

Cognitive Ergonomics' Impact on Employee Well-being and Performance: A Bibliometric and Thematic Analysis of Research Directions

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Abstract: The aim of this article is to identify and analyze the main research directions and thematic areas within the field of cognitive ergonomics, focusing on its impact on employee performance and well-being. The study aims to provide a comprehensive understanding of how various ergonomic factors contribute to organizational outcomes and employee well-being. The analysis was compiled based on sources available in the Web of Science, Scopus, and Google Scholar databases, published mainly after 2015. The selection criteria were clearly defined and included: publication type – peer-reviewed articles and conference papers; year of publication – 2015 to 2025; relevance to the work environment and cognitive ergonomics; focus on psychological, cognitive, or acoustic factors related to employee well-being. Studies focused exclusively on medical or clinical ergonomics were excluded. The results point to the main research clusters: physical work environment and productivity, acoustic ergonomics and noise factors, psychosocial factors and organizational context, experimental and application approaches. The findings confirm the interdisciplinary link between cognitive ergonomics, the working environment, and subjective well-being, and emphasize the importance of researching this issue not only from the perspective of health protection, but also in terms of maintaining work performance and the long-term competitiveness of organizations. The article also discusses practical and managerial implications that stem from the identified clusters, particularly in relation to workplace design and management strategies that promote sustainable productivity.

Keywords: bibliographic analysis Cognitive Ergonomics, work environment, productivity.

JEL Classification: M12,I31, D91

1 Introduction

The increasing complexity of modern workplaces requires a more fundamental examination of cognitive ergonomics and its significant impact on employee well-being and performance. Cognitive ergonomics is a subdiscipline concerned with optimizing the interaction between cognitive processes and workplace demands. It serves as a key element in improving both mental and physical aspects of health in organizational settings. Recent bibliographic analyses reveal that the interconnection between psychosocial dynamics, the physical work environment, and employee engagement is key to understanding employee performance (Subarno et al., 2025; Bajrami et al., 2022) (Wibowo et al., 2024).

The work environment significantly affects employee well-being, as a high-quality environment is associated with increased productivity, job satisfaction, and overall health. Empirical research has shown that factors such as job demands, control, and social support influence well-being, thereby positively affecting engagement and productivity (Subarno et al., 2025; Bajrami et al., 2022). In addition, research emphasizes that organizational culture influences the psychosocial environment, which is directly related to employee well-being (Rasool et al., 2021; Huang et al., 2016). Employees who perceive a high level of support from their organizational culture and superiors are more likely to be positively engaged in their work, thereby promoting a productive and innovative workplace (Wibowo et al., 2024; Korhan et al., 2023).

In addition, the role of acoustic ergonomics and psychosocial factors cannot be overlooked. Noise levels and mental well-being resulting from well-designed spaces significantly affect cognitive functions such as attention, reasoning, and memory (Korhan et al., 2023). The interaction of these elements creates an environment in which organizational support

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mechanisms such as training and teamwork not only increase employee well-being but also strengthen their sense of belonging and commitment to the organization (Ogbonnaya et al., 2018; Koon et al., 2023).

Given the changing dynamics of work, which have been greatly accelerated by the impact of the COVID-19 pandemic, organizations are forced to adapt their measures of employee performance and well-being to include a more comprehensive view of health that encompasses both physical and mental aspects (Lee, 2021). This broader view recognizes that employee well-being is not solely a personal responsibility, but a shared goal of the organization that is essential to supporting a sustainable and competitive workforce (Mohamad & Abiddin, 2024; Gupta, 2024).

This article aims to identify and analyze the main research directions in the field of cognitive ergonomics and employee well-being, reinforcing the need for a comprehensive understanding of how various ergonomic factors contribute to better organizational outcomes. In line with this goal, the study combines bibliometric and thematic analysis to uncover the dominant research areas, key authors, and interdisciplinary connections within the field. In today's data processing and visualization environment, there is a growing demand for technical support. The multifaceted nature of modern data sets, which are characterized by their size, diversity of formats, and variety of sources, poses a significant challenge for researchers and professionals alike. Despite the abundance of text analysis tools available, there is still a strong need for user-friendly yet powerful solutions that can scale effectively while providing advanced visual representations of data (Noshad et al., 2021).

Bibliometrics is a viable means to quantitatively and qualitatively evaluate trends in research activities over time. It uses literature databases and literature metrology characteristics. It has become a popular method of providing insight into research in specific fields (Xie et al., 2020). A new focal point in this area has been the use of VOSviewer, an open-source software tool that offers bibliometric analysis capabilities. VOSviewer allows users to perform in-depth analyses of large data sets and create visualizations that authentically map networks connected through authors, keywords, or institutions (Liu et al., 2022). This tool has gained popularity not only for its effectiveness in illustrating critical research dynamics, including emerging trends and thematic clusters, but also for its acceptance and adaptability within the academic community (Illiashenko et al., 2021). Using bibliometrics in combination with the VOSviewer tool, researchers can identify prevailing research channels and uncover potential gaps that require further investigation (Wang et al., 2020).

The integration of bibliometric tools into the field of cognitive ergonomics is an example of how data visualization can actively support research development. VOSviewer greatly contributes to the transparency of research trajectories and allows the identification of key authors and thematic groups, ultimately leading to a more comprehensive understanding of the field of cognitive ergonomics (Sikdar et al., 2022). This is essential for addressing the growing complexity and multifaceted nature of the phenomena being studied today, bringing visualization methodologies in line with the demands of contemporary research (Lopes et al., 2023).

Recent research into decision-making frameworks for complex problems further emphasizes the importance of multi-criteria assessment using diverse data sources. This is essential for ensuring that spatial and temporal dimensions are accurately reflected in decision-making processes, which improves the interpretability and information richness of the results (Lopes et al., 2023). The demand for effective data processing and visualization tools is therefore not only a prerequisite for individual research, but also signifies broader changes in the methodologies of both academia and industry. The collective knowledge provided by tools such as VOSviewer paves the way for better orientation in the complex network of modern data environments (Asiyabi et al., 2023).

In summary, the use of advanced visualization and processing tools is a key strategy for navigating the complexity of today's data-rich environment. The combination of bibliometric methods and visualization software supports the definition of research directions, facilitates a more detailed understanding of disciplines such as cognitive ergonomics, and thus addresses the urgent need for effective management of the influx of diverse and extensive data. By examining the research clusters identified in the bibliographic analysis, we emphasize the importance of an interdisciplinary approach in an effort to improve the work environment that supports the success of individuals and organizations.

2 Methods

The research was conducted in the form of a bibliographic analysis with the aim of identifying and analyzing the main research directions and thematic areas in the field of cognitive ergonomics and employee well-being. The analysis was designed as a systematic review of the literature supplemented by bibliometric visualization techniques. A similar approach has already been used by several authors, such as Van Eck and Waltman (2009), who laid the foundations for the methodology of visualizing bibliometric networks using VOSviewer software. In the field of ergonomics and related disciplines, bibliometric analysis has also proven its worth in the work *Emerging Applications of Cognitive Ergonomics*:

A Bibliometric and Content Analysis, where the authors mapped the main research clusters using VOSviewer and other analytical tools. Another example is the study Bibliometric analysis on physical ergonomics: A visual analysis (2024), which visualized trends in physical ergonomics and demonstrated the potential of bibliometric techniques in identifying research hotspots. In the field of employee wellbeing, authors such as Xu et al. (2025) applied bibliometric analysis to examine the development and key directions of this research. These studies confirm the relevance of combining a systematic literature review with bibliometric visualizations, which allows for a more comprehensive mapping of the current state of knowledge and its main trends. The purpose of this study was therefore twofold: to identify the dominant research directions and clusters in the field of cognitive ergonomics and employee well-being, and to analyze the thematic and interdisciplinary links between them.

Data sources and selection criteria. The primary data sources were the scientific databases Web of Science, Scopus, and Google Scholar. To ensure validity and comparability, several explicit inclusion and exclusion criteria were applied. The inclusion criteria were as follows:

- **Publication type:** only peer-reviewed journal articles and conference papers.
- **Publication period:** 2015–2025.
- **Language:** English.
- **Relevance:** studies focusing on the relationship between cognitive ergonomics, employee well-being, performance, or workplace design.
- **Thematic focus:** research addressing psychological, cognitive, acoustic, or environmental aspects of ergonomics related to employee functioning.

Exclusion criteria:

- studies focusing solely on medical or clinical ergonomics,
- publications unrelated to the work environment,
- papers with insufficient bibliographic data for analysis (e.g., missing keywords or authorship details).

The search was performed using a defined set of keywords: "cognitive ergonomics," "employee well-being," "workplace design," "auditory environment," "psychosocial factors," "productivity," and "organizational support." Each combination of these keywords was used with Boolean operators (AND, OR) to maximize the coverage of relevant sources.

After the initial search, duplicates were removed, and articles were screened by title, abstract, and keywords. Only studies meeting all the above criteria were included in the final dataset.

Data processing. After reading the titles, abstracts, and keywords, a final set of publications containing 418 relevant sources was created. Bibliographic data (authors, titles, abstracts, keywords, citations) were exported in a compatible format (RIS) and then processed in bibliometric software.

Analytical tools. Co-authorship analysis was chosen for the construction of the network, as it allows the research links between authors to be displayed and a map of collaborating research groups to be created. The fractional counting method was used, which eliminates the overestimation of collaboration in publications with a large number of authors. The LinLog method was chosen for data normalization, which allows for a clearer distinction between individual clusters and highlights the internal cohesion of research communities. At the same time, a minimum number of documents per author was set so that only relevant and repeatedly publishing researchers were included in the map. This threshold criterion was defined as at least three publications or five co-authorship links within the analyzed period, ensuring that only established contributors were visualized.

The result was a map that clearly shows the main directions of research as well as their interconnections.

Interpretation. Each cluster was analyzed in terms of its theoretical basis, most frequently cited authors, and implications for research on the work environment and well-being. The interpretation combined quantitative mapping of bibliographic links with qualitative content analysis of selected publications.

3 Research results

The visual map of co-authorships shows researchers who have proven to be the most significant in a given field of literature based on their publication and citation activity. Only authors who meet the set threshold criteria (e.g., minimum number of

publications or co-authorship links) are included in the analysis, with VOSviewer automatically highlighting the nodes that represent the most important connecting elements in the network. In this study, the threshold was defined as a minimum of three publications or five co-authorship connections, ensuring that only established and repeatedly publishing authors were included.

The visibility of individual names on the map is therefore the result of two factors:

Number of publications and citations – the more an author publishes and the more frequently their work is cited in the field under study, the greater their importance in the network. The size of the name on the map corresponds to the weight of their contribution to the field being analyzed.

Intensity of co-authorship – authors who collaborate with a larger number of other researchers create denser connections and become central nodes of clusters.

The colors on the map reflect the emergence of so-called communities, i.e., groups of authors who cite each other intensively or publish together on related topics. However, not all authors are displayed equally prominently on the map. Those with fewer publications or less citation impact appear only as smaller, less visible nodes, or are not displayed at all, so that the visualization remains clear.

For this reason, the map highlights the names of authors who play a key role in the research network – either as leaders of their clusters or as connecting elements between multiple research communities.

As a result of the analysis, four main research directions have been identified:

- Physical work environment and productivity (purple cluster),
- Acoustic ergonomics and noise factors (orange cluster),
- Psychosocial factors and organizational context (yellow cluster),
- Experimental and application approaches (blue cluster).

The research was based on the analysis of a basic corpus of 418 sources, in which the authors dealt with the issue of cognitive ergonomics. Based on the examination of the existence of mutual connections and connections to a specific cluster, a set of 167 sources was identified. Figure 1 shows a citation map created in the VOSviewer software. The LinLog method was chosen for normalization, which allows for clearer differentiation of clusters and highlights the internal cohesion of individual research groups. The size of the nodes represents the publication activity of the authors, and the thickness of the connections represents the intensity of their collaboration.

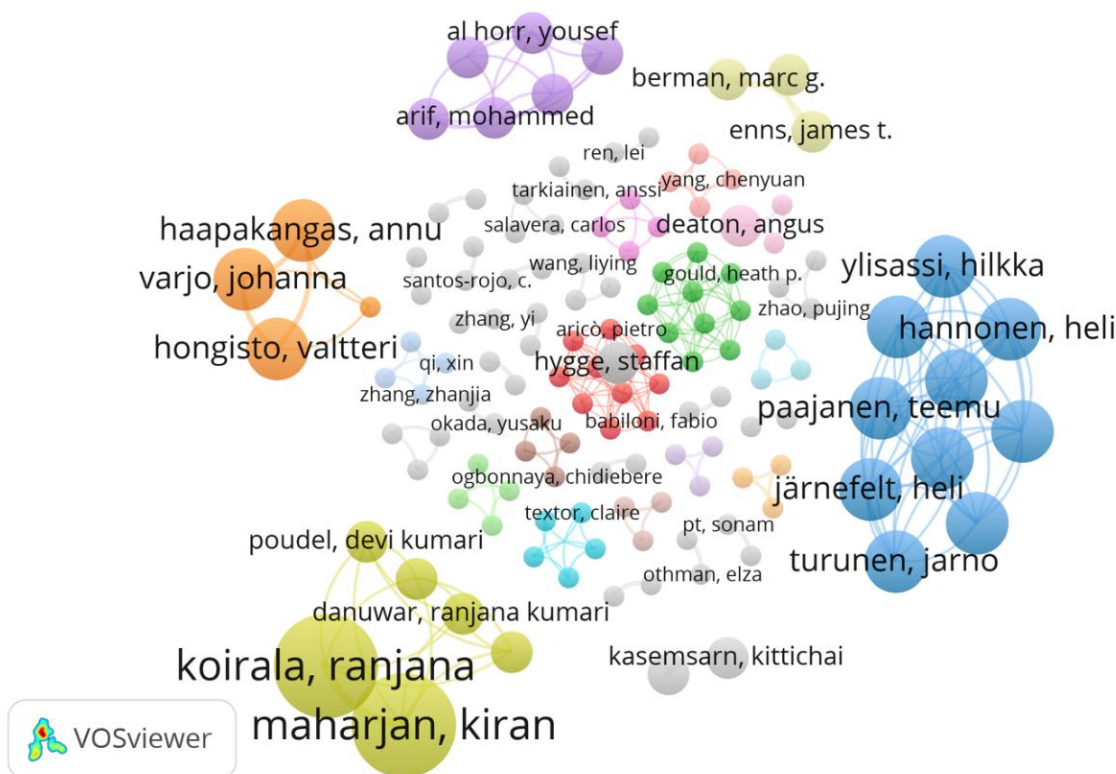
The purple cluster (Al Horr, Arif et al.) brings together authors who focus on the impact of the physical work environment on well-being and productivity. Research in this group focuses on factors such as the quality of the indoor environment of buildings, lighting, and temperature and their impact on cognitive performance and employee satisfaction. An important contribution is the linking of cognitive ergonomics with the fields of architecture and facility management, which makes it possible to design workplaces that promote not only efficiency but also health and well-being.

The Orange Cluster (Haapakangas, Hongisto, Varjo et al.) focuses primarily on acoustic ergonomics and the impact of the sound environment on well-being at work. Their studies examine how noise, open-plan offices, and distractions affect cognitive load, concentration, and employee satisfaction. A significant finding of this line of research is that acoustic conditions have a direct impact on subjective well-being and long-term productivity, and they also propose specific measures, such as acoustic panels or flexible workspaces.

The yellow cluster (Koirala, Maharjan et al.) represents authors who link psychosocial aspects of work with cognitive ergonomics. Their research focuses on factors such as work stress, organizational support, and subjective perceptions of the work environment. Studies in this group point out that employee well-being is influenced not only by physical conditions but also by social and organizational ties, which opens up space for managerial interventions and support for a healthy work environment.

The blue cluster (Ylisassi, Hannonen, Paaanen et al.) focuses on experimental approaches and applied research in the field of ergonomics. Authors from this group are involved, for example, in assessing working conditions in specific industries, testing new methodologies, and verifying the impact of ergonomic measures on employee performance and well-being. Research in this area provides practical knowledge that can be used to develop recommendations for employers and design work.

Figure 1 Citation Map Generated in VOSviewer



Source: Own processing

Summary

A number of thematically distinct clusters are depicted in the co-authorship map that was produced by the VOSviewer program. These clusters represent a variety of approaches to the investigation of cognitive ergonomics and its relationship with the well-being and performance of employees. Collectively, these clusters constitute a landscape that is diverse, and within this landscape, cognitive ergonomics emerges as a multidisciplinary field that connects design, psychology, management, and occupational hygiene. The identification of these clusters fulfills the main goal of this study – to map and analyze the dominant research directions in the field of cognitive ergonomics and employee well-being. Each cluster provides a unique perspective on how environmental, psychosocial, and organizational factors influence employee outcomes.

The synthesis of these findings confirms that cognitive ergonomics serves as an integrative platform linking mental processes, workplace conditions, and managerial practices. This insight not only strengthens the theoretical understanding of the field but also creates a foundation for practical recommendations aimed at improving the design of work environments and promoting sustainable employee performance.

The findings also underscore the importance of cognitive ergonomics in promoting employee well-being and work performance. Consequently, it is of significant practical importance to organizations that are making efforts to achieve sustainable productivity.

4 Conclusions

Bibliographic analysis has shown that cognitive ergonomics, especially in the context of the auditory environment, is an important factor influencing employee wellbeing and performance. The identified clusters confirm the interdisciplinary nature of this issue and open up space for practical applications in the design of work environments.

The results of the bibliometric mapping revealed four dominant research directions that form the conceptual framework of the field: (1) physical work environment and productivity, (2) acoustic ergonomics and noise factors, (3) psychosocial factors and organizational context, and (4) experimental and application approaches. These clusters demonstrate that cognitive ergonomics is not an isolated domain but a multidisciplinary field combining insights from psychology,

management, architecture, and occupational health. Each of these areas contributes to a better understanding of how cognitive demands and environmental stimuli jointly shape employee performance and well-being.

In practice, it is important to focus on:

- implementing ergonomic principles in the design of workspaces,
- reducing noise pollution and optimizing the auditory environment,
- promoting subjective wellbeing through meaningful and value-oriented work.

These recommendations stem directly from the identified research clusters. Studies in the physical environment cluster emphasize measurable links between environmental comfort and productivity, which supports the call for evidence-based workplace design. The acoustic ergonomics cluster highlights that noise and auditory distraction are consistent predictors of cognitive fatigue, suggesting the need for acoustic management in open-plan offices. The psychosocial and organizational cluster indicates that employee well-being is significantly influenced by leadership quality, organizational culture, and social support, pointing to managerial interventions as a key lever for improvement. Finally, the experimental and application cluster demonstrates how ergonomic interventions can be empirically tested and implemented in various industries. Together, these findings provide a strong empirical basis for the proposed managerial and design implications.

The conclusions also underline that cognitive ergonomics has a strategic value for organizations striving for sustainable performance. By integrating ergonomic principles into everyday management and workplace design, companies can not only improve health outcomes but also foster innovation, engagement, and long-term competitiveness.

Future research should focus on empirical verification of the identified relationships, particularly through experiments with sound stimuli and questionnaire surveys in the trade and services sector. Such empirical studies could validate the conceptual clusters identified in this analysis and expand the understanding of causal mechanisms between cognitive factors, the work environment, and well-being. Future research should therefore focus particularly on the acoustic dimension of cognitive ergonomics — specifically on the effects of white and pink noise on attention, concentration, and perceived well-being in various work settings. Building on the studies analyzed in this paper, further experimental research could clarify how controlled auditory stimuli contribute to reducing cognitive load and enhancing employee performance. The results of such research can serve as a basis for the creation of effective management strategies that promote mental health and employee productivity.

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