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Article

Beyond the 48-Hour Threshold: Mapping Long Working Hours, Mental Health Risks, and Pathways to Sustainable Work.

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Name of Author:
Anandraj J.

Affiliation:
Assistant Professor, Institute of Management, Kristu Jayanti (Deemed to be University), Bengaluru, Karnataka, India.

Corresponding Author:
Anandraj J.

Email: *anandraj@kristujayanti.com*

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Abstract: ***Background:*** Long working hours (LWH) represent a growing global challenge with major consequences for mental health, including depression, anxiety, burnout, and diminished quality of life. Despite decades of union struggles, working time remains under-theorised, and its hidden psychological costs are often overlooked in occupational health debates. This review examines how scholarship has mapped the relationship between LWH and mental health across time, sectors, and national contexts. ***Methods:*** A bibliometric review was conducted using 729 publications from Scopus and PubMed (1966-2024). Data were analysed through performance indicators, citation analysis, collaboration networks, and keyword co-occurrence mapping using Biblioshiny and VOSviewer. ***Results:*** Publications in this field have grown at an annual rate of 4.15%, with peak outputs in 2022-2024. Three research clusters dominate: occupational health risks, gendered and psychosocial dynamics, and stress in healthcare and high-demand sectors. Cross-national evidence highlights contrasting lessons - Japan's karoshi crisis, South Korea's working-hour reductions, European duty-hour regulations, and Microsoft Japan's four-day workweek pilot. ***Conclusions:*** This review demonstrates that LWH is not only a labour issue but also a public health determinant. It advances theoretical integration (JD-R and Effort-Recovery models) and proposes practical innovations such as recovery credit systems, cognitive load budgeting, and digital disconnection protocols to support sustainable work design.

Keywords: Long Working Hours - Mental Health - Occupational Health - Public Health Policy - Work intensity - Human resource governance.

INTRODUCTION

An emerging crisis of mental health in long working hours:

Individuals are driven to work in order to fulfil their physiological and security needs (Maslow, 1943; Warr, 2007/2011), often prioritising financial stability over their mental well-being. However, ensuring occupational health and safety requires a strategic approach to alleviate exposure to risk factors, with long working hours (LWH) emerging as a significant threat and which demands attention and intervention to safeguard the health and well-being of employees. Research highlights a strong correlation between working hours and mental health (Dinter et al., 2024; Saltanat Umbetkulova et al., 2023; Hong et al., 2022; Miranti & Li, 2020; Otterbach et al., 2019; Afonso et al., 2017; Otterbach et al., 2016; Zołnierczyk-Zreda et al., 2012; Hammig et al., 2009). Fluctuations in working hours, whether an increase or decrease, can significantly impact mental health (Mullens & Laurijssen, 2024; Vogel et al., 2012; Sato et al., 2020; Olafsen et al., 2024; Ozawa et al., 2023).

The issue of working hours has been a recurrent focal point in trade union struggles, yet within the major traditions of labour theory it has seldom constituted the theoretical nucleus. Webb and Webb (1897), in their foundational work on industrial democracy, conceptualised working hours within a broader programme of structural reform and institutional democratisation, emphasising collective bargaining and regulatory intervention rather than treating working time as a discrete issue (Davanzati & Pacella, 2004; Tosstorff, 2005; Fairbrother, 2008; Aldcroft & Oliver, 2017; Grote & Wagemann, 2018). Marxist theory, by contrast, located the length of the working day within the dynamics of surplus value extraction, treating excessive hours not as a discrete grievance but as a visible symptom of the deeper logic of capitalist exploitation (Roemer, 1982; Blackledge, 2007; Mavroudeas & Ioannides, 2011; Marx, 2020). Functionalist perspectives, while less overtly critical of capitalism, similarly framed working hours as one dimension of the social system's equilibrium, mediated by collective agency to maintain industrial order (Lash & Urry, 1984; Aglietta, 1998; Vivek Chibber, 2022; Floris de Krijger, 2023). In each case, the concern with hours of labour was derivative of wider theoretical commitments whether surplus appropriation, institutional reform, or systemic stability rather than a self-standing foundation of labour theory.

Although these traditions of labour theory made important contributions toward improving working lives, they did not place working hours at the centre of their analysis. Hours of labour were largely treated as one among many dimensions of industrial reform, visible mainly through negotiations over wages, bargaining rights, or structural democratisation. Yet, long working hours exert a more insidious influence: their impact on mental health is often hidden, less observable than accidents, strikes, or wage disputes, and therefore easily overlooked in both theoretical discourse and union agendas (Wan et al., 2021; Shirin Montazer & Young, 2024; Vesper et al., 2025). This neglect underscores a critical gap. By reframing working hours not merely as an economic or industrial relations issue but as a determinant of psychological well-being, contemporary research highlights the urgency of situating them at the core of debates on occupational health and labour regulation.

Despite the expanding empirical evidence linking long working hours to adverse mental health outcomes, the intellectual structure of this field remains insufficiently mapped. Existing reviews primarily synthesise epidemiological findings or focus on specific occupational groups, but they do not systematically analyse how this body of knowledge has evolved over time, which theoretical frameworks dominate, or how research communities are structured across countries and disciplines.

Furthermore, limited attention has been paid to how long working hours research connects to management and organisational scholarship. As a result, the field appears fragmented between occupational health, psychology, and labour studies, with insufficient integration into broader debates on sustainable performance and work design.

Although long working hours research has largely developed within occupational health and epidemiology, its implications extend directly into management and organisational scholarship. Working time is not merely a labour market variable but a strategic organisational design parameter that shapes productivity systems, employee sustainability, and long-term firm performance. By mapping the intellectual evolution and structural fragmentation of this field, this study repositions long working hours research within broader debates on sustainable work systems, human resource governance, and organisational resilience.

To address these limitations, a comprehensive bibliometric analysis is required to map the development, thematic clusters, collaboration networks, and theoretical foundations of long working hours and mental health research.

The first general conference of the International Labour Organisation, through the C001-Hours of Work (Industry) Convention, 1919 (No.1) and other International Labour Standards enforces the primary agenda of regulating and limiting working hours to safeguard employee's wellbeing (ILO, 2024; Bakir, 2021b). According to the Hours of Work (Industry) Convention, working hours of employees must not exceed 8 hours a day and 48 hours per week with partial exemption. Occupational health epidemiologists classify LWH into three categories 41-48, 49-54 and ≥ 55 hours per week and compare them with standard working hours (SWH) which is 35-40 (Li et al., 2020). In certain nations, the concept of LWH is based on national and state regulations. In many cases, average working hours (AWH) are set at 35-40 hours per week, with ≥ 41 hours per week considered overtime (ILO, 2024b).

While regulatory framework aims to limit excessive working hours to safeguard employee well-being (Reisinger et al., 2024; Sovold et al., 2021; Guest,

2017), employers often require a minimum number of working hours to efficiently manage fixed costs associated with hiring (Lambert et al., 2012; Md Omar Faruque et al., 2024). For instance, maximizing the use of physical facilities, minimizing recruitment and training expenses, and reducing welfare costs like social security make it impractical for employees to set their own schedules.

Although lowering wages to offset these fixed costs could theoretically allow for more flexible hours, this approach often conflicts with minimum wage laws and operational requirements (Yu et al., 2023; Guo et al., 2024). Certain production processes also necessitate the simultaneous presence of workers, making flexibility unfeasible (Andersen et al., 2024; Bokrantz et al., 2023). As a result, many workers find themselves unable to reduce their working hours despite their preferences, leading to a disparity between recorded and desired working hours in labour market data (Mullens & Glorieux, 2022; Mullens & Ignace Glorieux, 2023). This constraint has significant implications for labour market analysis and reflects the pressure between economic efficiency and employee autonomy.

Most nations saw a stable decline in average working hours over the second half of the 20th century, however in the 21st century, this general downward trend stopped and, in some cases, even it started to reverse (Addabbo et al., 2023). As time passes, the revolution in industries, including Information Technology and Information Technology Enabled Services (IT/ITES), may transform working hours, potentially leading to longer work hours in the future.

An overview of major difficulties in long working hours:

Long working hours significantly impact physical health, through studies highlighting their association with cardiovascular disease (CVD), stroke, and ischemic heart disease. For instance, individuals working ≥55 hours per week face a 50% higher risk of CVD mortality compared to those working 35-40 hours (Gu et al., 2025). Globally, in 2016, 488 million people exposed to ≥55 hours per week contributed to 745,194 deaths and 23.3 million disability-adjusted life years lost due to ischemic heart disease and stroke (Pega et al., 2021). Johnson (2021) similarly highlights the risks of long working hours, identifying ≥55 hours per week as a critical threshold for adverse health outcomes.

Sector-specific challenges highlight the importance of further regulating working hours. The Maritime Labour Convention (MLC) of 2006 aimed to regulate working hours and improve living conditions for seafarers but has faced challenges with constant implementation but faced implementation challenges, leaving many vulnerable to stress, fatigue, and social isolation (Exarchopoulos et al., 2018). Apart from that, factors such as vibration and noise during voyages, the voyage cycle, environmental conditions, an unpredictable number of port calls, added obstructed seafarers' ability to attain restful sleep (T Alderton et al., 2004).

Similarly, apprehensions about long working hours have been observed in other high-risk jobs. Soliani et al. (2024) found that longer working hours (averaging 14.62 hours before exhaustion) and insufficient sleep (5.92 hours) significantly contribute to truck driver fatigue and the risk of accidents emphasising the importance of tighter working hours and rest times. In healthcare, Song et al. (2024) reported that health workers in China and Indonesia reported higher incidence and severity of voice-related symptoms when they worked longer hours (50–60 hours per week). These findings highlight impact of pandemic influence on working conditions shown by differences in voice difficulties and communication quality. Likewise, Safiye Ghobakhloo et al. (2024) revealed that, longer working hours increase waste recyclers' exposure to toxic metals, significantly elevating Co levels in blood and Fe in urine. These health risks further emphasise the need for regulated work-hour limits and improved safety measures in such environments.

Conversely, Yang et al. (2025) found that employee overtime boosts innovation output but not its quality, and there are no significant differences between state-owned and non-state-owned organisations in China. The impact is weaker in manufacturing and labour-intensive industries; at the same time this study suggests that leniency toward employee rights violations does not enhance competitiveness and offer key policy insights.

This highlights broader societal issue of persistent inequality, where the rich get richer, while the poor remains poor (OSGOOD & CHAMBERS, 2000). Social discrimination and delinquency are undesirable factors that impose significant social costs beyond mere economic reflections. As urbanization accelerates globally, addressing social inequities provides a potential pathway to mitigating delinquency, highlighting the interconnected nature of these societal challenges (Leaw et al., 2015). The results on the implications of long working hours emphasise the need for public health programmes aimed at preventing the negative effects of long working hours while educating on the

relevance of these threats among workers.

METHODOLOGY

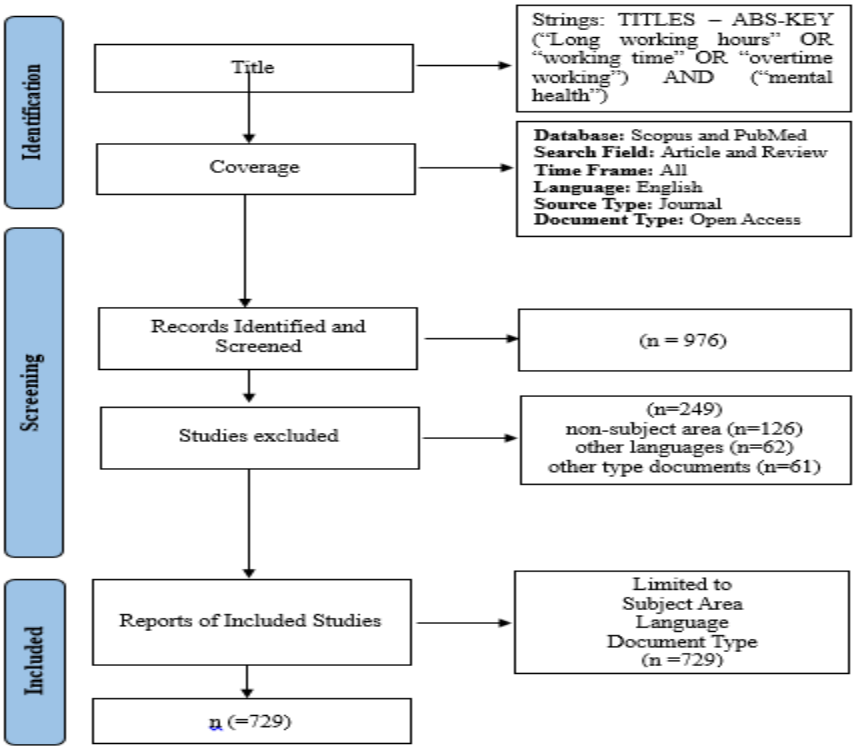
This study employed bibliometric analysis to systematically examine the relevant literature. The analysis was conducted using Biblioshiny, an open-source web-based visualization tool built on RStudio, which facilitates knowledge mapping, network analysis, index computation, statistical evaluation, and thematic exploration. Prior to the analysis, the objectives and scope of the review were clearly defined, in line with the recommendations of Donthu et al. (2021). Bibliometric methods enable a quantitative and structured evaluation of published research, allowing scholars to trace the historical development of a field, identify recurring themes, extract insights from both classical and contemporary sources, and forecast potential future directions. For this study, the R package "bibliometrix" was used as the computational engine, with Biblioshiny serving as the interface for data processing and visualization.

Analytical Framework for Bibliometric Visualisation

To operationalize the bibliometric analysis, this study developed specific objectives and aligned them with appropriate methodologies. The review of existing literature and identification of research gaps guided the choice of analytical techniques. The analyses included publication trends, citation patterns, collaboration networks, and keyword co-occurrence, which together provide a comprehensive understanding of the research landscape on long working hours and mental health.

Table 1. Research Objectives and Methodologies for Working Hours and Mental Health

	Study Objective	Methodologies
Bibliometric Investigation	To explore the evolution of research on long working hours and mental health.	Publication trend analysis
	To identify the most influential nations, journals, and authors in this domain	Citation analysis
	To evaluate the structural dynamics and global collaboration patterns	Collaborations network analysis
	To determine the most impactful and highly cited publications	Factorial analysis.
	To identify and map the theoretical framework and recurring keywords related to long working hours and mental health.	Co-occurrence analysis



Search and Retrieval Strategy

The database Scopus and PubMed were selected as primary sources for this bibliometric analysis. The keywords "mental health" and "long working hours" were identified as the most frequently used terms in preliminary searches. On January 17, 2025, a comprehensive search was conducted in the Scopus database. The search strategy employed "Scopus categories" as filters, with the terms "mental health" and "long working hours" serving as the main retrieval criteria. For the initial phase of data collection, two sets of subject area were identified. The first included the terms "long working hours" and "overtime working", while the second included "mental health" and "mental health care". These key words were applied to ensure a systematic and inclusive coverage of the relevance literature.

Data Acquisition and Dataset Construction

The search was conducted in the Scopus database using the fields Article Title, Abstract, and Keywords, with combinations of terms defined by Rule 1 and Rule 2. The results were entered into the search box .

for each topic. The document type was limited to "Articles" and "Reviews", while the access type was set to "All" (including open access). The publication year filter was set to "All Years."

The preliminary search returned 976 documents covering technology advancement, long working hours, and mental health across multiple subject domains, including psychology, social sciences, arts and humanities, medicine, and multidisciplinary studies. After applying filters for document type (articles and reviews) and language (English), the dataset was refined to 727 publications. Table 1 provides an overview of the first three stages of data screening.

Following the identification of pertinent keywords, the data were exported in CSV format and processed in MS Excel for correction, classification, and selection. The findings were visualized through graphs, tables, and figures. Knowledge mapping and network structures were generated using VOSviewer and the R package Bibliometrix

FINDINGS AND ANALYSIS

Descriptive Analysis of the Dataset

A bibliometric review of 729 publications (1966–2024) from 367 sources reveals steady growth in the field, with an annual increase of 4.15 % and an average of 20.57 citations per work. The literature incorporates 2,747 Keywords Plus and 1,712 author keywords, indicating diverse thematic coverage. Contributions came from 3,299 authors, averaging 5.25 co-authors per paper, with international collaborations accounting for 21.95% of the total output. Most works are research articles (677) alongside 52 reviews, reflecting both active investigation and synthesis in the domain. Table 2 provides an overview of the main characteristics of the dataset.

Table 2: Search Criteria and Article Selection

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1966:2024
Sources (Article, Keyword, Title)	367
Documents	729
Annual Growth Rate %	4.15
Document Average Age	7
Average citations per doc	20.57
References	29982
DOCUMENT CONTENTS	
Keywords Plus (ID)	2747
Author's Keywords (DE)	1712
AUTHORS	
Authors	3299
Authors of single-authored docs	38
AUTHORS COLLABORATION	
Single-authored docs	39
Co-Authors per Doc	5.25
International co-authorships %	21.95
DOCUMENT TYPES	
Article	677
Review	52

RESULTS

The bibliometric analysis findings are presented using tables and visualizations aligned with the research questions, in order to capture the major contributions and research trends concerning long working hours and mental health.

RQ1: What are the performance analysis metrics and publishing trends in the area of mental health and long working hours?

Publication output on long working hours and mental health has increased substantially since the first recorded work in 1966. As shown in Figure 2, growth was modest until the mid-2000s, after which scientific production expanded sharply. The years 2022 (110 articles), 2023 (103 articles), and 2024 (109 articles) recorded the highest publication counts, together accounting for nearly one-third of the total 729 documents published between 1966 and 2024. This steep upward trend highlights the topic's rising global relevance, particularly in connection with occupational health debates during and after the COVID-19 pandemic.

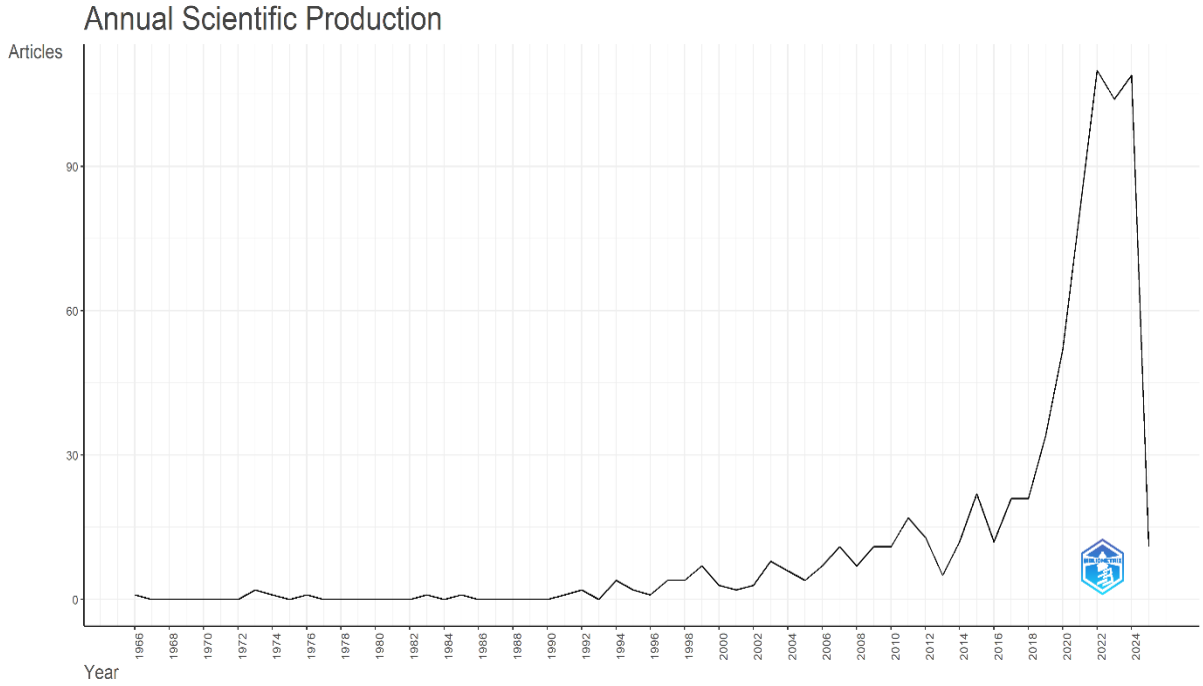


Figure 2. Annual scientific production on long working hours and mental health (1966-2024).

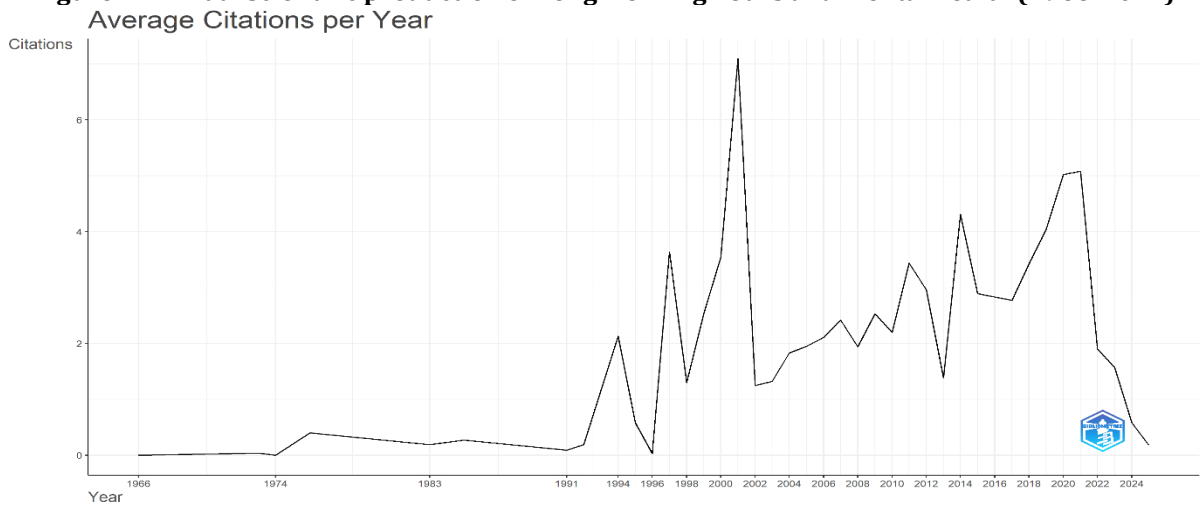


Figure 3. Average citations per year for publications on long working hours and mental health (1966-2024).

Citation trends, however, display greater variability. Figure 3 shows peaks in average citations around 2001 and again during 2016-2018, suggesting that publications in these years produced influential contributions that shaped subsequent research. In contrast, the most recent surge in publications (2022-2024) has yet to accumulate significant citations, reflecting the typical lag between publication volume and scholarly impact.

The distribution of publications also reveals three distinct phases. The first stage (1966-1986) represents the formative years, with only a handful of contributions, reflecting limited scholarly attention to psychosocial dimensions of labour during the early development of occupational health research. The second stage (1987-2007) reflects a gradual consolidation, producing on average more than twice the output of the earlier period. This rise coincided with processes of globalization, economic restructuring, and the spread of flexible labour markets, which renewed concerns over job insecurity and working time (Lanchenko et al., 2025). The third stage (2008-2024) marks the most dynamic expansion, accounting for the majority of publications, including the peak of 109 papers in 2024. The surge during this period can be linked to heightened awareness of work-life balance, the 2008 global financial crisis (Torres et al., 2009), and later the COVID-19 pandemic (Henke, 2022), alongside the broader transformation of globalisation and flexible labour market (Begum et al., 2022), all of which intensified scholarly and policy attention to the mental health implications of extended work hours (International Labour Organisation, 2022; Priya & N, 2024).

Together, these findings indicate that the field has matured from a relatively niche topic into a consolidated area of inquiry. While the rapid growth of output demonstrates heightened academic and policy attention, the fluctuating citation impact underscores the need for more foundational theoretical and methodological work to sustain long-term scholarly influence. Building on these patterns of growth, the next step is to examine how knowledge production in this field has been distributed across countries, journals, and research communities, in order to identify the leading contributors and collaborative networks shaping its development.

RQ2: Which country and institutions provide the largest contribution to the publishing of long working hours and mental health?

Table 3: Top Ten Research Articles Ranked by Global Citation Count

No	Articles	Authors / Year	Citations
1	Health and safety problems associated with long working hours: a review of the current position	SPURGEON A, 1997,	409
2	Gender differences in couples' division of childcare, work and mental health during COVID-19	ZAMARRO G, 2021,	348
3	Suicidal ideation among medical students and young physicians: a nationwide and prospective study of prevalence and predictors	TYSSEN R, 2001, J	319
4	The Effect of Long Working Hours and Overtime on Occupational Health: A Meta-Analysis of Evidence from 1998 to 2018	WONG K, 2019,	236
5	"It's driving her mad": Gender differences in the effects of commuting on psychological health	ROBERTS J, 2011,	229
6	Long working hours and symptoms of anxiety and depression: a 5-year follow-up of the Whitehall II study	VIRTANEN M, 2011,	226
7	Do mental health professionals stigmatize their patients?	LAUBER C, 2006,	226
8	Anxiety and hopelessness levels in COVID-19 pandemic: A comparative study of healthcare professionals and other community sample in Turke	HACIMUSALAR Y, 2020,	188
9	The impact of job stress and working conditions on mental health problems among junior house officers. A nationwide Norwegian prospective cohort stud	TYSSEN R, 2000,	188
10	Stress, burnout, and job dissatisfaction in mental health workers	RÖSSLER W, 2012,	180

The citation structure of the field reflects the influence of key studies that have shaped subsequent research agendas. As shown in Table 3, the most cited work is Spurgeon's (1997) review on the health and safety risks associated with long working hours (409 citations), which provided an early comprehensive synthesis and remains foundational in occupational health literature. Zamarro's (2021) study on gender differences in childcare, work, and mental health during COVID-19 (348 citations) demonstrates how crises reshape labour-family dynamics, while Tyssen's (2001) nationwide investigation of suicidal ideation among medical trainees (319 citations) highlights the vulnerability of health professionals under extended or irregular working schedules.

Other highly cited contributions reinforce these themes. Wong's (2019) meta-analysis consolidated evidence on the occupational health risks of long working hours (236 citations); Roberts' (2011) analysis of commuting linked

mobility burdens to psychological health (229 citations); and Virtanen's (2011) longitudinal study established associations between long working hours, anxiety, and depression (226 citations). Additional influential works include Lauber's (2006) study on stigma among mental health professionals, Hacimusalar's (2020) comparative investigation of anxiety and hopelessness during COVID-19, Tyssen's (2000) cohort study of junior doctors, and Rössler's (2012) work on stress and burnout among mental health workers, each cited between 180 and 226 times. Taken together, the top-cited studies illustrate three dominant research streams in the field: (1) occupational health risks associated with long working hours, (2) gendered and psychosocial dynamics such as childcare and commuting, and (3) mental health outcomes among healthcare professionals. This pattern indicates that while long working hours serve as the unifying concept, its impact is most often explored through the lenses of workplace health, family roles, and professional stress, reflecting the interdisciplinary character of the field.

Performance of Publications

Table 4: Top Publishing Journals by Impact.

Journals	H-index	Cite Score
International Journal of Environmental Research and Public Health	14	8.5
Scandinavian Journal of Work, Environment and Health	12	7.9
BMC Public Health	11	4.9
Journal of Affective Disorders	9	7.80
PLOS One	9	5.4
BMJ Open	8	4.5
Frontiers In Public Health	8	5.5
Industrial Health	8	3.3
International Archives of Occupational and Environmental Health	8	6.5
Frontiers In Psychology	7	6.3

Across 2004-2024, output is concentrated in a set of high-visibility public- and occupational-health outlets. The *International Journal of Environmental Research and Public Health* leads the field in corpus-level influence (h-index = 14) with a high CiteScore (8.5), followed by the *Scandinavian Journal of Work, Environment & Health* (h-index = 12; CiteScore = 7.9) and *BMC Public Health* (h-index = 11; CiteScore = 4.9). Additional hubs include *Journal of Affective Disorders*, *PLOS ONE*, and *BMJ Open*, indicating strong ties to clinical and population-health audiences. The presence of *Industrial Health* and *International Archives of Occupational and Environmental Health* underscores the specialty's occupational-epidemiology anchor, while *Frontiers in Public Health* and *Frontiers in Psychology* reflect growing interdisciplinarity at the interface of work, well-being, and mental health.

Author Productivity Trend

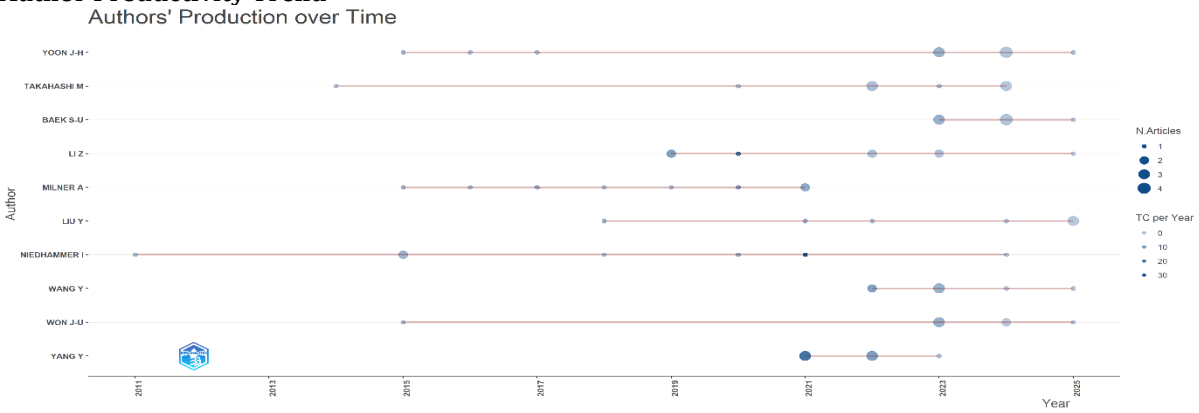


Figure 4. Authors' Productivity and Citation Impact in Long Working Hours and Mental Health Research

Figure 4 illustrates the publication trends of the top ten contributing authors in this research domain. Yoon J.-H., Takahashi M., and Baek S.-U. emerge as sustained contributors, consistently producing multiple articles across several years, which underscores their ongoing commitment to building a cumulative research agenda around long working hours and mental health. Authors such as Li Z., Milner A., and Liu Y. also show steady productivity, with recent publications suggesting that their influence is expanding in the current phase of scholarship.

Niedhammer I. stands out as an early pioneer, with contributions spanning more than a decade, highlighting their foundational role in shaping the field's direction. In contrast, Wang Y., Won J.-U., and Yang Y. represent a newer wave of researchers whose recent publications have already gained visible citation traction, signalling their growing prominence in the global research landscape.

Taken together, the figure highlights a dual pattern: long-term contributors who provide continuity and depth, and emerging authors who inject new perspectives and expand the thematic scope of inquiry. This combination of established and rising researchers suggests that the field is both consolidating around core expertise and diversifying with fresh intellectual contributions, which is essential for sustaining long-term scholarly growth.

Trend on Countries by Citations

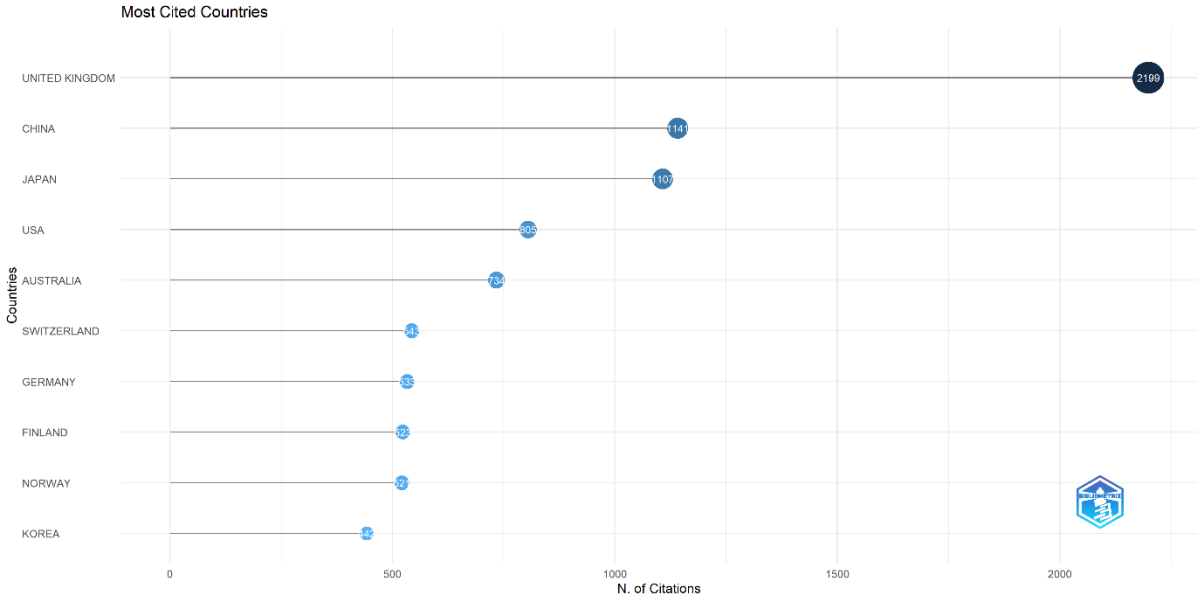


Figure 5. Most Cited Countries Contributing to Research on Long Working Hours and Mental Health.

Figure 5 highlights the top ten countries receiving the highest number of citations in this research domain. The United Kingdom leads by a significant margin with 2,199 citations, underscoring its central role and longstanding research tradition in occupational and public health. China (1,141 citations) and Japan (1,107 citations) follow, reflecting the increasing investment of Asian countries in labour and mental health research, particularly in the context of rapid industrialization and changing work cultures. The USA (805 citations) and Australia (734 citations) occupy the next positions, demonstrating their strong academic networks and contributions to global health debates.

European countries such as Switzerland (546 citations), Germany (533 citations), Finland (523 citations), and Norway (512 citations) are also prominent, indicating how smaller but research-intensive nations have achieved high scholarly impact relative to their size. Korea, with 442 citations, completes the top ten, highlighting its emerging role in addressing work-related health concerns.

Overall, the results show that research influence is concentrated in a few leading nations. The dominance of the UK, alongside the rising contributions of China and Japan, points to both continuity in established research hubs and the growing diversification of knowledge production. Meanwhile, the visibility of Nordic countries highlights how institutional expertise and policy-driven research priorities contribute disproportionately to global scholarship on long working hours and mental health.

Combination of keyword and mapping network analysis

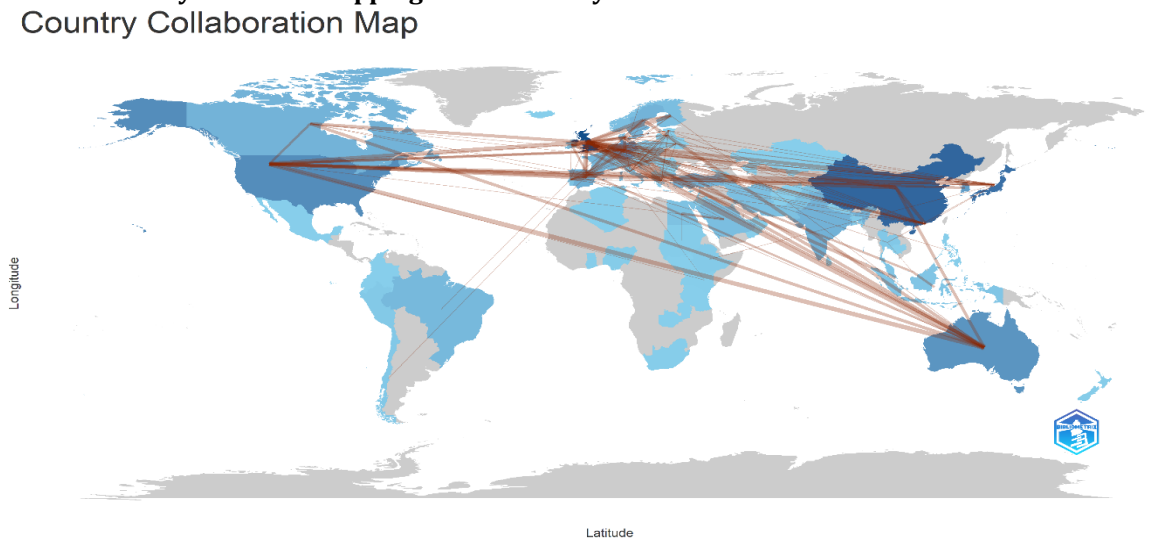


Figure 6. Global Collaboration Networks in Long Working Hours and Mental Health Research.

As shown in Figure 5, the United Kingdom, China, and Japan emerge as the most influential countries in terms of citation impact, with the UK leading by a substantial margin (2,199 citations). Other major contributors include the USA, Australia, Switzerland, Germany, Finland, Norway, and Korea, which together highlight the strong presence of both Western and Asian nations in shaping the field. These citation patterns suggest that research leadership is not concentrated in a single region but distributed across advanced economies with strong traditions in occupational health, epidemiology, and public health research.

The Country Collaboration Map (Figure 6) complements this by demonstrating how scholarly impact is reinforced through international partnerships. The darker shades indicate the high publication output of countries such as the USA, China, the UK, Australia, and European nations, while the connecting lines illustrate cross-border co-authorships. Particularly strong links exist between North America, Europe, and East Asia, forming a triangular collaboration network that anchors global research in this domain. Europe shows dense internal collaboration, whereas transcontinental partnerships extend toward Asia, North America, and Oceania, indicating both regional integration and global outreach.

Nations with higher citation counts also tend to be deeply embedded in international networks, suggesting that visibility and scholarly impact in the field of long working hours and mental health are closely tied to global research integration.

Keyword co-occurrence Analysis

The co-occurrence network map Figure 7, generated using VOSviewer highlights the most frequently used author keywords in this research domain, indicating prevailing themes and interconnected topics. The dominant keywords include “mental health,” “COVID-19,” “depression,” and “burnout,” reflecting a strong research focus on the psychological impacts of the pandemic and occupational stress. Closely linked terms such as “occupational health,” “healthcare workers,” “job stress,” “quality of life,” and “psychological distress” further emphasize concerns related to work environment and employee well-being. Additional clusters include keywords related to sleep quality, work hours, resilience, public health, and social support, suggesting a multidisciplinary approach involving mental health, occupational safety, and public health. Overall, the co-occurrence network illustrates how research has evolved around core mental health issues while increasingly integrating pandemic-related concerns and occupational risk factors. This pattern underscores the dynamic and interdisciplinary development of the field.

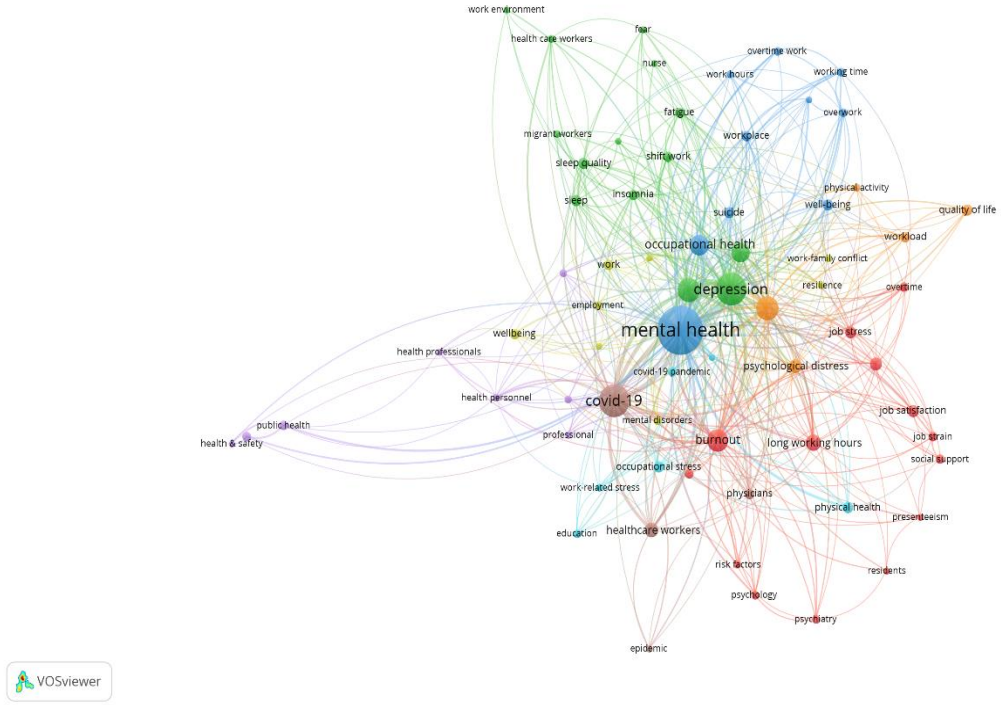


Figure 7. Mapping Thematic Clusters in Long Working Hours and Mental Health Literature.

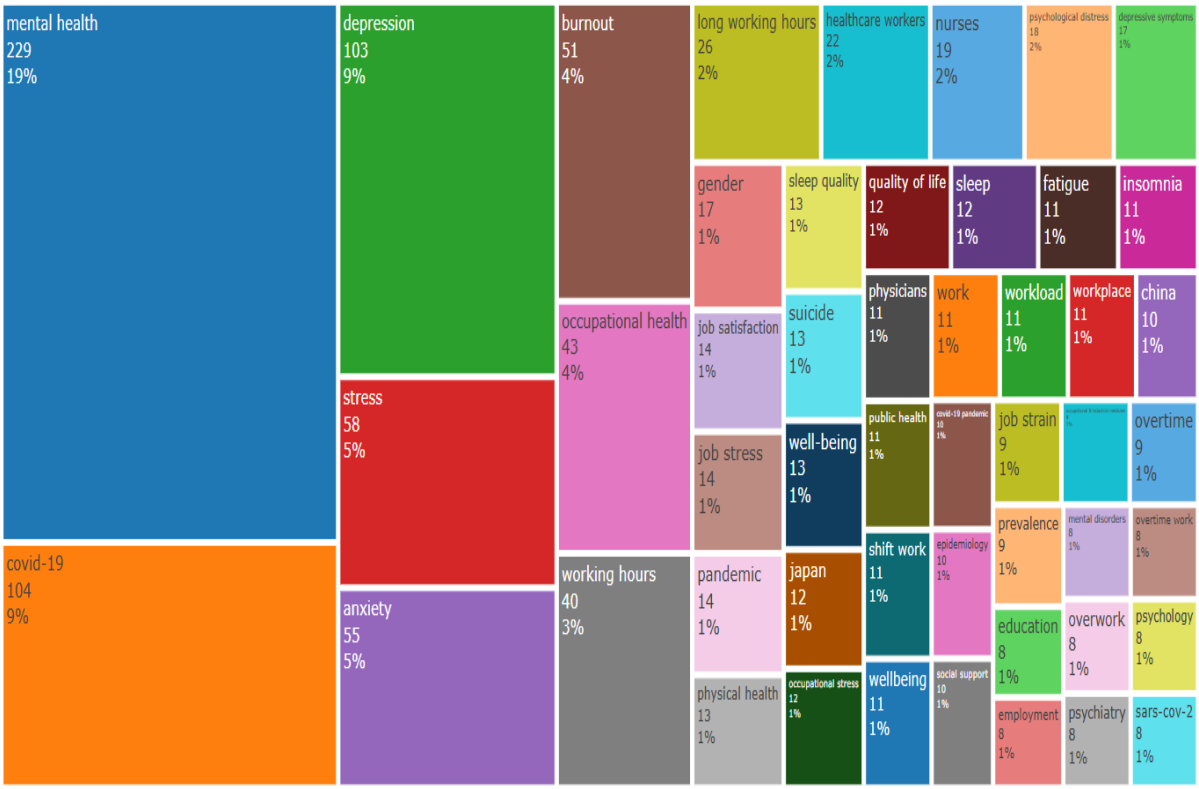


Figure 8. Research Hotspots Identified by Author Keyword Frequency

The tree map visualization (Figure 8) reinforces the co-occurrence network findings (Figure 7), presenting the relative frequency of the most influential keywords. Mental health (229 occurrences, 19%) clearly dominates, followed by COVID-19 (104, 9%), depression (103, 9%), stress (58, 5%), anxiety (55, 5%), burnout (51, 4%), and occupational health (43, 4%). Collectively, these highlight the field's sustained focus on psychosocial well-being and pandemic-related disruptions.

Work-related factors are also strongly represented, with terms such as working hours, long working hours, healthcare workers, nurses, and psychological distress, emphasizing the intersection of occupational stressors and employee well-being. Keywords like sleep quality, quality of life, fatigue, and insomnia demonstrate growing interest in lifestyle and health-related consequences of extended work commitments. Meanwhile, terms such as gender, suicide, and job satisfaction suggest that the literature increasingly addresses vulnerable populations and broader social determinants of mental health.

Overall, Figures 7 and 8 together reveal a dual emphasis:

1. **Core psychological constructs** (mental health, depression, anxiety, burnout) and their pandemic intensification (COVID-19).
2. **Occupational and contextual determinants** (working hours, healthcare workers, job stress, sleep quality, quality of life), highlighting how structural work conditions affect mental well-being.

This combined analysis underscores the field's interdisciplinary orientation, bridging mental health, occupational safety, and public health research.

Theoretical Implications

This bibliometric review consolidates and extends the theoretical foundations linking long working hours (LWH) to mental health outcomes by synthesizing two decades of research into an integrated framework. Previous studies (Salgado-Peralvo et al., 2025; Dong et al., 2025; Hong & Skiba, 2024; Butt et al., 2025) consistently demonstrate that prolonged working hours are associated with heightened risks of depression, anxiety, burnout, and reduced quality of life. The keyword co-occurrence analysis in this study reinforces these findings, showing a tightly connected cluster of mental health, burnout, depression, anxiety, and occupational health, which aligns with established theoretical models such as the Job Demands-Resources (JD-R) framework and Effort-Recovery theory. Both models emphasize that sustained job demands-such as extended working hours-deplete psychological and physiological resources, producing strain and adverse health outcomes unless adequate recovery opportunities are provided (Li et al., 2025; Demerouti & Bakker, 2022; Upadyaya et al., 2016).

Beyond direct associations, the evidence underscores several indirect pathways through which LWH affects mental health, including work-life imbalance (Baek et al., 2024; Priya et al., 2025), sleep deprivation (Fadel et al., 2023, pp. 227–243; Jiang et al., 2025; Priya V & Savitha, 2026a), and occupational stress (Lemke et al., 2023; Kerr et al., 2021). However, the bibliometric evidence adds new dimensions to theory-building in this field. First, the strong clustering of *COVID-19* with keywords such as burnout, healthcare workers, and mental health highlights the pandemic as a disruptive catalyst that reshaped the discourse on LWH. This suggests that classical frameworks like JD-R may require refinement to incorporate compound stressors (crisis + workload), where external shocks (e.g., pandemics, economic crises) amplify job demands and simultaneously restrict recovery opportunities.

Second, the country collaboration mapping reveals distinct regional patterns, particularly dense European interconnections and strong transcontinental networks. This indicates that the impact of LWH is not universal but rather moderated by cultural norms and institutional frameworks. For example, the EU Working Time Directive provides structural protections that mitigate risks, whereas overwork cultures in East Asia persist despite policy efforts. Theoretically, this underscores the need for multilevel models that incorporate both micro-level determinants (job type, individual coping strategies) and macro-level moderators (labour policies, cultural values).

Finally, the bibliometric mapping demonstrates the multidisciplinary nature of this domain, with intersecting contributions from psychology, occupational health, public health, and sociology. This signals a shift toward a systems-oriented perspective, emphasizing that LWH is not merely an economic or labour-market issue but a broader public health challenge linked to social inequality, gender disparities, and global labour standards (Rachel Cox Stevens, 2024; (Marslev & Whitfield, 2025). Future theoretical models should therefore move beyond discipline-specific explanations, integrating structural, cultural, and individual factors to explain the persistence and varied impacts of long working hours across contexts.

Practical Contributions

The findings of this study have several direct applications for policy, organisational practice, and occupational health interventions. First, the identification of high-impact countries, such as the United Kingdom, China, and Japan, suggests where existing best practices and regulatory frameworks may be evaluated and adapted. For example, the *ILO's Maritime Labor Convention: Amendments to Improve Seafarer Working and Living Conditions* (2025) including new frameworks to review and potentially align hours of work and rest provisions across ILO and IMO standards offer globally recognised

benchmarks that could be more rigorously enforced to reduce excessive work hours, especially in high-risk sectors.

Lessons from Global Experiences provide a strong foundation for evidence-based reform. Japan's *karoshi* crisis highlights how unchecked overtime escalates into systemic health and productivity failures, forcing the adoption of stricter regulations and employer accountability (Herbig & Palumbo, 1994; Acosta, 2025; Sanmargaraja et al., 2021). South Korea's decision to lower its legal weekly cap from 68 to 52 hours demonstrates that prolonged hours depress, rather than enhance, national innovation and workforce vitality (Kim & Min, 2023; Yoon et al., 2018). By contrast, Microsoft Japan's four-day workweek pilot showed that restructuring schedules can simultaneously increase productivity by 40% while reducing operational costs (Oluwadare et al., 2024; Schor, 2025). Similarly, European aviation and healthcare regulations, which strictly cap continuous duty hours to prevent fatigue, illustrate how protecting worker recovery safeguards not just employees but also public safety (Folke & Melin, 2024; Minoretti et al., 2024; Wingelaar-Jagt et al., 2021;Priya V & Savitha, 2026a). Collectively, these lessons reveal that the trade-off between productivity and worker health is false-well-designed systems can deliver both.

Future Research Directions

This review highlights several novel avenues for advancing the study of long working hours (LWH) and mental health, moving beyond traditional survey-based approaches.

First, neurocognitive mechanisms of overwork require systematic investigation. Existing evidence relies predominantly on self-reported stress and health surveys, which, while valuable, lack precision in capturing underlying brain processes. Future studies should employ neuroscientific methods such as functional MRI (fMRI), electroencephalography (EEG), and digital cognitive testing to assess how prolonged working hours impair executive functions, including decision-making, memory, and problem-solving. Early findings already link chronic stress to diminished prefrontal cortex activity and reduced cognitive flexibility (Knauft et al., 2021; Leso et al., 2021; Luciana & Collins, 2022), underscoring the potential of this approach. Such insights could establish more scientifically grounded thresholds for safe work limits, particularly in high-stakes sectors like finance, cybersecurity, and air traffic management.

Second, AI-enabled predictive fatigue models represent a paradigm shift from descriptive monitoring to proactive prevention. By integrating work schedules, digital activity logs, and biometric data, machine learning systems can forecast fatigue risks before they manifest in errors, accidents, or productivity losses. Emerging research on workplace wearables and real-time analytics (Shukla et al., 2024; Hadi et al., 2025; Patel et al., 2021) demonstrates the feasibility of such interventions. Future studies should refine these predictive systems to balance accuracy with ethical considerations, including employee privacy and data security.

Third, lifespan and intergenerational impacts of overwork deserve greater scholarly attention. Early-career exposure to excessive hours may increase vulnerability to chronic illnesses, mental health disorders, and burnout across the life course. At the same time, parental overwork may shape children's well-being and future work orientations, perpetuating a culture of overwork across generations (Li, 2025; Nomaguchi & Milkie, 2017). Adopting a lifespan and family systems perspective would broaden the scope of occupational health research, reframing LWH as not only an individual health risk but also a multigenerational concern with direct implications for workforce sustainability.

Collectively, these directions extend the field toward an interdisciplinary, technology-driven, and future-oriented agenda, bridging occupational health, neuroscience, and data science. They encourage scholars and policymakers alike to reconceptualize long working hours not simply as a labour-market issue but as a complex biopsychosocial phenomenon with global and intergenerational consequences.

Conflicts of Interest

The authors declare no conflicts of interest.

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