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Systematic Review

The Role of Artificial Intelligence in Improving Workplace Well-Being: A Systematic Review

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Abstract: In recent years, the use of artificial intelligence (AI) has significantly increased in the field of workplace well-being. This study systematically reviews the most common applications of AI in this context, covering literature published between 2018 and 2023, and evaluates both its current and potential impact. The research involved a comprehensive search in the Scopus and Web of Science databases, following PRISMA guidelines, resulting in 31 articles that met the inclusion criteria. The qualitative synthesis reveals that AI is being utilized in areas such as mental health monitoring, emotional support, personalized well-being programs, identification of psychosocial risk factors, and training and development. This review contributes to the existing literature by offering a detailed categorization of AI applications in workplace well-being, and it highlights the practical utility of AI in enhancing employee mental health and overall well-being. The findings suggest that AI has the potential to revolutionize the management of workplace well-being, providing actionable insights for both researchers and practitioners. Recommendations for future research are also discussed.

Keywords: artificial intelligence; workplace well-being; AI applications; mental health at work; systematic review

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1. Introduction

We as a society are suffering from an attack of economic pessimism. These are not our words, but those of JM Keynes in 1928 [1]. However, the current context should neither lead to optimism nor pessimism, but rather to realism and an effort to make the most of the technologies we have at our disposal, such as artificial intelligence (AI). AI is a field of computer science that seeks to develop algorithms and techniques that allow machines to perform tasks that typically require human intelligence, such as learning, reasoning, and understanding. It has been described as "the ability of machines to perform tasks that exhibit human-like intelligent behavior" [2]. It has roots in seemingly distant disciplines such as philosophy, mathematics, computer science, psychology, and neuroscience [3]. Since the seminal studies of the mid-20th century [4,5], a vast scientific literature on artificial intelligence and neural networks has emerged, with significant milestones [6–10].

AI exerts a substantial influence on society, presenting both opportunities and challenges. Its effects have been described as potentially 'a curse or a blessing', depending on its application and management [11]. Its role in the future is both fascinating and concerning [12]. On the one hand, AI technology has a favorable impact on employment and productivity [13]; for instance, the use of AI in sectors such as manufacturing is an established trend [14]. In fact, it can improve efficiency in many fields, such as healthcare, where AI is used in a variety of applications, such as disease diagnosis, treatment planning, and patient monitoring. AI algorithms are being developed that can analyze medical

images, such as X-rays and CT scans, to help doctors detect diseases early. Managers in this field must begin preparing their workforce to collaborate with AI systems and adjust the job design of each healthcare professional [15].

However, despite these advances, significant challenges remain, such as the privacy and security of patient data and the need to ensure that AI is used ethically and responsibly [16]. The academic literature has reported on various AI-related issues, including algorithmic bias [17], vulnerability [18], malicious use, security-related problems [19,20], potential job loss [21] and associated ethical concerns [22]. As noted by Harvard Business Review [23]: "The question is not whether AI will be good enough to take on more cognitive tasks, but rather how we will adapt".

It is difficult to predict with certainty which human jobs will be most impacted by automation and the adoption of artificial intelligence, as this depends on many factors such as industry, economy, and government policies. However, in general, jobs that involve repetitive tasks are expected to be the most affected. Some examples of these jobs include low-level tasks in the service sector, such as customer service and data processing; production jobs in the manufacturing industry, such as operating machines and working on the production line; and jobs in the financial sector, such as accounting and processing banking transactions. Automating work can create problems of unemployment and lower wages, particularly among service-related professions, as machines can replace workers in certain tasks that previously required human intervention, such as generating content, answering frequently asked questions, generating automated responses in chatbots, or automated text production in areas such as journalism or advertising [24]. Therefore, it could reduce the need for employees to perform these tasks and could lead to greater economic inequality, as people with limited skills and education may have more difficulty finding employment. In fact, this situation is not new: automation has significantly contributed to the increase in wage disparity in the United States over the last 40 years [25].

However, it could also enable employees to focus on more valuable and creative tasks, working alongside AI in what is known as "hybrid intelligence" [26]. Extensive research has been conducted on human co-creation with AI in various fields, such as music, video games, design ideation, and sketching [27]. It could even contribute to boosting employment in service industries, as in this sector, AI cannot completely replace labor tasks that require emotional traits [28], to the extent that jobs that require emotional intelligence, such as responding appropriately or reacting to the feelings of customers or employees, may have a better future [29].

The need for studies on the future of work has already been emphasized [30], but very little is known about how employees view these technological developments in relation to their own jobs and careers or how they are preparing for these possible changes. Few academic studies of this kind were available prior to the disruptive public emergence of ChatGPT in December 2022. However, it is a topic of the highest social relevance, as demonstrated by the significant attention it has received in the international press since then [23,31–36].

Although new, emerging, and innovative technologies offer numerous advantages in the workplace, it is crucial to consider the potential consequences of displacement or unemployment for workers, regardless of their skill level, occupation, or industry. These consequences can have significant implications for worker safety and health, so appropriate measures should be taken to address such situations [37]. Organizational health is a continuous process that results from the interconnections between multiple factors [38]. Academics have proposed conceptual models of healthy organizations for years [39,40]. More recently, Grawitch et al. [41] identified five key practices for a healthy work environment (work-life balance, employee growth and development, health and safety, employee participation, and recognition), and Keller and Price [42] classified nine elements that contribute to organizational health: responsibility, capabilities, coordination and control, culture and climate, direction, external orientation, innovation and learning, leadership, and motivation.

The empirical definition of healthy organizations generally focuses on the psychosocial health of employees, without considering the factors that could cause or maintain this health [43]. Employees tend to experience lower levels of stress and higher levels of well-being when working in units that have a positive organizational climate characterized by safety, customer service, fairness, interpersonal treatment, control, support, and efficacy [44]. Particularly important is for companies to give meaning to their employees' work and to leverage all available technologies, such as AI, so that the well-being and health of their employees in the workplace reach the highest standards. It is important to emphasize that in this study, 'well-being' is understood as a comprehensive concept that includes an individual's overall health, happiness, and life satisfaction, encompassing both physical and mental aspects. 'Mental well-being', a subset of overall well-being, specifically refers to an individual's emotional, psychological, and social health, which are critical for effective functioning and coping with life's challenges. It is important to note that while the terms 'well-being' and 'wellness' are often used interchangeably in the literature, they are not strict synonyms. 'Wellness' generally refers to the active pursuit of health through lifestyle choices and behaviors aimed at achieving optimal health, whereas 'well-being' is a broader term that reflects a more holistic view of health and quality of life.

Academia has specifically focused on the impact of this new technology on human resource processes [45,46]. Some evaluations have been conducted on the impact of artificial intelligence on workplace outcomes [47–49]. However, little research has been done on how the use of artificial intelligence affects workers' experiences [50], and the success rates of AI system implementation are partly hindered by technology-focused strategies that ignore labor behaviors [51].

The purpose of this study is to provide an overview of the most common applications of AI in this environment and to evaluate their present and potential impact, based on a systematic review of academic literature. This includes categorizing the most relevant experiences up to this crucial moment, which can undoubtedly be classified as a turning point. Pishgar et al. [52], in their 2021 study, reviewed artificial intelligence and its applications in occupational safety and health, but the rapid evolution of technology necessitates, in our opinion, an updated review that includes new categories.

The innovative aspects of this review are manifold. Firstly, it addresses a gap by focusing on the psychological impacts of AI integration in the workplace. Secondly, it includes emerging AI technologies, such as large language models, and their potential impact on workplace dynamics, which have not been extensively covered in previous reviews. Another innovative feature is the comprehensive categorization of AI applications in workplace well-being, including mental health monitoring, emotional counseling and support, personalized wellness programs, risk factor identification, and training and development. This approach provides a more structured and comprehensive view of how AI is transforming various aspects of workplace well-being. Moreover, this review examines both the potential benefits and ethical concerns associated with AI implementation in workplace wellbeing programs, providing a balanced perspective on this rapidly evolving field. This holistic approach is crucial for fully understanding the implications of AI integration in work environments. Finally, the proposal of specific hypotheses and objectives allows for a more structured evaluation of AI's impact on workplace well-being compared to previous, more general reviews. This rigorous methodological approach helps generate more precise and actionable insights.

To address these gaps in the literature, this study posits the following hypotheses:

Hypothesis 1 (H1). *Artificial intelligence (AI) applications in workplace settings significantly improve employee mental health and overall well-being.*

Hypothesis 2 (H2). *The implementation of AI-driven personalized wellness programs reduces the incidence of work-related stress and enhances job satisfaction.*

Hypothesis 3 (H3). *AI systems used for monitoring mental health can predict and mitigate risks more effectively than traditional methods.*

The first hypothesis, suggesting that AI applications can significantly enhance employee mental well-being, is supported by research showing the effectiveness of AI in monitoring mental health and providing real-time feedback, which contributes to improved well-being. The second hypothesis, which proposes that AI can improve workplace productivity by automating routine tasks, is also well-supported. Research highlights AI's ability to enhance productivity through targeted interventions and advanced training programs. The third hypothesis, positing that AI can be instrumental in identifying workplace risk factors that may negatively impact employee health, is strongly backed by studies demonstrating AI's role in assessing and mitigating workplace risks, ultimately contributing to better health and safety outcomes.

The primary objectives of this study are:

- Objective 1: To provide a comprehensive overview of the most prevalent applications of AI in enhancing workplace well-being.
- Objective 2: To evaluate the current and potential impacts of AI on mental health management and workplace wellness.
- Objective 3: To identify and categorize the key areas where AI can offer substantial benefits in the context of employee well-being, including mental health monitoring, personalized wellness programs, emotional support, and training and development.

By systematically reviewing the existing academic literature, this study aims to elucidate the transformative potential of AI in promoting a healthier, more supportive work environment and to propose directions for future research in this burgeoning field.

The work is structured as follows: identification of a relevant research problem (Section 1: Introduction), explanation of the qualitative methodology used (Section 2: Materials and Methods), presentation and discussion of results (Section 3: Results), and finally, conclusions and implications of the findings (Section 4: Conclusions). The authors' original contributions are primarily presented in Sections 3 and 4. In Section 3, the findings are classified into different thematic areas based on the authors' analysis of the reviewed literature, providing a comprehensive categorization of AI applications in workplace well-being. Section 4 discusses the implications of these findings, offering new insights and practical recommendations derived from the study, highlighting the innovative aspects and ethical considerations of AI integration in workplace well-being programs.

2. Materials and Methods

The presented research follows a systematic review, which is a rigorous and structured approach to synthesizing knowledge on a specific topic. The aim is to provide a transparent and traceable process that enhances the quality and reliability of the results. [53].

This section plays a crucial role in establishing the methodological foundation of this study. It details the systematic review process, which is essential for ensuring the rigor and transparency of the research. This section directly supports the research objectives and hypotheses by systematically identifying, selecting, and analyzing relevant studies. The methodology outlined provides the necessary framework for the qualitative synthesis presented in the subsequent sections, ensuring that the study's findings are robust and aligned with the stated research goals. Furthermore, the fulfillment of the proposed hypotheses and objectives is treated separately in Section 3, where the results are discussed in detail.

A qualitative synthesis was conducted for this review because the studies included were diverse in their methodologies, outcomes, and contexts, making it challenging to perform a quantitative analysis or meta-analysis. The primary objective of this study was to provide a comprehensive overview of the different applications of AI in workplace well-being, rather than to quantify specific outcomes. The heterogeneity of the included studies, including variations in study designs, sample sizes, and measured outcomes, necessitated

a qualitative approach to effectively synthesize and interpret the findings. This method allowed for a more nuanced understanding of how AI is being utilized across different workplace settings and provided a broader perspective on its potential impact.

To conduct this systematic review, the researchers followed the protocol Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [54]. Recently updated [55], this protocol establishes criteria for high-quality scientific publications. The PRISMA methodology was chosen for this study due to its widespread acceptance and rigorous standards in conducting systematic reviews. PRISMA is particularly well-suited for ensuring transparency, reproducibility, and completeness in the reporting of systematic reviews, making it an ideal framework for synthesizing the diverse literature on AI applications in workplace well-being. While other methodologies, such as the Cochrane Handbook for Systematic Reviews of Interventions or the Joanna Briggs Institute Reviewer's Manual, also offer robust frameworks, PRISMA was selected for its specific emphasis on reporting standards, which aligns with the goals of this review. The use of PRISMA ensures that the review process is thoroughly documented and adheres to best practices, thereby enhancing the credibility and reliability of the findings.

The researchers followed a five-stage process: identifying relevant studies, selecting studies, mapping data, synthesizing, and presenting results. As established, the investigation was characterized by transparency and clarity of purpose [56,57]. The systematic review protocol was not registered due to the exploratory nature of the study, which aimed to provide a comprehensive overview of AI applications in workplace well-being without being restricted by a predefined framework. The flexibility allowed the research team to adapt the review process as new insights emerged, ensuring that the review captured the most relevant and recent developments in the field. While registering a protocol is a valuable practice for certain types of systematic reviews, in this case, the open-ended approach was deemed more appropriate to achieve the study's objectives.

The inclusion and exclusion criteria were specified and documented. This study considered only research studies published in conferences, scientific journals, books, and book chapters. Official literature and state reports were not included since the study was designed to identify and analyze proposals based solely on scientific studies. A comprehensive search was conducted in the Scopus and Web of Science databases in March 2023. The decision to limit the search to these two databases was based on their high indexing standards and the breadth of the literature they cover. However, recognizing the potential for additional valuable studies in other databases, future research could benefit from a broader search strategy that includes these and other relevant sources. The search strategy was adapted for each database included. For example, the final search equation used in Scopus was: ("artificial intelligence" or AI) and workplace and (well-being or "health promotion").

The literature search yielded 116 investigations, with 47 studies retrieved from the Scopus database and 69 studies sourced from Web of Science (WOS). The information specialist in the study team exported the results to Zotero and removed duplicates, retaining 88 articles. After a pilot test, titles and abstracts were evaluated by two researchers to determine their fit for the study's purpose in terms of scope, selecting those with broadly generalizable contributions. The researchers retained 49 articles: 43 of them were recovered. The same reviewers carefully evaluated the full text of the selected citations. Decisions were made based on their fit with the objective of the study. After this critical review, 12 articles were discarded as a result of the full text review, resulting in 31 articles being included in the qualitative synthesis.

A PRISMA flow diagram is presented (Figure 1), illustrating the inclusion process and decision-making in the review.

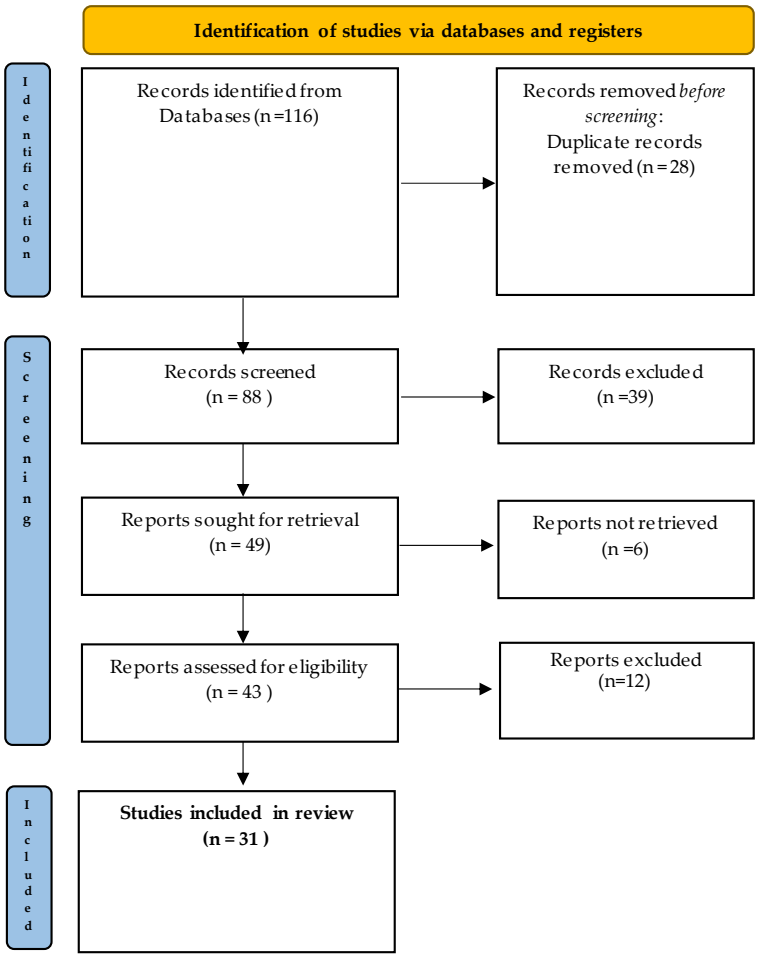

Figure 1. PRISMA Flow Diagram. Source: Created by the authors based on the systematic review process described in Section 2.

In summary, the diagram illustrates the steps of identification, screening, eligibility, and inclusion of studies. Initially, a total of 116 records were identified through database searching. After removing duplicates, 88 records were screened based on their titles and abstracts. This was followed by a full-text assessment of 43 articles to determine their eligibility, ultimately resulting in the inclusion of 31 studies in the qualitative synthesis.

Data extraction and synthesis were performed for each of the included studies. Reviewers combined this information into Appendix A, which included the following extraction fields: journal or book, year, title, authors, keywords, and main contribution. To ensure that the data extraction method was congruent with the research question and objectives, the researchers independently extracted data from the first 10 studies and then combined them. A customized checklist was used to evaluate potential biases in study design, data collection, and analysis. The assessment of bias was conducted independently by two reviewers for each study to ensure objectivity and reliability in the evaluation process. Each study was evaluated by at least two reviewers working independently, and any discrepancies in their assessments were resolved through discussion or by consulting a third reviewer. This approach ensured that the evaluations were consistent and unbiased.

3. Presentation and Discussion of the Results

In this section, the results are classified into different cases based on key thematic areas that emerged from the systematic review. These thematic areas include mental health monitoring, emotional counseling and support, personalized wellness programs, risk factor identification, and training and development. Each case represents a distinct application of AI in workplace well-being, and the studies have been categorized according to the

primary focus of the AI application, the specific outcomes being measured, and the type of intervention or technology utilized. This structured approach provides a comprehensive overview of the diverse ways in which AI is being leveraged to enhance employee well-being, allowing for a clearer understanding of the varied impacts of AI across different aspects of workplace well-being.

The findings were structured and classified based on the similarity of their meaning, identifying a set of categories representing the aggregate. The results are presented in narrative style where textual grouping was not feasible. In this synthesis, only conclusive and reliable findings were used.

3.1. Mental Health Monitoring

There is a growing incidence of mental health issues among individuals who apply for sickness benefits, with more than 40% of these claims citing a mental or behavioral disorder as the primary cause [58]. AI can be used to monitor and analyze real-time data related to employees' mental health, though it is also important to highlight the line manager's role in mental well-being [59]. This may include measuring mood, stress levels, and fatigue to provide feedback and recommendations for personal care.

To carry out this analysis, Izumi et al. [60] propose a machine learning algorithm to estimate stress, well-being, and degree of depression using vital data collected from sensing devices such as a camera, microphone, and wearable device. The technique proposed would evaluate the digital phenotype related to stress and well-being of white-collar workers over a 4-week period using persistently obtainable biomarkers such as heart rate, acoustic characteristics, body motion, and electrodermal activity. Otherwise, artificial intelligence and machine learning techniques, such as linear regression, multiple linear regression, decision tree, random forest, neural network, and convolutional neural network, can be used to forecast an employee's mental health state during a stressful period. These techniques can decipher graphic patterns and create visualizations to analyze various fitness parameters of individuals both in the present and over time.

There are other procedures of great interest in this regard. Tania et al. [61] explore the utilization of AI-powered tools such as sentiment analysis to gain deeper insights into people's discussions and feelings regarding specific health topics or conditions, with a focus on work-related mental health issues in real-time. The study presents a hypothetical data map illustrating how publicly accessible fragmented data can uncover an employee's "digital" mental health status.

These examples suggest that AI can play a role in monitoring and predicting mental health states in employees [62]. However, excessive use of such applications raises ethical concerns about employee monitoring, such as voice recording and location tracking, and can violate employee privacy. Additionally, behavior monitoring can increase stress on workers, create a climate of mistrust, and paradoxically pose risks to mental health [63], as the psychological impacts of AI implementation in workplaces are largely unknown [64]. Through the CDC/NIOSH's Total Worker Health program and associated partnerships, ongoing research and workplace initiatives are being conducted to support workers experiencing increased integration of technology in their jobs, addressing the psychological and behavioral challenges they face due to job displacement caused by technology [37].

3.2. Emotional Counseling and Support

AI can provide emotional counseling and support to employees who need help coping with stressful situations. Chatbots and messaging applications that use artificial intelligence can be utilized to provide emotional support and counseling to employees. According to Broughman and Haar [65], being aware of STARA (Smart Technology, Artificial Intelligence, Robotics, and Algorithms) has a negative impact on job outcomes and well-being, especially for younger employees. This underscores the importance of providing emotional counseling and support to employees who may be having difficulty coping with the changes brought about by technological progress. Loureiro et al. (2023) [66] examine the impact

of benign stress on employee happiness and engagement, and how employees who can handle mental or emotional pressure by working with and engaging with AI are more likely to be happy and intend to continue working in that firm.

3.3. Personalized Wellness Programs

AI can be used to create personalized wellness programs for employees based on their individual needs. Mobile applications and wearables monitor and manage health data, including mental health, in a personalized and seamless manner that can be used to develop effective health programs at work, including ergonomic recommendations and risk prevention of work-related injuries [67]. Some wellness programs implement corporate wellness self-tracking technologies (CWST) [58]. Makridis et al. [68] discuss using machine learning to predict veterans' physical health and well-being based on demographic, socio-economic, and geographic characteristics. Their article explores the possibilities of personalized recommendations and feedback to encourage people to adopt preventative behaviors, resulting in significantly reduced healthcare costs and adverse events in the future. These suggestions can be grounded in predictive models for subjective well-being and health outcomes.

Anan et al. [69] discuss the use of mobile health and eHealth in health promotion activities, as well as their effectiveness in improving health literacy and health management among workers. Their study evaluated the effectiveness of an AI-assisted health program in relieving musculoskeletal symptoms in workers. The program uses a chatbot to send users messages with exercise instructions and personalized tips, resulting in significant improvements in symptoms of neck pain, shoulder pain, and low back pain after 12 weeks.

It is important at this point to consider the role that doctors will play in this new scenario and their opinion on the matter. According to Trenerry et al. [70], medical physicians have been found to be both skeptical and optimistic about new digital technologies such as AI. They were not overly concerned about their jobs becoming obsolete and were doubtful about the potential of technology to outperform humans and replace human clinicians in the delivery of care. However, physicians did believe that new technologies would change their professions, and they were optimistic about technology's potential as a diagnostic tool, as well as its ability to improve healthcare delivery and relieve administrative burdens.

3.4. Risk Factor Identification

AI can be used to identify workplace risk factors that may negatively impact employees' mental health and well-being. For example, AI has shown progress in identifying risk factors for lung cancer, pulmonary tuberculosis, diabetic retinopathy, skin cancer, and cardiovascular disease [71]. There are mobile applications for managing medical information that can be used to monitor the physiological performance of workers and detect work situations that might negatively impact their health, such as hypertension [67]. It is also possible to predict occupational accident outcomes based on national data using machine learning (ML) methods coupled with several resampling strategies [72], and Raliile and Haupt's findings [73] suggest that machine learning can be used to monitor compliance and identify anomalies in legislative requirements.

Lorenzini et al. [74] discuss the use of human monitoring hardware and systems to assess ergonomics in industrial environments. They highlight the importance of noninvasive, accurate, and lightweight devices for measuring body kinetics and physiological indicators. The challenges faced by existing technologies, such as motion capture systems and wearable biosensors, are also explored to optimize worker safety and wellbeing. The identification of risk factors also includes recognizing stressful work situations or patterns of behavior that can be harmful to mental health.

Jindo et al. [75] discuss the utilization of AI technology that employs motion detection and video analysis to provide an objective assessment of changes in the usage of workstations and spaces in renovated offices, by using the Darknet framework of deep neural networks. Posture-sensing chairs that continuously monitor physical states or methods

for estimating quality of life (QoL) using wearable sensors—which have already achieved an accuracy of around 90% in estimating QoL with only nine questions—have been highlighted by Arakawa [76]. Gómez-Carmona et al. [77] discuss how technology can be used to monitor human factors and provide context-aware guidance. Gorovei [78] explains how the use of wearables and sensors is a way to obtain information related to users' health and recognize unhealthy behaviors or habits. In this sense, the IoT can provide a continuous stream of data that can be used to monitor and improve employee wellness, and health in the workplace. IoT devices can monitor various aspects of employee wellness such as activity levels, sleep patterns, and stress levels. These data can provide insight into how these factors affect employee health and well-being and enable the development of personalized wellness programs for employees. Additionally, this information can help identify potential risk factors that may impact employee health.

Fukumura et al. (2021) [79] highlight the need for a multifaceted approach to support worker health and well-being when incorporating AI systems into office workspaces. Their research emphasizes the importance of designing AI systems that are acceptable to end users, can support worker health and productivity, and do not interrupt job performance. The article also suggests that data transparency and confidentiality, practical and concise communication, and user control over the system are essential for increasing the acceptability of AI in office settings. Regular monitoring and analysis of employees' attitudes and opinions towards algorithmically-defined work are necessary to ensure that it does not limit job autonomy and a sense of meaningful work (Kinowska and Sienkiewicz, 2020) [80].

3.5. Training and Development

Changing workplace behavior requires altering habits that people have developed in their workspaces over time. Smart technology positively affects employee well-being and learning performance. By using smart technologies, an organization can create an environment that not only helps employees improve their skill sets but also enhances their sense of security, acceptance, and well-being, thereby achieving these objectives [81]. Molan and Molan [82] reflect on the use of artificial intelligence to identify influential attributes of actual availability on workers' performance. The identified influencing factors serve as focal points for humanization interventions in a specific work environment.

AI can be used to help employees improve their skills and knowledge in the area of mental health and workplace well-being. This could include AI-based training and development programs that can provide employees with the necessary tools to maintain good mental health at work. Howard [71] reflects on the use of AI-enabled virtual reality training to create dynamic, immersive, and high-fidelity environments that simulate hazardous situations and enhance a worker's hazard recognition capabilities. Chang [59] emphasizes the responsibility of organizational leaders and senior executives to learn AI and understand how to use it. Similarly, Makridis and Han [83] suggest that structured management may help mediate the emergence of AI and automation. Xu et al. [84] discuss the mediating role of informal learning in the relationship between AI opportunity perception and workplace well-being. Their study proposes a theoretical model that includes AI opportunity perception, informal learning in the workplace, employee workplace well-being, and unemployment risk perception. Loureiro et al. [66] mention the importance of psychological support during implementation and adaptation to use and cooperate with AI algorithms and agents.

Ghislieri et al. [85] emphasize the significance of educators, policymakers, and career practitioners in preventing skill obsolescence and promoting the continuous upgrading and development of skills that are essential for the current and future job market. Their article proposes systematic monitoring of both hard and soft skills at the end of university courses to assess their efficacy in the workplace and to align with the expectations of companies. Mendoza-Valencia [86] underscores that the educational programs in high schools and universities can be tailored to align with intelligent manufacturing trends, ensuring that resources invested in education produce skilled workers, engineers, and entrepreneurs

who can become leaders in the industrial sector. Finally, Pishgar et al. [52] suggest that a comprehensive review of existing AI curricula in academia and the training and skills needs among Occupational Safety and Health (OSH) professionals in the industry may provide a better understanding of future AI capacity needs for OSH researchers and practitioners. Their manuscript also proposes that OSH researchers and practitioners advocate for a long-term strategy in partnership with the government, AI experts, and the industry to protect the health, safety, and well-being of all workers.

3.6. Discussion of Results in Relation to Research Objectives

In this Results section, the findings are now explicitly connected to the research objectives outlined in the Introduction. Each objective is addressed in relation to the corresponding results, providing a clear and structured analysis of how the data supports or challenges the initial hypotheses and goals of the study.

To provide a clear and structured view of how our findings address the hypotheses and objectives set forth in this study, the following table (Table 1) has been prepared. This table details the relationship between each hypothesis, the corresponding research objectives, and the main findings derived from our systematic literature review:

Table 1. Relation between hypotheses, objectives, and findings. Source: Created by the authors based on the reviewed literature.

Hypotheses	Objectives	Findings
Hypothesis 1 (H1): AI applications in workplace settings significantly improve employee mental health and overall well-being.	Objective 1: To provide a comprehensive overview of the most prevalent applications of AI in enhancing workplace well-being.	AI significantly improves mental health management by providing continuous, objective, and accurate monitoring. Studies by Izumi et al. (2021) [60] and Tania et al. (2022) [61] confirm this by demonstrating the effectiveness of AI in real-time stress and mood monitoring. Further, Howard (2019) [70] emphasizes the implications of AI for workplace mental health through decision support systems, while Selenko et al. (2022) [50] discuss the psychological impacts of AI integration. These findings collectively underscore AI's transformative potential in mental health monitoring, supporting H1 and Objective 1.
Hypothesis 2 (H2): The implementation of AI-driven personalized wellness programs reduces the incidence of work-related stress and enhances job satisfaction.	Objective 2: To evaluate the current and potential impacts of AI on mental health management and workplace wellness.	AI-driven personalized wellness programs reduce work-related stress and improve job satisfaction. Rodriguez et al. (2018) [66] and Anan et al. (2021) [68] highlight how mobile applications and wearables monitor and manage health data effectively. Loureiro et al. (2023) [82] demonstrate that AI can help employees handle stress better, leading to increased happiness and engagement. These studies validate H2 and Objective 2 by showing that personalized wellness programs tailored to individual needs can significantly enhance workplace well-being.
Hypothesis 3 (H3): AI systems used for monitoring mental health can predict and mitigate risks more effectively than traditional methods.	Objective 3: To identify and categorize the key areas where AI can offer substantial benefits in the context of employee well-being, including mental health monitoring, personalized wellness programs, emotional support, and training and development.	AI systems effectively identify and mitigate risks by monitoring compliance and identifying potential hazards. Studies by Koc et al. (2022) [71] and Raliile and Haupt (2020) [72] illustrate how AI predicts occupational accidents and monitors safety legislation compliance. Jindo et al. (2020) [74] and Fukumura et al. (2021) discuss the use of AI for ergonomic assessments and its impact on workplace safety. These findings support H3 and Objective 3, demonstrating AI's capability to enhance workplace safety and health through advanced risk identification and mitigation techniques.

The first research objective aimed to identify the key applications of AI in workplace well-being. The results indicate that AI is predominantly used in areas such as mental health monitoring, personalized well-being programs, and the identification of psychosocial risk factors. These findings are in line with previous studies that emphasize the growing importance of AI in enhancing employee well-being.

The second objective focused on assessing the impact of AI on employee mental health and overall well-being. The qualitative synthesis revealed mixed results, with some studies reporting significant improvements in employee well-being, while others highlighted potential challenges, such as increased stress due to surveillance technologies. This aligns with the dual nature of AI's impact, as discussed in the literature.

Finally, the third objective sought to explore the future directions of AI in workplace well-being. The analysis suggests several promising areas for future research, including the integration of AI with other emerging technologies and the development of ethical guidelines to manage AI's impact on workers. These findings provide a foundation for further exploration and contribute to the ongoing discussion about the role of AI in the workplace.

4. Conclusions

Based on the systematic review of academic literature on the use of AI in workplace well-being, the objectives of this study have been fulfilled. The study aimed to provide an overview of the most common applications of AI in this context and to evaluate its current and potential impact. The results show that AI can be used in various applications such as monitoring mental health, providing emotional counseling and support, personalized wellness programs, identification of psychosocial risk factors, and training and development. The study concludes that AI has the potential to revolutionize the management of mental health and workplace well-being, but ethical concerns regarding employee monitoring and privacy must be addressed.

One of the main conclusions of this study is that AI can be a powerful tool for monitoring and predicting employees' mental health states. Several studies suggest that AI can identify and monitor mental health risk factors and provide personalized recommendations and feedback to encourage individuals to adopt preventative behaviors. However, it is also essential to consider the potential psychological impacts of AI implementation in workplaces. The findings suggest that excessive use of such applications can increase stress on workers and create a climate of mistrust. Future research should focus on developing AI systems that are acceptable to end users, do not interrupt job performance, and can support worker health and productivity.

Another significant finding is that AI can be utilized to create personalized wellness programs for employees based on their individual needs. Wearables and mobile applications can monitor health data, including mental health, and be used to develop effective health programs at work. The use of AI in training and development programs can also provide employees with the necessary tools to maintain good mental health in the workplace. Future research should focus on developing more effective and personalized wellness programs that can enhance employee well-being and productivity.

Despite the promising potential of AI in workplace well-being, this study has some limitations. The search was restricted to the Scopus and Web of Science databases, which could have excluded relevant studies from other databases. Additionally, the review only included studies in English, which may have excluded research published in other languages. Moreover, the studies analyzed in this review are primarily cross-sectional and do not provide a comprehensive understanding of the long-term impact of AI on workplace well-being.

Future research should focus on addressing these concerns and evaluating the long-term impact of AI on employee well-being. One critical area is the need for longitudinal studies that examine the long-term effects of AI applications on employee well-being. Such studies could provide more comprehensive insights into the sustained impact of AI inter-

ventions and help identify any potential risks that may arise over time. Another promising direction for future research is the integration of AI with other emerging technologies, such as wearable devices and the Internet of Things (IoT). These technologies, when combined, could lead to more personalized and real-time monitoring of employee health, thereby improving the effectiveness of wellbeing interventions. Furthermore, there is an urgent need to explore the ethical implications of AI in the workplace, particularly in areas such as privacy, data security, and potential biases in AI algorithms. Developing ethical frameworks and guidelines will be essential as AI becomes more deeply integrated into workplace environments. Finally, cross-cultural studies are recommended to understand how AI applications in workplace well-being might vary across different cultural contexts. This could help in identifying best practices that are adaptable to a wide range of environments, ensuring that AI-driven solutions are effective globally.

The practical outcomes identified in this study offer valuable insights for organizations aiming to implement AI-driven solutions. For example, AI tools for mental health monitoring and personalized well-being programs have demonstrated considerable potential to positively influence employee outcomes. These findings provide actionable guidance for practitioners looking to leverage AI technologies to foster healthier and more productive workplace environments. Additionally, the study highlights the ethical considerations surrounding AI deployment, emphasizing the need for organizations to address challenges such as privacy, data security, and algorithmic bias to ensure that AI contributes positively to workplace well-being. The integration of these AI solutions can lead to enhanced employee satisfaction and reduced turnover rates, which are critical for maintaining a competitive edge in today's business environment. Moreover, businesses that effectively implement these technologies may see significant improvements in overall organizational efficiency and employee engagement, driving long-term success.

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Appendix A

Table A1. Summary of studies included in the qualitative synthesis. Source: Compiled by the authors based on data extracted from Scopus and WOS.

Item	Type	Year	Author	Title	Publication Title	Keywords	Main Issue
1 [67]	Conference	2018	Rodriguez, JM; Aso, S; Cavero, C; Quintero, AM; Ramos, I; Perez, M; Mediavilla, C; Rodriguez, B	Towards Digital and Personalized Healthcare and Well-Being Solutions for the Workplace	Workshop Proceedings of the 14th International Conference on Intelligent Environments	digital ergonomics; intelligent workplace; issues; m-health; p-health	Mobile application to manage medical information.
2 [77]	Conference	2018	Gomez-Carmona, O; Casado-Mansilla, D; Garcia-Zubia, J	Health Promotion in Office Environments: A Worker-Centric Approach Driven by the Internet of Things	University of Deusto	behavior; care; health promotion; impact; internet of things; interventions; management; occupational-health; office environments; participatory sensing; persuasive computing; user-centred design; workplace;	Use of IoT for health promotion in office environments with a worker-centric approach.
3 [85]	Article	2018	Ghislieri, C.; Molino, M.; Cortese, C.G.	Work and organizational psychology looks at the Fourth Industrial Revolution: How to support workers and organizations?	Frontiers in Psychology	fourth industrial revolution; industry 4.0; future of work; working conditions; human-robot interaction; artificial intelligence; future work skills; employment	Impact of the Fourth Industrial Revolution on Work and organizational psychology, with focus on the expansion of automation in the workplace and the changing requirements for knowledge and skills
4 [65]	Article	2018	Brougham, D.; Haar, J.	Smart Technology, Artificial Intelligence, Robotics and Algorithms (STARA): Employee perceptions of our future workplace	Journal of Management and Organization	career planning; change; technology; disruptive technology; employees	Study finds STARA (Smart Technology, Artificial Intelligence, Robotics, and Algorithms) awareness negatively impacts job outcomes and well-being, particularly for younger employees. Traditional career paths may need to be re-evaluated in light of technological change.

Table A1. *Cont.*

Item	Type	Year	Author	Title	Publication Title	Keywords	Main Issue
5 [71]	Article	2019	Howard, J.	Artificial intelligence: Implications for the future of work	American Journal of Industrial Medicine	artificial intelligence; decision support systems; machine learning; robotics; smart sensors	Implications of Artificial Intelligence (AI) on the workplace, including Job Dislocation and human-robot interaction
6 [76]	Article	2019	Arakawa, Y.	Sensing and changing human behavior for workplace wellness	Journal of Information Processing	sensing behavior; workplace; behavior change; wellness; office productivity; quality of life	Use of sensors and behavior change support systems to improve workplace wellness and productivity. It also emphasizes the importance of user-centered design
7 [37]	Article	2020	Tamers, SL; Streit, J; Pana-Cryan, R; Ray, T; Syron, L; Flynn, MA; Castillo, D; Roth, G; Geraci, C; Guerin, R; Schulte, P; Henn, S; Chang, CC; Felknor, S; Howard, J	Envisioning the future of work to safeguard the safety, health, and well-being of the workforce A perspective from the CDC's National Institute for Occupational Safety and Health	American Journal of Industrial Medicine	climate-change; corporate social-responsibility; employment; environment; future of work; job; life; occupational safety and health; paid sick leave; promotion; sexual-harassment; stress; total worker health; worker well-being	CDC/NIOSH Future of Work Initiative and its focus on occupational safety and health in the face of changing work arrangements and emerging technologies.
8 [59]	Article	2020	Chang, K	Artificial intelligence in personnel management: the development of APM model	Bottom Line	ai; artificial intelligence; career opportunity; job replacement; manager subordinate relationship; personnel management	Potential of AI in personnel management
9 [78]	Conference	2020	Gorovei, AA	Internet of Things and employee happiness in the digital era	Alexandru Ioan Cuza University	digital era; employee engagement; happiness; internet of things; job satisfaction	The potential of IoT to improve employee happiness and productivity in the workplace: advantages, disadvantages, and future applications.
10 [80]	Article	2020	Kinowska, H.; Sienkiewicz, Ł.J.	Influence of algorithmic management practices on workplace well-being—Evidence from European organizations	Information Technology and People	algorithmic management; workplace well-being; job autonomy; total rewards; human resources management	Impact of algorithmic management on workplace well-being, job autonomy, and total rewards practices.

Table A1. *Cont.*

Item	Type	Year	Author	Title	Publication Title	Keywords	Main Issue
11 [75]	Article	2020	Jindo, T.; Kai, Y.; Kitano, N.; Wakaba, K.; Makishima, M.; Takeda, K.; Iida, M.; Igarashi, K.; Arao, T.	Impact of activity-based work and height-adjustable desks on physical activity, sedentary behavior, and space utilization among office workers: A natural experiment	International Journal of Environmental Research and Public Health	office renovation; office layout; sit-stand desk; workplace health promotion; physical activity; sedentary behavior	Use of AI technology for motion detection and video analysis
12 [73]	Conference	2020	Raliile, M.T.; Haupt, T.C.	Machine learning applications for monitoring construction health and safety legislation and compliance	Proceedings of the International Society of Structural Engineering and Construction	construction industry; law; artificial intelligence; workers' well-being	Applications of unsupervised machine learning in monitoring health and safety legislation and compliance on construction sites.
13 [82]	Conference	2020	Molan, G.; Molan, M.	Sustainable level of human performance with regard to actual availability in different professions	Work	questionnaire of actual availability; well-being; artificial intelligence; machine learning; classification tree; ah-model	Use of artificial intelligence to identify influential attributes of actual availability on workers' performance
14 [68]	Article	2021	Makridis, CA; Zhao, DY; Bejan, CA; Alterovitz, G	Leveraging machine learning to characterize the role of socio-economic determinants on physical health and well-being among veterans	Computers in Biology and Medicine	health informatics; machine learning; social determinants; socioeconomics; subjective well-being; veterans	Use of machine learning to predict physical health and well-being among veterans based on demographic, socio-economic, and geographic characteristics.
15 [60]	Article	2021	Izumi, K; Minato, K; Shiga, K; Sugio, T; Hanashiro, S; Cortright, K; Kudo, S; Fujita, T; Sado, M; Maeno, T; Takebayashi, T; Mimura, M; Kishimoto, T	Unobtrusive Sensing Technology for Quantifying Stress and Well-Being Using Pulse, Speech, Body Motion, and Electrodermal Data in a Workplace Setting: Study Concept and Design	Frontiers in Psychiatry	adult psychiatry; depression; industrial medicine; mental health; occupational; protocols; recognition; stress; system; wearable sensors; well-being	Technique to quantify stress and well-being using sensing devices.

Table A1. *Cont.*

Item	Type	Year	Author	Title	Publication Title	Keywords	Main Issue
16 [83]	Article	2021	Makridis, CA; Han, JH	Future of work and employee empowerment and satisfaction: Evidence from a decade of technological change	Technological Forecasting and Social Change	employee attitudes; employee engagement; growth; impact; innovation; jobs; labor; leadership; managers; performance; productivity; resource; technological change; transformation; well-being	Technological change impacts workplace interactions but can have positive effects on employee empowerment and well-being with structured management.
17 [79]	Article	2021	Fukumura, YE; Gray, JM; Lucas, GM; Becerik-Gerber, B; Roll, SC	Worker Perspectives on Incorporating Artificial Intelligence into Office Workspaces: Implications for the Future of Office Work	International Journal of Environmental Research and Public Health	artificial intelligence; comfort; computer workstations; health; hot-desking; impact; office work; performance; recognition; time; workspace	The acceptability of AI in the workplace is complex and dependent upon the benefits outweighing the potential detriments.
18 [64]	Article	2021	Stamate, AN; Sauve, G; Denis, PL	The rise of the machines and how they impact workers' psychological health: An empirical study	Human Behavior and Emerging Technologies	artificial intelligence; basic psychological needs; cognitive-ability; distress; job challenge; job characteristics; job demand; job resource; measurement scales; mental-health; multiple-item; need satisfaction; psychological health; self-determination theory; single-item; technology acceptance model; user acceptance; well-being; workplace	Impact of machines on workers' psychological health and ways to mitigate negative effects.
19 [69]	Article	2021	Anan, T; Kajiki, S; Oka, H; Fujii, T; Kawamata, K; Mori, K; Matsudaira, K	Effects of an Artificial Intelligence-Assisted Health Program on Workers with Neck/Shoulder Pain/Stiffness and Low Back Pain: Randomized Controlled Trial	JMIR Mhealth And Uhealth	adherence; digital health; digital intervention; disability; e-health; exercise program; intervention; low back pain; management; m-health; mobile app; mobile phone; musculoskeletal symptoms; neck pain; neck pain; office workers; predictors; shoulder; shoulder pain; shoulder stiffness; workplace	The 12-week use of the AI-assisted health program significantly improved subjective symptoms of both neck/shoulder pain/stiffness and low back pain
20 [70]	Article	2021	Trenerry, B.; Chng, S.; Wang, Y.; Suhaila, Z.S.; Lim, S.S.; Lu, H.Y.; Oh, P.H.	Preparing Workplaces for Digital Transformation: An Integrative Review and Framework of Multi-Level Factors	Frontiers in Psychology	digital transformation; digital disruption; digital technology; workplace; organization; employee; literature review; multi-level framework	Review of the literature on the digital transformation of the workplace digital transformation

Table A1. *Cont.*

Item	Type	Year	Author	Title	Publication Title	Keywords	Main Issue
21 [52]	Article	2021	Pishgar, M.; Issa, S.F.; Sietsema, M.; Pratap, P.; Darabi, H.	Redeca: A novel framework to review artificial intelligence and its applications in occupational safety and health	International Journal of Environmental Research and Public Health	artificial intelligence; worker health and safety; occupational safety and health; sensor devices; robotic devices; machine learning algorithms; future of work	AI's role in detecting hazardous situations and removing workers from hazardous conditions.
22 [86]	Conference	2021	Mendoza-Valencia, J.	Smart Manufacturing and Jobs	Proceedings of CECNet 2021	manufacturing; worker and artificial intelligence	The benefits and challenges of using new technologies in manufacturing
23 [58]	Conference	2021	Cahill, J.; Howard, V.; Huang, Y.; Ye, J.; Ralph, S.; Dillon, A.	Intelligent Work: Person-Centred Operations, Worker Wellness and the Triple Bottom Line	HCI International 2021-Posters: 23rd HCI International Conference, HCII 2021, Virtual Event	creative technologies; digital engagement; responsible work; workplace wellness; work related stress	Introduction of the concept of "Intelligent Work" and its focus on enabling people and performance monitoring.
24 [61]	Article	2022	Tania, MH; Hossain, MR; Jahanara, N; Andreev, I; Clifton, DA.	Thinking Aloud or Screaming Inside: Exploratory Study of Sentiment Around Work	JMIR Formative Research	5 personality-traits; anxiety; artificial intelligence; Bayesian inference; Facebook; machine learning; mobile phone; musculoskeletal; natural language processing; occupational health; privacy; sentiment analysis; social media; twitter; work-related mental health	Study on using social media to assess work-related sentiments.
25 [79]	Article	2022	Jiang, F.; Wang, L.; Li, J.-X.; Liu, J.	How Smart Technology Affects the Well-Being and Supportive Learning Performance of Logistics Employees?	Frontiers in Psychology	smart technology; learning performance; well-being; self-efficacy; corporate trust	Link between smart technology and learning performance in the logistics industry
26 [62]	Article	2022	Sagar, S.; Rastogi, R.; Garg, V.; Basavaraddi, I.V.	Impact of Meditation on Quality of Life of Employees	International Journal of Reliable and Quality E-Healthcare	corporate employee; industry 5.0; meditation; quality of life; workplace wellness	Benefits of meditation on employee well-being, AI's role, and the significance of Indian cultural practices.
27 [72]	Article	2022	Koc, K.; Ekmekcioğlu, Ö.; Gurgun, A.P.	Prediction of construction accident outcomes based on an imbalanced data set through integrated resampling techniques and machine learning methods	Engineering, Construction, and Architectural Management	artificial intelligence; construction safety; machine learning; occupational health and safety (ohs); occupational accidents; safety management	Predicting occupational accidents using machine learning and resampling strategies.

Table A1. *Cont.*

Item	Type	Year	Author	Title	Publication Title	Keywords	Main Issue
28 [66]	Article	2023	Loureiro, SMC; Bilro, RG; Neto, D	Working with AI: Can stress bring happiness?	Service Business	al; artificial intelligence; artificial intelligence; behavior; benefits; benign stress; employee engagement; employee happiness; job stress; resources; self-esteem; service robots	Effect of AI on employee happiness and engagement.
29 [74]	Article	2023	Lorenzini, M; Lagomarsino, M; Fortini, L; Gholami, S; Ajoudani, A	Ergonomic human-robot collaboration in industry: A review	Frontiers in Robotics and AI	collaborative robots; driven musculoskeletal model; ergonomics; exposure assessment; heart rate; human factors; human-robot collaboration; human-robot interaction; industry; joint moments; mental workload; motion-capture; muscle forces; practical method; risk-factors; strain index	Importance of ergonomics in human-robot collaboration in industrial settings and overview of assessment tools and monitoring technologies
30 [84]	Article	2023	Xu, G.; Xue, M.; Zhao, J.	The Relationship of Artificial Intelligence Opportunity Perception and Employee Workplace Well-Being: A Moderated Mediation Model	International Journal of Environmental Research and Public Health	artificial intelligence opportunity perception; informal learning in the workplace; employee workplace well-being; unemployment risk perception	Importance of recognizing AI technology and taking measures to actively respond to it to improve WWB and promote the smooth application of AI technology in the workplace
31 [63]	Article	2023	Segkouli, S.; Giakoumis, D.; Votis, K.; Triantafyllidis, A.; Paliokas, I.; Tzovaras, D.	Smart Workplaces for older adults: Coping 'ethically' with technology pervasiveness	Universal Access in the Information Society	pervasive technology; ethics framework; workplaces; older workers	Technologies such as AI, VR, and IoT can improve the well-being and workability of the ageing workforce, but pose ethical challenges

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