to all three psychological needs that support internal motivation. People need to be motivated to act and ideally possess internal motivation, acting for interest and enjoyment. By acting on their interests, people grow their knowledge and skills and apply those skills [25]. This type of motivation is vital for faculty members who produce and disseminate knowledge. One of the needs which must be met to support intrinsic motivation is competence. Experiences of small successes can foster intrinsic motivation. However, decreased scholarship and scholarly collaborations during the pandemic, limited the small wins that faculty members gain through scholarship such as submitting an abstract or manuscript or presenting at a conference. Faculty members, especially junior faculty members, reported decreased mentored opportunities to master their research skills which likely impacted intrinsic motivation.

The other basic need which supports intrinsic motivation, and was lost during the pandemic, is a sense of autonomy and internal perceived locus of causality [27]. The argument can be made that there is always some degree of reward for faculty scholarship such as prestige and promotion, so scholarship is not entirely internally motivated. However, the pandemic further complicated the academic environment that fosters intrinsic vs. extrinsic motivation. Faculty members in this study described that, even prior to the pandemic, there was a degree of external regulation to producing scholarship as well as pressure and ego involvement, especially early in their careers. However, over time, faculty members appreciated that their scholarship advanced health care and health professions education and became more internally motivated. The pandemic then vastly altered the social and environmental factors that contribute to internal motivation. Faculty members were faced with a strong sense of external locus of control as there was a lack of autonomy and pressure to help students graduate on time and maintain quality of teaching while dealing with uncertainty in both their professional and personal lives.

Relatedness also supports intrinsic motivation [26] and there was a lack of relatedness and connection during the pandemic which included lost scholarship and networking opportunities. Despite advances in technology that allowed for virtual interactions, collaborative researchers needed to adjust to the elimination of in-person conferences. This reduction in net-

working was even more pronounced for women due to increased domestic responsibilities that could not be outsourced because of the pandemic leaving less time for career-advancing networking [32,35]. Recent studies in science-related fields are demonstrating an impact on women's scholarship due to decreasing collaboration with smaller teams and fewer female first and senior authorships [13,36], which we noted in this study. Those who continue to work remotely even after the pandemic cite increased productivity but also report decreased connectedness with co-workers [37]. With more evidence supporting the efficacy of remote learning, institutions of higher education face pressure to blend instructional design. The work environment may be greatly altered moving forward [38,39]. Research examining the successes and challenges of virtual work and learning post-pandemic will be vital. It will be important to determine the lasting impact of the pandemic on female faculty members, those from minoritized backgrounds, and researchers at the beginning of their careers. Program development directed towards mitigating these effects should be implemented and studied, as when individuals feel supported and engaged, intrinsic motivation is likely to be sustained [40].

Our results also highlighted the interplay between the pandemic, academic productivity, and career stage. Faculty rank has been shown to be associated with increased resilience during the pandemic [15]. Junior faculty members noted that while they were motivated to be productive and show tangible products, research mentorship was slow to start back up as the campus life returned to normal which slowed their professional development. Some faculty members described that, despite a lack of time and bandwidth, they pursued doctoral programs during the pandemic to gain access to formal research mentoring. Ultimately, senior faculty members may be quicker to recover from the effect of the pandemic whereas junior faculty members, without mentorship, may see longer-lasting effects. While there is evidence of an increase in journal submissions during the pandemic [41], our results showed a decrease in submissions with survey participants as first and senior authors, but an increase in submissions as co-author. Senior clinical researchers confirmed that with the inability to gather patient data, they did dedicate their time to writing. However, the concern is that the pandemic may deter junior researchers from pursuing clinical research which can have longer-lasting effects on patient care.

Despite the clear external locus of control during the pandemic, faculty members did have internal drivers as well, which contributed to their resilience. Faculty members felt that the values of the institution aligned with their own. Faculty members were committed to helping develop future health care providers and were aware of the importance of sharing their innovations. However, as the pandemic drew on, there was evidence of faculty members reaching a breaking point and needing to re-establishing boundaries between personal and professional lives. Faculty members were once again seeking autonomy, choice, and the opportunity for self-direction to build back their intrinsic motivation.

### *Limitations*

Just as important as the response rate is that the study sample is representative of the population being studied [42]. This study focused on one graduate school in the northeast, making the results potentially less generalizable to other faculty groups. The results of this study should be interpreted as exploratory. As is reflective of faculty composition in health professions programs, most of the participants were White women. Women from minoritized backgrounds may have been affected by the pandemic differently than their White counterparts and should be a focus of future research in the health sciences. We attempted to capture the demands of caregiving which extend beyond childcare. An estimated 53 million adults in the United States are caregivers, and 61% of family caregivers are also working [43]. While a small number of participants cared for dependents besides children, most participants in this study cared for children younger than 18 years of age. However, older children also returned home as their college campuses closed. While older than 18, these children also had significant needs not captured in this study.

## 5. Conclusions

Consistent with studies in academic medicine, this study demonstrated a reduction in scholarly productivity disproportionately affecting women who were balancing work responsibilities in three stressed systems: health care, higher education, and their home lives. In this study, we also saw changes in faculty motivation and the psychological needs that support intrinsic motivation, including competence, autonomy, and connectedness. Mentorship and networking were greatly reduced during the pandemic. We may see the lasting effects of the pandemic on junior faculty members more than on senior faculty members already established in their research. Additionally, the effect on clinical research needs further investigation as junior researchers may have switched to health science research due to limited access to patients. We argue that academic environments must attend to the psychological needs which foster intrinsic motivation. Ultimately, intrinsic motivation and self-determination can lead to increased resilience [20–22] which will be necessary to stimulate the process of adaptation to recover from the pandemic.

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## Appendix A. Interview Protocol

1. What was it like to be a researcher in a health sciences program during the COVID-19 pandemic.
2. What stories can you share about the experience that were particularly memorable?
3. Tell me some stories about how you navigated this challenge. Follow-up questions:
  - a. You said it was a challenge to . . . Can you say more about this challenge?
  - b. You said that you had difficulty with . . . Can you elaborate?
4. How do you define scholarly productivity?
5. Can you talk about what, if anything, hindered your scholarly productivity during the pandemic?
6. Can you talk about what, if anything, facilitated your scholarly productivity during the pandemic?
7. Do you have anything else to share about being a researcher during the pandemic?

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