Compassion fatigue in laboratory animal personnel: A bibliometric analysis of global trends.

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Abstract

Laboratory animal personnel face enormous pressures such as workload, conflicts, deadlines, lack of psychological support, and ethical dilemmas. These pressures are often due to the need to balance scientific objectives, ethical responsibilities, and personal emotions, while trying to maintain legal and institutional animal housing and care standards. When these profession related pressures are exacerbated by toxic social relationships and financial challenges, it may lead to chronic stress that will ultimately cause compassion fatigue. This review was aimed at analysing publication trends on compassion fatigue among laboratory animal personal by doing a bibliometric analysis on published articles to come up with insights that could inform future research strategies.

A literature search was done via the Scopus databases for articles published in English. The data collected from the search was transferred to Bibliometrix R-package and assessed for publication trends, analysis of contributing countries, thematic evolution and co-occurrence of authors' keywords.

17 articles published between 2015 and 2024 were retrieved for analysis. Among these, 14 were survey studies, 3 were literature reviews. The number of articles published is on an upward trend, with all authors being affiliated with Global North institutions. The keyword analysis identified 53 words. The most common word used was, "compassion fatigue" and the analysis indicated that technologists and veterinarians are the primary target populations for CF research.

The modest rise in the body of literature on CF and mental health issues among LAP is commendable and I encourage more work to be done to better understand this complex phenomenon.

Keywords: Laboratory animals, Laboratory animal personnel, Compassion fatigue, Bibliometric analysis, Global trends.

1 Introduction

Laboratory animal personal (LAP) are people that are responsible for housing and caring of laboratory animals. Laboratory animals are animals that are used for scientific and teaching purposes in search for solutions to some of the major challenges facing the continent, including the prevention and treatment of human and animal diseases, food safety and security, climate change and nature conservation[1]. LAP may face enormous pressures from the nature of the work they do such as conflicts, deadlines, and ethical dilemmas and these profession related pressures may be exacerbated by toxic social relationships and financial challenges. Profession and socioeconomic pressures may lead to chronic stress that will ultimately cause compassion fatigue (CF). The relationship between professional responsibilities and personal challenges can escalate feelings of burnout, making it difficult for individuals to cope effectively. Understanding the broader context of these contributing factors is essential for recognising and addressing CF in a comprehensive way. The term CF was first used in the nursing profession to describe occupation related behavioural changes observed in personnel such as chronic exhaustion, impatience, and a diminished sense of happiness in life[2-4]. The nursing profession also used secondary traumatic stress as an alternative to CF, bringing the aspect of cost of caring i.e., the emotional distress and fatigue developing in nurses due to prolonged exposure to patients' suffering[5, 6]. In this article, CF will be recognised as a multifaceted construct that involves burnout and secondary traumatic stress[7]. Secondary traumatic stress stems from indirect exposure to trauma, and vicarious trauma involves deep, lasting psychological changes due to repeated encounters with others' distress while burnout results from chronic workplace stress and exhaustion[3, 4, 8].

Although, CF has been extensively researched and documented in healthcare professions such as nursing, there is paucity of data when it comes to LAP [9-14]. This review builds upon previous work that concluded that occupational stress is prevalent in the LAP although conclusions and recommendations could not be made due to the small number of surveys published that used different methodologies and outcome measures [10]. A recent systematic review investigated stressors for LAP and moderators relevant for the development of psychological strain, concluded that LAP are experiencing stressors, but could not identify specific stressful duties beyond euthanasia and recommended further studies to help institution design programmes to address psychological strain [15]. In South Africa, feedback from LAP has shown that during the COVID-19 pandemic, some LAPs experienced various emotions such as shock, anger, grief, restlessness, feeling their lives are out of control[16]. This feedback from LAP shows that

CF is present in the profession. A survey among veterinarians working with laboratory animals identified the need for further training in stress management, resilience building, well-being maintenance, and burnout prevention[17].

This review aims to conduct a bibliometric analysis and examine trends in CF based on published articles, identifying keywords commonly used in the literature and publication trends. By analysing these trends, I seek to uncover potential patterns in literature and identify gaps that will shape future research to understand the development of CF across different settings.

2 Methodology

2.1 Search strategy.

Database search was carried out in English and included Scopus. Scopus was used because it covers a wider journal range in keyword searches and citation analysis when compared to other databases[18]. The database search followed the Preferred Reporting Items for Systemic Reviews and Meta-Analysis (PRISMA) guidelines(Figure 1)[19]. Multiple key word combinations of Laboratory animals and one or more of the following: Compassion fatigue, Compassion satisfaction, Burnout, Secondary traumatic stress, vicarious trauma was used.

2.2 Inclusion and exclusion criteria

The study included published articles on compassion fatigue in LAP and findings published in English in peer reviewed journal as original articles.

2.3 Study selection.

Titles and abstracts of articles identified from the search were assessed and those that did not meet the inclusion and exclusion criteria were excluded while those that were in line with the study criteria included.

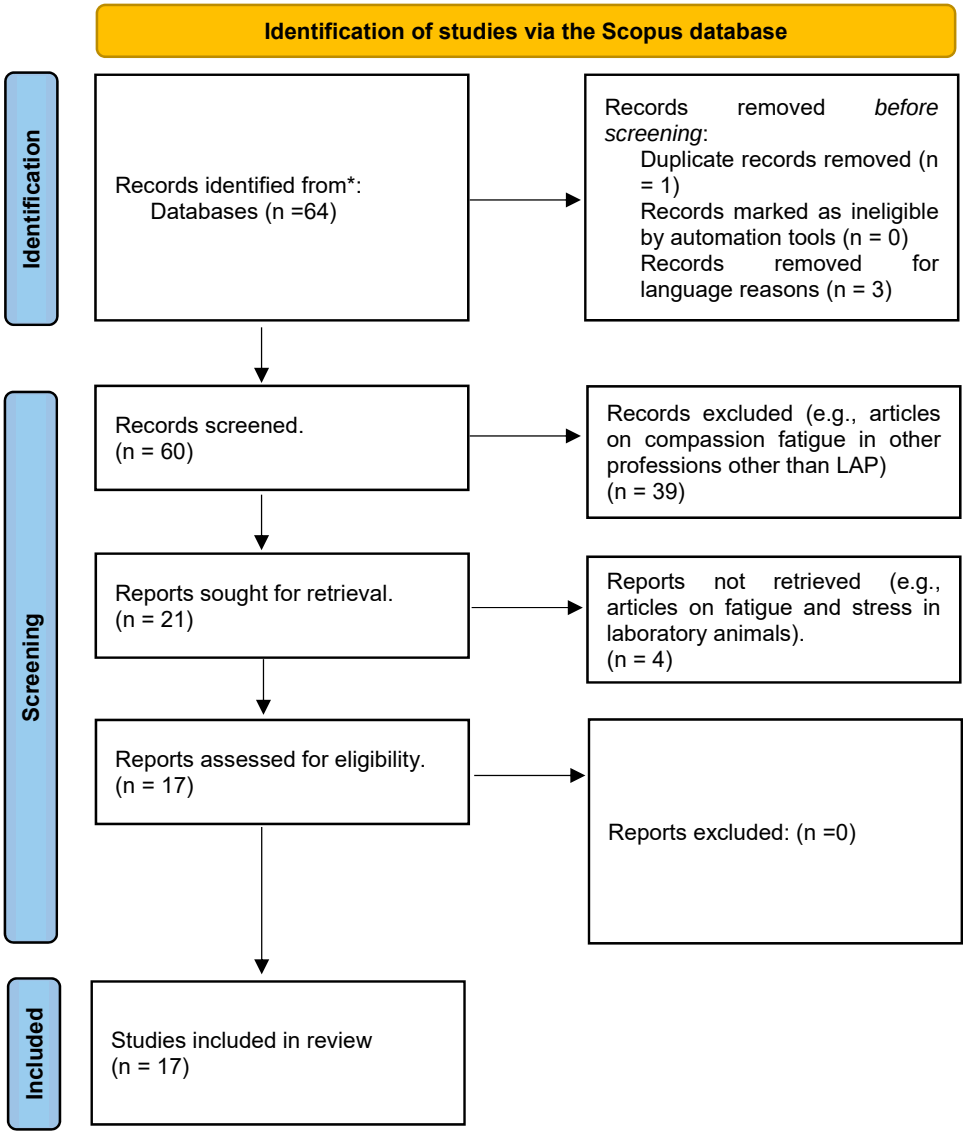

Figure 1: A flow diagram showing the selection process for identifying publications on compassion fatigue in laboratory animal personnel from the Scopus database.

Adapted from [19].

2.4 Data extraction

The data collected from the search engine was transferred to Bibliometrix R-package (http://www.bibliometrix.org) and assessed for publication trends, analysis of contributing countries, thematic evolution and co-occurrence of authors' keywords. The Bibliometrix R-package was used because it is freely available and compatible with a wide range of databases.

3 Results and discussion

The modest rise in the body of literature on CF and mental health issues among LAP raises an important question. Is it that LAPs are now more aware of mental health issues or the prevalence of mental health cases among LAPs has genuinely increased? There could be increased awareness and/or reduced stigma surrounding mental health problems leading to more LAPs feeling comfortable discussing their experiences and seeking help, resulting in a rise in reported cases of CF. This shift in perception can encourage more open dialogues about mental well-being in the workplace, fostering an environment where individuals are willing to share their struggles and access support services. On the other hand, there may be legitimate increases in the extent of mental health crises among LAPs. Factors such as rising job demands and exposure to trauma can contribute to heightened levels of stress, burnout, and CF[10, 20]. The impact of the COVID-19 pandemic on mental health may also have exacerbated these issues, leading to an increase in the number of professionals experiencing mental health challenges[16, 21, 22].

3.1 Annual trends in publications.

The literature search yielded 64 articles, and out of those, 21 articles were considered for a full study screening, of which a further 4 articles were excluded since they did not meet the study criteria. In this review, 17 articles published between 2015 and 2024 were retrieved for analysis. Among these, 14 were surveys studies, 3 were literature reviews. As illustrated in Table 1, the first article to address CF among laboratory animal personnel was published in 2015, although there are minimal number of publications in this field until 2019. The modest rise in the number of publications after 2019 may reflect the growing awareness of CF and mental health, particularly following the COVID-19 pandemic. Even though an upward trend in the number of publications may indicate an increasing interest in CF among laboratory animal personnel, the overall impact of the articles remains modest as shown by the average citation count of 26.88 per article, which is expected for articles in growing topics[23]. This relatively low citation count may indicate that, despite heightened awareness, the topic of CF in this field has not yet gained widespread visibility within the broader scientific community. Increased efforts are needed to promote and disseminate research on CF and mental well-being in laboratory animal settings, ensuring that the subject receives attention from all stakeholders in the field.

Table 1: Annual publication trend on compassion fatigue in research animal personnel.

Year	Number of articles published
2015	1
2016	0
2017	0
2018	2
2019	0
2020	4
2021	5
2022	1
2023	0
2024	4

3.2 Author affiliation

A total of 64 authors contributed to these publications with a 29.41% international co-authorship and an average of 4 co-authors per publication. All the authors are affiliated with Global North institutions, with no representation from the Global South(Figure 2). Global North refers to institutions in economically developed, industrialised, and high income countries, primarily in North America, Europe, and parts of East Asia while Global South are institutions in economically developing or less industrialised countries, including Latin America, Africa, and much of Asia[24, 25]. This trend is concerning, as it suggests a potential lack of interest to undertake research on CF among laboratory animal researchers in the Global South. The absence of published research may result in delayed recognition and intervention for CF-related issues in these regions, where cultural, socioeconomic, and institutional factors may differ significantly from those in the Global North. This is particularly alarming when considering that CF and mental health challenges, including increased suicide rates among veterinary professionals are documented[26-28]. I speculate that researchers and professionals in the Global South maybe facing challenges to research this field due to insufficient resources, support systems, and mental health infrastructure. Therefore, I encourage funding organisations and governments to prioritise research collaborations, knowledge exchange, and mental health initiatives that address CF in a globally inclusive manner, ensuring that no region is left behind in addressing this critical issue.

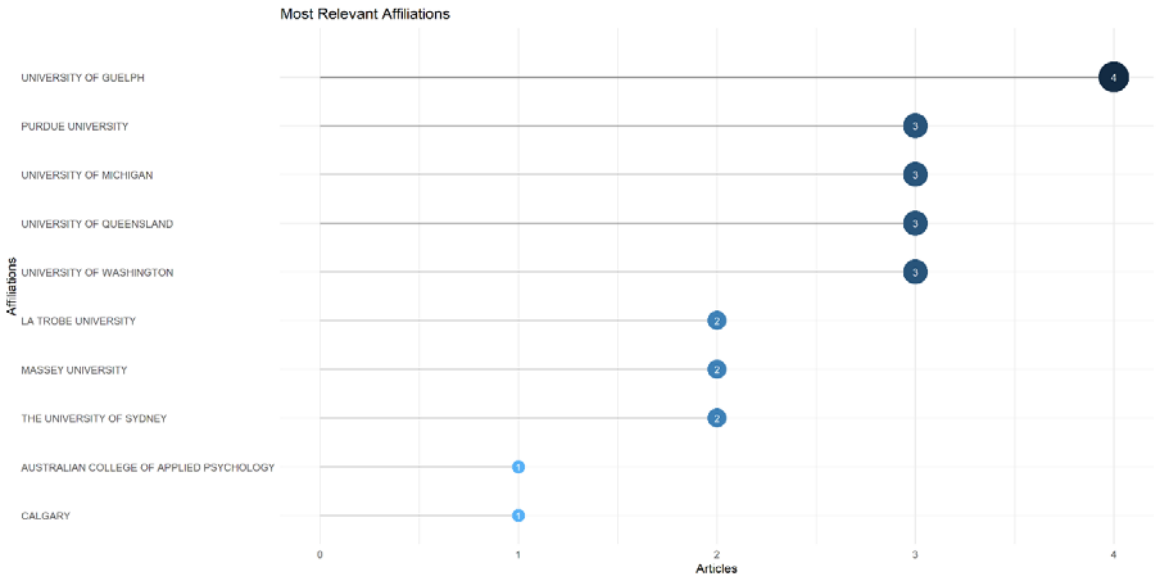

Figure 2: Author affiliation of published articles on compassion fatigue in research animal personnel by institution.

3.3 Journal analysis.

Journal trend analysis is important to understand the direction of research trends on specific topics. The data search revealed that the 17 articles reviewed were published across 10 different journals (Table 2), all of which are widely circulated. Notably, most of the publications (n = 4) appeared in the Journal of the American Association for Laboratory Animal Science. Most of the authors (n = 4) are affiliated with University of Guelph(Figure 2Figure 2: Author affiliation of published articles on compassion fatigue in research animal personnel by institution.). The author affiliation data is valuable for prospective researchers from the Global South as it points to potential opportunities for collaboration with well-established researchers and institutions in the field of CF. Collaborating with these groups can offer insights into comparative studies, provide mentorship, and enable the development of local strategies for managing CF, an area that remains underrepresented in the Global South. This global collaboration is crucial for expanding the discourse and addressing the unique challenges faced by researchers working in different socio-cultural and institutional contexts.

Table 2: Journals on compassion fatigue in research animal personnel research, ranked by the highest number of publications.

Journal title	Number of publications
Journal of the American Association for Laboratory Animal Science	4
Frontiers In Veterinary Science	3
Animals	2
Traumatology	2
Anxiety, Stress and Coping	1
Journal of Human Behavior in The Social Environment	1
Journal of the American Veterinary Medical Association	1
Journal of Veterinary Medical Education	1
Laboratory Animals	1
Plos One	1

3.4 Thematic map and key words analysis

Keyword analysis offers valuable insights into the terms authors consider important in their articles, while also highlighting current research trends and tracking the trajectory of studies within the chosen thematic domain[29-31]. The keyword analysis identified 53 words that were commonly used and relevant to the study of CF (Figure 3). The most common word was, "compassion fatigue" with a frequency count of 25.

Figure 3: Word cloud of commonly used keywords in published articles on compassion fatigue in research animal personnel.

The world cloud also came up with technologists and veterinarians which may indicate this group to be the primary target populations for CF research and as such I recommend that future research should focus on other people involved with the care and housing of animals used in experiments such as animal caretakers. Laboratory animal facilities are often located in basements to facilitate climatic control, but these environments are not ideal for personnel, the reliance on artificial light and air conditioning creates a less pleasant atmosphere, making the work mentally demanding for animal caretakers[32]. Animal caretakers are at risk of developing CF due to the extensive time they spent in animal facilities, often working with various diseased animal models. The stress of observing animals in distress can be emotionally taxing, as witnessing animal suffering can evoke significant emotional strain in caregivers[6, 33, 34]. Words describing mental health issues such as burnout, post-traumatic stress disorder, and depression, as well as words describing the personal and organisational effects of CF such as job satisfaction and quality of life emerged as significant research hotspots. I think these are important areas that require further research to explore how different working conditions affect

CF. A survey conducted by Young et al concluded that professional quality of life for laboratory animal personnel is related to job satisfaction and retention; and impacted by factors beyond working with research animals, including institutional culture and general mental health support[35]. Comparative studies can be done for different countries and regions with different work cultures and ethics.

Thematic evolution analysis is a method for identifying connections among various evolutionary paths and trends over time[36]. The thematic analysis is important for giving an overview of the primary themes for future research, outlining the fundamental trajectory of the various scopes that have been covered[37]. A thematic progression map was created by clustering the networks of authors' keywords (Figure 4). In this diagram, each node represents a specific topic, with the size of the node reflecting the number of keywords associated with that theme. The flow between nodes indicates the evolutionary direction of the research theme, while adjacent themes are connected to illustrate temporal continuity. Visual attributes of the lines, such as width and colour, convey different aspects: line width typically indicates the number of shared keywords, with thicker lines signifying greater relevance between themes, and colour helps to differentiate among the various research themes.

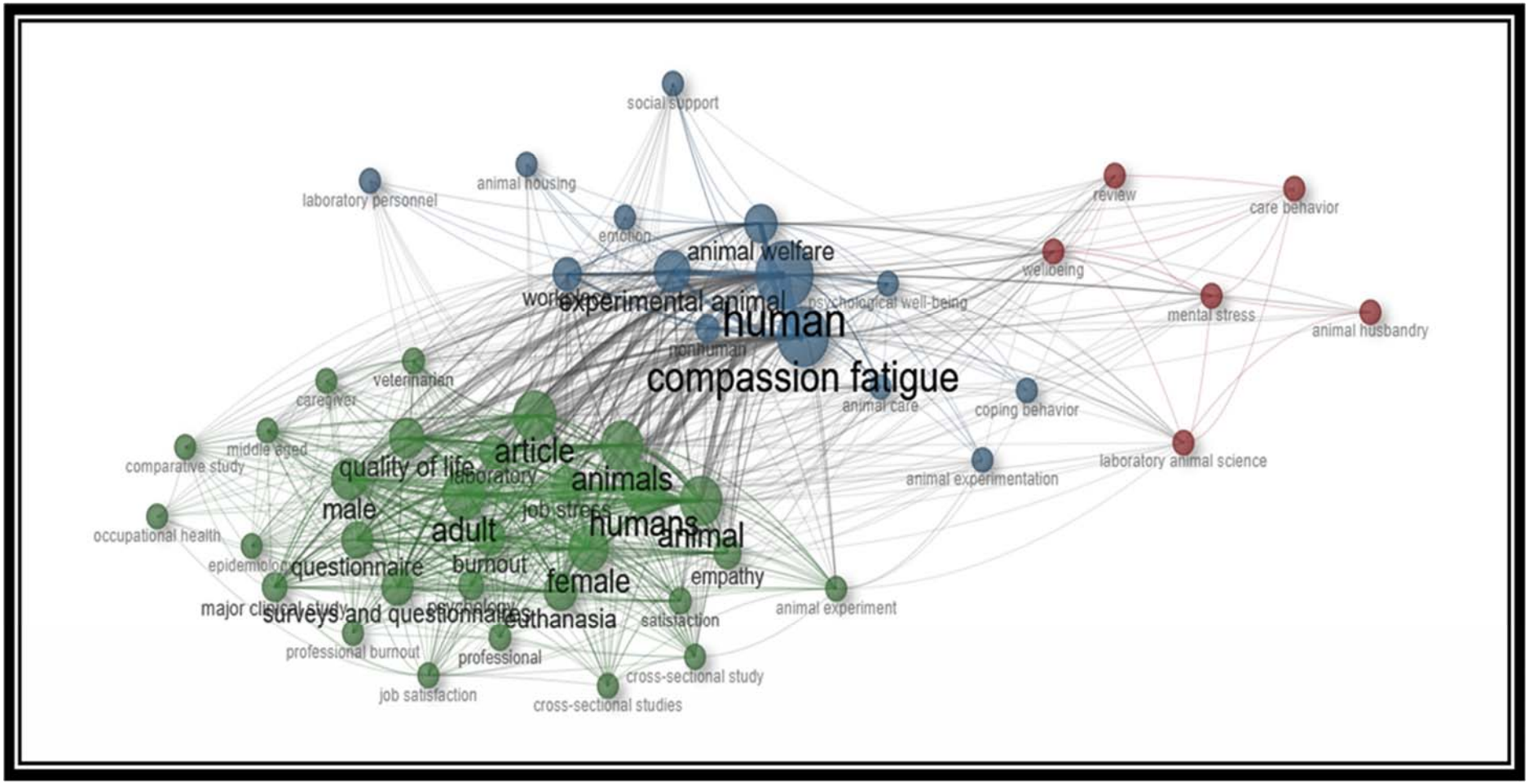

Figure 4: A thematic map based on authors' keywords in network visualisation mode for compassion fatigue in research animal personnel shows clusters in various colours. The lines indicate keyword co-occurrence, and the size of each node reflects the frequency of the keyword in published articles.

The word cloud also picked that questionnaire surveys are the predominant method used to estimate the prevalence of CF and to explore related risk factors Figure 3. This methodological choice highlights the importance of quantitative data in understanding the scope and impact of CF within these populations. The insights gained from these studies are crucial for institutions aiming to develop effective programs tailored for at-risk groups like technologists and veterinarians. To further advance this field, I propose that additional research focuses on the highlighted groups identified in the keyword analysis. Specific areas for future exploration could include qualitative studies that delve into the lived experiences of these professionals, as well as intervention-based research aimed at mitigating the effects of CF. Furthermore, longitudinal studies could provide valuable insights into the long-term impacts of CF and the effectiveness of implemented programs[38, 39]. By prioritizing these research avenues, institutions can better understand the dynamics of CF and develop targeted strategies that promote mental well-being among those who are essential to animal care and research.

3.5 Future directions and research needs

I envisage that this review will help guide future research directions, support policy changes, and improve the well-being of laboratory animal personnel particularly in the Global South.

Future qualitative studies can focus on narrative synthesis by summarising qualitative themes from different studies to provide a comprehensive understanding of CF in LAP. With more studies to analyse, thematic analysis could be used to code and interpret recurring themes identified in the word cloud and thematic map, allowing for a deeper exploration of the key issues affecting LAP. On the other hand, future quantitative studies should prioritize cluster analysis to group related concepts using statistical techniques, helping to identify patterns and relationships among key topics. Trend analysis will be essential for tracking changes of thematic importance over time, offering insights into the evolution of research on CF. Furthermore, network analysis should be utilized to visualize connections between keywords, authors, and articles, providing a structured overview of influential studies and emerging research trends in the field.

3.6 Limitation of the study

This study has limitations in that the data was collected from Scopus databases and only articles available in BibTeX format were analysed using the Bibliometrix R-package which could have caused the exclusion of studies indexed in other databases. The relatively small number of

publications analysed may not provide a conclusive trend on CF as trends could change over time as more research and publications emerge. The search strategy was limited to articles published in English only, excluding articles published in other languages, potentially skewing our findings to only trends from English speaking countries. I recommend that future bibliometric studies should include data from a broader range of sources including multiple languages to capture a global trend on CF in LAP.

4 Conclusion

CF and mental health issues among LAP is an emerging research topic that necessitates further research to gain a clearer understanding of this complex phenomenon. Longitudinal studies could provide insights into trends over time, while qualitative research could explore the experiences of LAPs in different contexts. This research can better inform interventions and support systems aimed at promoting mental health and well-being among laboratory animal personnel. Researchers in the Global South should make concerted efforts to investigate CF within their contexts, as understanding this phenomenon is crucial given the diverse cultural backgrounds of LAPs in these countries. Such research could yield valuable insights into the unique stressors and coping mechanisms that may be present in different cultural settings. Furthermore, comparative studies between the Global South and Global North could highlight distinct challenges and potential solutions, fostering a more inclusive understanding of CF. By prioritizing this area of research, institutions in the Global South can contribute to the global discourse on CF, ultimately improving the mental well-being of LAPs and promoting best practices that will ultimately result in production reliable results from animal experiments.

The findings from this review informs the following recommendations that can be implemented to prevent CF and burnout in LAP.

1. Culture of care

Laboratory animal institutions are encouraged to foster a culture that prioritises personnel well-being, empathy, and mutual support within the institution, creating a psychologically safe and inclusive environment. Senior management should encourage work-life balance, recognising staff contributions and efforts. They should encourage teamwork to further strengthen this culture which may ultimately result in the reduction of stress and burnout.

2. Training

Laboratory animal institutions should implement training programs (e.g., regular workshops) that equip LAP with practical resilience building techniques. The training should include but not limited to stress management strategies and mindfulness training. Line managers should be trained on how to recognise signs of CF and burnout and how to help individuals cope with the emotional demands of their work.

3. Mental health support

Laboratory animal institutions should establish accessible and confidential mental health support services tailored to the unique challenges faced by LAP.

4. Workplace interventions

Laboratory animal institutions should develop and enforce policies aimed at mitigating burnout and compassion fatigue such as workload management strategies, scheduled debriefing sessions after emotionally challenging procedures, and structured rotations to prevent prolonged exposure to distressing tasks.

5. Fostering an Interdisciplinary Approach

It is also recommended that laboratory animal institutions should foster interdisciplinary collaboration between LAP, psychologists, and animal ethics committee members to develop evidence-based interventions and policies that support both animal welfare and human well-being.

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6 Ethics statement

The study did not require ethical committee authorisation because it did not contain human or animal experiments.

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8 Conflict of Interest

The author declares no conflicts of interest.

9 Data availability statement

All data described in this article is available on request from John Chipangura (john.chipangura@up.ac.za)

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