


Mapping the Physical and Psychosocial Occupational Risks of Remote Working: A Scoping Review

Mukhayatun Sholehah^{1*}, Efa Septiana²

^{1,2}Universitas Islam Negeri Jurai Siwo Lampung, Jl. Ki Hajar Dewantara No.15A, Iringmulyo, Kec. Metro Tim., Kota Metro, Lampung

E-mail: Sholehah@uinjusila.ac.id

* Corresponding Author

 <https://doi.org/10.31004/jerkin.v4i4.6377>

ARTICLE INFO

Article history

Received: 15 Nov 2025

Revised: 23 March 2026

Accepted: 14 May 2026

Kata Kunci:

Kerja Jarak Jauh,
Kesehatan Kerja,
Ergonomi, Risiko
Psikososial, Tinjauan
Cakupan

Keywords:

Remote Work,
Occupational Health,
Ergonomics,
Psychosocial Risks,
Scoping Review



ABSTRACT

Peralihan permanen ke kerja jarak jauh dan hibrida telah mengubah lanskap Keselamatan dan Kesehatan Kerja (K3) dengan munculnya risiko baru di lingkungan rumah yang sering belum memenuhi standar keselamatan kerja. Penelitian ini bertujuan memetakan risiko fisik dan psikososial yang dialami pekerja jarak jauh di era pascapandemi sebagai dasar intervensi keselamatan kerja. Studi menggunakan metode Scoping Review berdasarkan pedoman PRISMA-ScR dengan analisis 13 artikel dari Google Scholar dan PubMed periode 2021–2025. Hasil penelitian menunjukkan dua risiko utama, yaitu risiko fisik berupa gangguan muskuloskeletal (MSD) dan ketegangan mata akibat ergonomi buruk serta kurang gerak, dan risiko psikososial seperti jam kerja tanpa batas, pengawasan digital, dan isolasi sosial. Tekanan psikologis juga terbukti memperburuk nyeri fisik. Karena itu, organisasi disarankan menerapkan kebijakan keselamatan kerja seperti subsidi ergonomi dan aturan “Hak untuk Memutus Koneksi” guna mengurangi risiko tersebut.

The permanent shift to remote and hybrid work has changed the Occupational Safety and Health (OHS) landscape, with the emergence of new risks in home environments that often do not meet occupational safety standards. This study aims to map the physical and psychosocial risks experienced by remote workers in the post-pandemic era as a basis for occupational safety interventions. The study used a Scoping Review method based on PRISMA-ScR guidelines with an analysis of 13 articles from Google Scholar and PubMed for the period 2021–2025. The results showed two main risks: physical risks in the form of musculoskeletal disorders (MSDs) and eye strain due to poor ergonomics and lack of movement, and psychosocial risks such as unlimited working hours, digital surveillance, and social isolation. Psychological stress has also been shown to exacerbate physical pain. Therefore, organizations are advised to implement occupational safety policies such as ergonomic subsidies and “Right to Disconnect” rules to mitigate these risks.



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How to Cite: Mukhayatun Sholehah, et al (2026). Mapping the Physical and Psychosocial Occupational Risks of Remote Working: A Scoping Review, 4(4) 25399-25404. <https://doi.org/10.31004/jerkin.v4i4.6377>

INTRODUCTION

The global workforce has undergone a paradigmatic shift following the COVID-19 pandemic, transitioning from traditional office-based arrangements to remote and hybrid work models. What began as an emergency response to public health restrictions has evolved into a permanent feature of the modern labor market. While this transformation offers flexibility and autonomy, it has fundamentally altered the landscape of Occupational Safety and Health (OSH). The rapid digitalization of work has introduced a “new way of working” that often bypasses the regulated safety standards of physical offices, creating complex challenges for worker well-being (Roquelaure et al., 2024). Recent systematic reviews indicate that organizations frequently lack awareness of the actual working conditions in home offices,

leaving employees to manage safety risks independently (Wütschert et al., 2022). As organizations increasingly formalize remote work policies, understanding the long-term health implications of this shift is critical.

The primary problem lies in the inadequacy of the home environment to support sustained professional activities. Unlike regulated offices, domestic spaces frequently lack ergonomic infrastructure. Research indicates that a significant proportion of remote workers operate without standard desks or ergonomic chairs. For instance, Huršidić Radulović et al. (2021) found that this lack of equipment led to the worsening of Musculoskeletal Disorders (MSDs) such as low back pain, a finding further supported by Gomez et al. (2023) whose review confirmed a high prevalence of spinal pain among teleworkers due to non-neutral postures. Furthermore, the physical risks extend beyond ergonomics; recent studies have highlighted alarming trends in sedentary behavior and dietary changes (Shinoda et al., 2025), as well as significant risks of weight gain and obesity among teleworkers (Saes-Silva et al., 2023). Additionally, specific physical ailments such as eye strain have been reported at significantly higher rates among remote workers compared to their office-based counterparts due to prolonged screen exposure (Cheng et al., 2025).

Parallel to physical hazards, the psychosocial architecture of work has deteriorated for many remote employees. The dissolution of physical boundaries between work and private life has fostered an "always-on" culture. Wöhrmann and Ebner (2021) describe this as the "dark side" of telework, characterized by boundaryless working hours and constant availability pressure. This disruption often leads to circadian rhythm disturbances and "social jetlag," as the lack of organizational structure encourages irregular work patterns (Janc et al., 2024). This environment is exacerbated by digital surveillance and communication overload, which contribute to feelings of entrapment and anxiety (Mendonça et al., 2022). Moreover, the loss of face-to-face interaction has precipitated a rise in social isolation and loneliness (Khan & Patel, 2025), while distinct stressors such as role conflict have been observed to affect female workers disproportionately (Bhinuko & Puspasari, 2021).

Despite the growing body of literature, current research often treats physical and psychosocial risks in isolation. Several studies have focused exclusively on ergonomic factors (Okawara et al., 2023) or the specific aggravation of pain symptoms (Yoshimoto et al., 2021). While specific mental health outcomes have been addressed by others (Sadłowska-Wrzesińska et al., 2022), and systematic reviews have covered specific domains like MSDs (Milaković et al., 2023) or emerging psychosocial risks (Koren et al., 2023), there is a paucity of comprehensive scoping reviews that map both domains simultaneously using recent primary data from the post-pandemic "new normal" period (2021–2025). This gap is significant because risks are often interconnected; psychological stress exacerbates physical pain (Shimura et al., 2021), and environmental stressors combined with mental fatigue can even precipitate domestic accidents, a risk category often overlooked in traditional OSH frameworks (Santurtún & Shaman, 2023).

This study addresses this gap by providing a holistic mapping of occupational risks. The scientific novelty of this article lies in its synthesis of the most recent global evidence to categorize how physical and psychosocial hazards intersect in the remote working environment. Consequently, the purpose of this article is to conduct a scoping review to identify, map, and categorize the physical and psychosocial occupational risks faced by remote workers, providing an evidence base for future OSH interventions in the digital economy.

METHOD

This study employed a Scoping Review design adhering to the reporting guidelines of the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR). The primary instruments used for literature retrieval were two electronic databases, namely Google Scholar and PubMed. The selection of these two sources aimed to obtain broad literature coverage while ensuring access to high-reputation medical literature. The search timeframe was restricted to articles published between 2021 and 2025 to ensure the data relevance to current remote working conditions in the post-pandemic and new normal era.

Data collection procedures were conducted using specific keyword search strategies adapted to the syntax of each database. In Google Scholar, the search utilized the advanced search feature with the command `allintitle:` to limit relevance to article titles, using the keywords: `"allintitle: ("remote work"`

OR "work from home" OR "telework") AND ("risk" OR "health" OR "stress" OR "pain" OR "safety")", with an additional filter applied to exclude patents and citations. Meanwhile, in PubMed, the search utilized Medical Subject Headings (MeSH) and free-text keywords in the Title/Abstract field with the string: ("Remote work"[Title/Abstract] OR "Telework"[Title/Abstract] OR "Work from home"[Title/Abstract]) AND ("Occupational health"[Title/Abstract] OR "Safety"[Title/Abstract]) AND ("Risk"[Title /Abstract] OR "Adverse effects"[Title/Abstract] OR "Musculoskeletal"[Title/Abstract] OR "Psychosocial"[Title/Abstract]), with a filter applied for Free Full Text availability.

Article selection was strictly conducted based on eligibility criteria using the Population, Concept, Context (PCC) framework. The study population was limited to active workers engaged in remote work, while studies involving student populations were excluded. The research concept focused on Occupational Safety and Health (OSH) risks, specifically physical risks (such as musculoskeletal disorders and eye strain) and psychosocial risks (such as stress, burnout, and social isolation). The study context covered remote work, Work From Home (WFH), or telework environments. Included study types were original research articles utilizing quantitative, qualitative, or mixed-methods written in English. Literature reviews, systematic reviews, opinions, and books were excluded to avoid secondary data duplication.

The study selection process began with an identification phase yielding a total of 386 articles, consisting of 335 articles from Google Scholar and 51 articles from PubMed. All articles subsequently underwent a screening phase based on titles and abstracts. In this phase, 347 articles were excluded because the titles or abstracts were irrelevant to the research topic (305 from Google Scholar and 42 from PubMed). A total of 39 articles (30 from Google Scholar and 9 from PubMed) proceeded to full-text assessment. Following this assessment, 26 articles were further excluded due to being literature reviews, non-English full text, or inaccessible full-text. Finally, a total of 13 original articles (11 from Google Scholar and 2 from PubMed) were obtained that met the requirements for analysis. The detailed literature search and screening process is illustrated in Figure 1. Data from the selected articles were extracted and organized into a characterization table covering the author and year, country of origin, study design, sample, as well as findings regarding physical and psychosocial risks.

RESULTS AND DISCUSSION

Study Characteristics and Global Distribution

The systematic search yielded 13 original research articles eligible for analysis (Table 1). The geographical distribution of these studies covers diverse economic contexts, ranging from developed nations like Japan and Germany to emerging economies like Indonesia, Brazil, and India. This wide distribution suggests that the OSH challenges of remote work are universal, transcending cultural and economic boundaries. In terms of study design, 10 out of 13 studies employed a cross-sectional approach. While this design is appropriate for capturing the immediate prevalence of risks during the pandemic, it presents a limitation in establishing long-term causality. However, the inclusion of prospective cohort studies, such as those by Okawara et al. (2023) and Shimura et al. (2021), strengthens the evidence base by providing longitudinal data on how remote work environments impact health over time.

Physical Risks: The "Silent Epidemic" of Home Offices

The review identified two distinct clusters of physical risks: musculoskeletal degradation and metabolic/visual strain.

The Musculoskeletal Burden

The most consistent finding across the literature is the exacerbation of Musculoskeletal Disorders (MSDs). Huršidić Radulović et al. (2021) provided compelling evidence from the telecommunications sector, reporting that 39% of workers experienced worsening Low Back Pain (LBP) and 45.7% reported aggravated neck pain. The mechanism behind this trend is biomechanical: the home environment often lacks the engineering controls present in regulated offices. Larrea-Araujo et al. (2021) found that the use of non-standard furniture—such as dining chairs without lumbar support or laptops placed on low tables—forces the spine into prolonged flexion. Okawara et al. (2023) further quantified this, showing that inadequate legroom and poor thermal comfort were statistically significant predictors of work functioning impairment. This suggests that "ergonomics" in remote work is not just about furniture, but the holistic physical environment.

Visual and Metabolic Consequences

Beyond MSDs, Cheng et al. (2025) highlighted a critical risk often overlooked: digital eye strain. Their study found that teleworkers had an Odds Ratio (OR) of 3.18 for eye strain compared to office workers. This is likely attributed to the "always-on" screen culture and poor ambient lighting in domestic settings. Furthermore, a concerning metabolic pattern emerged. Shinoda et al. (2025) reported that 39.7% of teleworkers experienced weight gain. This aligns with Saes-Silva et al. (2023), who found a strong association between high BMI and chronic back pain. The reduction in "incidental physical activity" (commuting, walking to meetings) has created a sedentary lifestyle loop that poses long-term cardiovascular risks.

Psychosocial Risks: The Paradox of Autonomy vs. Isolation

While remote work is often lauded for flexibility, the results reveal a darker side related to the dissolution of boundaries.

Boundaryless Working and Surveillance

Wöhrmann and Ebner (2021) identified "boundaryless working hours" as a primary stressor. The absence of a physical commute removes the psychological "switch-off" mechanism, leading workers to extend hours into evenings and weekends. This phenomenon can be analyzed through Boundary Theory, where the integration of work and home domains prevents cognitive detachment. Moreover, Mendonça et al. (2022) and Cheng et al. (2025) introduced the concept of "digital surveillance." Approximately 49% of workers in the Taiwan study reported being digitally monitored, which significantly increased mental distress (OR=1.67). This feeling of being watched creates a "Panopticon effect," where workers overcompensate by remaining constantly online to prove their productivity.

Isolation and Role Conflict

Khan and Patel (2025) emphasized that flexibility comes at the cost of social isolation. The lack of informal interactions deprives workers of social support, a crucial buffer in the Job Demands-Resources (JD-R) model. Without this resource, job demands (such as workload) become more taxing. Additionally, gender disparities were evident. Bhinuko and Puspasari (2021) found that female workers in Indonesia experienced higher stress due to inter-role conflict (balancing domestic chores and work). This suggests that remote work may reinforce traditional gender roles, placing a "double burden" on women.

The Biopsychosocial Interplay: A Vicious Cycle

A key contribution of this review is mapping the bidirectional relationship between physical and mental risks. Yoshimoto et al. (2021) demonstrated that psychological stress was an independent predictor of pain augmentation. Workers with high stress levels were more likely to report severe pain, supporting the biopsychosocial model where cortisol and muscle tension induced by stress exacerbate nociception (pain perception). Conversely, physical discomfort from poor ergonomics acts as a constant stressor, reducing mental well-being. Shimura et al. (2021) added a nuance regarding "presenteeism." Full-time remote workers were more likely to work while sick because the physical barrier to attending work was removed. This behavior risks long-term burnout and delayed recovery.

Implications for Occupational Health Policy

The findings imply that the "hands-off" approach to remote safety is no longer tenable. Organizations must transition from voluntary guidelines to mandatory support. This includes:

1. Ergonomic Subsidies: Providing allowances for adjustable chairs and external monitors to mitigate MSDs and eye strain.
2. The Right to Disconnect: Implementing policies that strictly define "work hours" to prevent boundarylessness and burnout.
3. Virtual Social Support: Creating structured opportunities for non-work interactions to combat isolation.
4. Gender-Sensitive Policies: Recognizing the unique burden on female caregivers and offering flexible output-based (rather than time-based) performance metrics.

Strengths and Limitations

The strength of this review lies in its use of recent data (2021–2025), capturing the post-pandemic reality. However, limitations exist. Most included studies were cross-sectional, preventing causal

inferences. Additionally, self-reported data carries a risk of recall bias. Future research should prioritize longitudinal designs to assess the chronic effects of remote work on non-communicable diseases and mental health trajectories.

CONCLUSION

This scoping review successfully mapped the multifaceted occupational health landscape of the post-pandemic remote workforce. The findings confirm the hypothesis that the shift to remote work has introduced a "double burden" of occupational risks that are often invisible in traditional safety frameworks. First, regarding physical health, the study concludes that the lack of ergonomic infrastructure in domestic settings is the primary driver of worsening Musculoskeletal Disorders (MSDs), specifically low back and neck pain. This is compounded by emerging metabolic risks, such as weight gain and sedentary behavior, and visual strain due to inadequate lighting standards. Second, regarding psychosocial health, the study establishes that the dissolution of work-life boundaries ("boundaryless working") and the rise of digital surveillance are the dominant stressors leading to burnout, anxiety, and social isolation. The synthesis of evidence reveals a critical bidirectional relationship: psychological distress exacerbates physical pain, and physical discomfort further deteriorates mental well-being, creating a vicious cycle of ill health.

Based on these conclusions, several suggestions are proposed for future action. Organizations should move beyond voluntary guidelines and implement mandatory "Telework Safety Policies" that include subsidies for ergonomic equipment (e.g., adjustable chairs, external monitors) and strict "Right to Disconnect" protocols to protect workers' recovery time. For the scientific community, it is recommended that future research pivot from cross-sectional surveys to longitudinal cohort studies. This is essential to establish causal links between long-term remote work and chronic non-communicable diseases (such as cardiovascular risks from sedentary behavior) and to evaluate the effectiveness of specific interventions like "virtual watercoolers" in mitigating social isolation.

ACKNOWLEDGMENTS

The researcher would like to express his gratitude to those who have contributed to the implementation of the research and the preparation of this article.

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