International Journal of Health and Medicine
Volume 2, Nomor. 1 Tahun 2025
e-ISSN: 3047-793X, p-ISSN: 3047-7948, Page 117-125
DOI: https://doi.org/10.62951/ijhm.v2i1.216
Available online at: https://international.arikesi.or.id/index.php/IJHM

Artificial Intelligence -Based Apps to Manage Occupational Stress and Burnout: Scoping Review

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Abstract*. Stress and burnout among healthcare workers represent a global crisis with significant implications for psychological and physical health, job performance, and interpersonal skills. These conditions are linked to anxiety, depression, suicidal ideation, substance use, poor quality of life, digestive disorders, and cardiovascular diseases. Burnout is characterized by emotional fatigue, depersonalization, and reduced personal accomplishment, often caused by chronic workplace stress. Factors such as demographics, fatigue, and resilience influence its development and severity. Traditional stress management interventions, such as counselling and leave, often prove insufficient in addressing these challenges. Recent advancements in Artificial Intelligence (AI) provide innovative tools for stress and burnout management, including mobile applications offering mindfulness, meditation, and self-care resources. AI systems like IBM Watson and Google DeepMind are being tested to enhance accessibility and effectiveness in stress management. Additionally, Stress Inoculation Training (SIT), involving methods such as meditation, yoga, cognitive-behavioural therapy, and biofeedback, has been recognized as a proactive approach to mitigating stress. This review explores the factors contributing to stress and burnout in healthcare workers and evaluates interventions aimed at improving well-being and productivity, emphasizing the potential of AI and SIT in preventing and managing these conditions.*

Keywords *: burnout, stress, healthcare worker*

1. INTRODUCTION

The hhigh llevels of stress and burnout should be underlined by the need for intervention in managing the effects that have been shown to cause anxiety, depression, suicidal ideation, substance use, poor quality of life and digestive disorders and cardiovascular disease (John et al., 2022). Stress and burnout in healthcare workers are recognized as a global crisis that requires immediate attention, as it affects interpersonal skills, job performance, and psychological and physical health Stress is also high in fatigue associated with poor health outcomes for people who experience it (Afulani et al., 2021). Burnout is generally described as a syndrome consisting of several components, nnamely emotional burnout, depersonalization and reduce personal accomplishment (Mollart et al., 2013). Some of the development of burnout syndrome is influenced by many factors that can be analyzed to identify possible risk profiles(De La Fuente-Solana et al., 2019). Burnout syndrome is a psycho-social disorder that occurs due to exposure to chronic interpersonal stress at work and

Received:October 15,2024; Revised:November 18,2024; Accepted:December 14,2024; Online Available: December 16, 2024

has three elements; negative attitude towards the client, emotional exhaustion and low feelings of self-achievement(Konlan et al., 2022). In this review, we explored the factors that can affect stress and fatigue in workers, particularly in healthcare workers, and some types of interventions in professional support. Burnout has 3 elements of ongoing and common work stress that often occurs in the workplace, spending more time supporting others. Both in individual health workers and in sites contribute several factors to the work(Ghahramani et al., 2021). Some of the factors associated with fatigue, resilience, should be addressed with a focus on the respondents' demographics(Lee et al., 2023). This impact causes the condition of individual employees and organizational results to experience very severe mental and physical suffering. Some methods of managing stress are often not enough such as counseling and leave, Artificial Intelligence has recently emerged as an easily accessible health solution with several applications as a new way to manage stress as well as for proactive stress management and burnout prevention(Botha et al., 2024).

2. LITERATURE REVIEW

Working with algorithms and AI agents can be challenging for human employees, causing stress. However, these situations can also play a positive role in helping or facilitating human functioning, resulting in what we refer to in this article as harmless stress. Eustress can be defined as harmless, enjoyable, and exploitative stress caused by the use of algorithms and artificial intelligence agents in the workplace to assist human employees and facilitate their tasks. (Loureiro et al., 2023). Overall, work productivity and well-being are recognized as critical issues affecting occupational and burnout. The current goal for AI is to manage stress and burnout with accessibility, accessibility and experience using. Stress Inoculation Training (SIT) is similar to the Relapse Prevention method in addiction therapy, in that patients learn about stress, its nature, potential negative outcomes, and steps to avoid it. The approach based on the idea that people can learn to “inoculate” themselves against stress by preparing for stressful situations and developing positive coping responses (Donald., 2017). There are several types of SIT such as meditation, yoga, relaxation, progressive muscle relaxation, progressive, breathing exercises, breathing, cognitive behavioral therapy, music to reduce stress, certain meditations, biofeedback and stress relief (Mayo Clinic, 2014). AI systems such as IBM Watson and Google Deepmind are being tested in various healthcare services in several countries (Ploug & Holm, 2020). The Artificial Intelligence (AI) advances can now be made through mobile applications and are more accessible to a wider audience. Several mobile apps

can help healthcare workers deal with stress and burnout, by providing tools for mindfulness, meditation, self-care, and support.

3. METHODS

We conducted a comprehensive search of peer-reviewed articles and grey literature using databases such as PubMed, Web of Science, Scopus, and Google Scholar. Search terms include "AI stress management apps", "work burnout", "digital health interventions", "stress at work", and "burnout prevention". The search is limited to articles published in English from January 2013 to December 2023. The search was conducted comprehensively in several gray and peer-reviewed literature articles using databases such as Google Scholar, Scopus and PubMed. Searches include "burnout prevention, AI stress management apps, workplace stress, digital health interventions and work burnout. Disbursement of articles from January 2013 to June 2024. Inclusion Criteria: - Publication years January 2013 and July 2024. - Articles in English. - AI-based studies designed specifically for work stress and burnout. - Studies with quantitative data on the effectiveness of the application. - work stress and burnout. Exclusion Criteria: - Non-AI Intervention. - The study did not focus on work stress and burnout. - Articles with incomplete text - studies with qualitative data on the application.

Data extraction uses standard forms. The extracted data included title, year of publication, study author, study design, sample size, population characteristics, application details, AI components, measurable results, and key findings.

4. RESULTS

The study results indicate that the health and well-being. Quantitative data revealed suffer from chronic physical health conditions, such as hypertension and diabetes, while 45% exhibit symptoms of depression or anxiety. Their quality of life is rated as moderate to low, especially concerning mobility and access to healthcare services. Additionally, staff members feel undertrained in addressing the unique needs of the elderly population, leading to dissatisfaction among both detainees and staff in the care process. These findings highlight the need for developing more

A total of 11 studies were included in the review. In this study, there were several studies that varied including cross-sectional surveys and randomized controlled trials and cohort studies. There are several AI applications in valuation that combine several features such as relaxation techniques, stress monitoring, real-time feedback and personalized recommendations.

Table 1

No	Article tittle, year	N	Country	Study design	Burnout Measure	Measurable Results	**Apps**	**Recommendation for addressing burnout**
1	Human-centered AI for personalized workload management: A multimodal approach to preventing employee burnout. (Meduri et al., 2024)	320 Workers from various fields	USA	Quantitative surveys	The Job Demands-Resources (JD-R) model measures burnout	AI integration, combined with comprehensive training and feedback has been shown to reduce burnout rates.	An AI tool that provides feedback and without specifying a specific application.	A comprehensive approach by combining comprehensive training, personalized attention, and continuous feedback
2	Working with AI: can stress bring happiness? (Loureiro et al., 2023)	200 employees	Portugal	A mixed method that combines quantitative surveys and qualitative interviews	The study used stress theory to examine the impact of stress on employee happiness as well as its indirect influence on employee engagement.	AI in the workplace can cause stress but motivates employees, playing an important role in mediating these relationships.	application of AI algorithms and agents used in the service industry.	Increase employee engagement by offering effective support in managing stress
4.	Burnout PRedictiOn Using Wearable and Artificial Intelligence (BROWNIE) study. (Wilton et al., 2024)	360 Nurses		online surveys	Occupational burnout.	Predictive models of occupational burnout and estimation of burnout-associated costs	Consumer-grade smartwatches (e.g., Apple Watch, Fitbit)	Early warning signs detection, preemptive institutional responses, and engagement strategies to maintain compliance and reduce attrition
5	The right to refuse diagnostics and treatment planning by artificial intelligence. (Ploug & Holm, 2020)	not specify, theoretical analysis.	not focus on specific country	Argumentation and Theoretical analysis	Focuses on the ethical and legal aspects of AI in diagnostics and treatment planning	advocate for patients to have the right to refuse AI diagnostics and treatment planning due to concerns about the doctor's lack of clarity and personal worth.	Not applicable	advocate for patients to have the right to opt out of AI diagnostics and treatment planning, arguing that these rights should be protected by regulations
6	The AI Yoga Trainer Using Artificial	No	India	Development and evaluation of an AI-	Focuses on the AI yoga trainer system	Classification accuracy of about 95% to identify and	Not specifying a specific applicati	AI-based yoga trainers can enhance the accuracy of yoga poses, prevent injuries, and

	Intelligence and Machine Learning. (Balakrishnan, 2023)			based system		correct yoga poses	on, but developing a prototype of an AI yoga trainer system	enhance the benefits of yoga practice.
7	The Burnout PRedictiOn Using Wearable and Artificial Intelligence (BROWNIE) study: a decentralized digital health protocol to predict burnout in registered nurses. (Wilton et al., 2024)	360 Nurses. 3 cohorts (training, testing, and validation data sets)	Not Specified	Decentralized, asynchronous digital health protocol to collect daily data from smartwatches, conduct surveys, and collect administrative data on nursing care outcomes.	Occupational burnout predictive models	Predictive models of occupational fatigue and fatigue cost estimation	smartwatches (e.g., Apple Watch, Fitbit)	Warning of early signs of burnout
8	Artificial Intelligent Tools: Evidence-Mapping on the Perceived Positive Effects on Patient-Care and Confidentiality. (Botha et al., 2024)	95 articles	Not specified	Comprehensive literature review (multiple databases (Nature, PubMed, Scopus, ScienceDirect, etc.)	Not applicable	AI can improve the accuracy of clinical diagnosis.	Not specified (general AI healthcare)	Public health practitioners, and healthcare managers to develop AI applications that consider the socio-cultural dimension in patient care
9	The role of artificial intelligence in healthcare: a structured literature review. (Secinaro et al., 2021)	288 articles	United States, China, and the United Kingdom	Qualitative and Quantitative, literature review search of Scopus database	Not applicable	Focus on healthcare management	Not specified (AI healthcare)	Researchers can understand and address the future of AI in healthcare
10	Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing	Not Specified	75 peer-reviewed articles	Systematic literature review	Not applicable	Evaluate the Quality of AI techniques including machine learning to effectively diagnose various diseases	Not specified (AI in healthcare)	Focus on future AI improvements used to diagnose

	framework and future research agenda. (Kumar et al., 2023)							
11	Revolutionizing healthcare: the role of artificial intelligence in clinical practice help me about (Salam & Abhinesh, 2024)	Not specified	Not specified	Comprehensive literature review	Not applicable (focus on AI diagnose)	AI improves disease diagnosis, treatment selection, and clinical laboratory testing, reducing costs, time, and errors, revolutionizing personalized medicine, population health management, and patient education.	Not specified (AI in healthcare)	Ensuring the effective application of AI according to human needs in health care

Studies show that AI-based applications reduce burnout, stress, and mental well-being, with personalized AI interventions being highly effective in providing timely support and increasing user engagement through real-time feedback, making them a valuable tool for mental health improvement. The success of the intervention is influenced by accessibility, usability, user-friendliness, as well as routine restrictions, but wider adoption is needed for privacy and digital literacy considerations, as the researchers show

AI applications reveal that Reviews, effectively managing work stress and burnout, contribute to a healthier work environment and better employee well-being and offer cost-effective solutions to scaled individual needs and ongoing support in traditional workplaces. Rigorous evaluation methods, user engagement, and AI-based data privacy are the challenges of this application. Continuous research requires long-term impact and standard evaluation for ethical use and Trust and ethics are essential.

To evaluate the impact of AI-based applications on work stress and burnout should focus on large-scale and integrity studies in exploring their long-term effectiveness and ensuring cost-effectiveness is the focus of future research.

Discussion

This article discusses the growing and occurring burnout and stress problems among healthcare workers, especially midwives. The potential of AI and Stress Inoculation Training to manage these conditions. Copenhagen fatigue is a useful tool in assessing fatigue. However,

the effectiveness of SIT and AI varies widely across settings, demonstrating the need for a culturally adaptive approach.

5. CONCLUSION AND LIMITATION

Conclusion

Data privacy needs to be addressed for long-term success and evaluation methods. Future research should focus on incorporating AI in workplace strategies. But AI-based apps offer several innovative tools for managing work stress and burnout, reducing stress, improving user engagement, and improving mental well-being.

Limitation

Applications of AI for fatigue and stress management, but it does not cover all technologies and also discusses generalizations, short-term vs long-term effects, limitations of diversity and sample size of publication bias, and the complexity of interventions and potential bias towards positive findings and the need to consider the broader technology and its impact for future reviews.

Future

AI applications in stress and burnout management, conducting long-term studies to evaluate their effectiveness. It also explores cultural and regional adaptations, examining their effectiveness across diverse healthcare settings. The study also explores integrative approaches, focusing on user experience and accessibility. It also investigates the impact of policy changes and institutional support on stress management program effectiveness.

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