Systematic Reviews

PROTOCOL

Open Access

Barriers and facilitators impacting the implementation of digital interventions targeted at mental health and musculoskeletal disorders in the workplace: a scoping review protocol

Mallorie Leduc[1,2], Andrea Sinesi[3], Margaret Kenneally[1,2], Margaret Maxwell[3], Birgit Greiner[1], Birgit Aust[4], Carolina Piña[5], Andreas Czaplicki[6], Evelien Coppens[7], Alex Burdorf[8], Ricardo Gusmão[9], Daniel Guinart[10,11], Johanna Cresswell-Smith[12], Gentiana Qirjako[13], Naim Fanaj[14], Eleftherios Giovanis[15], Ainslie O'Connor[16], Eva Zsak[17], Pedro Lobo[18], Arlinda Cerga Pashoja[19], Victoria Ross[20], Ella Arensman[1,2,20], Eve Griffin[1,2*] and the PROSPERH Consortium

Abstract

Background The digital transition in the workplace has increased trends such as permanent connectivity, an increased sedentary lifestyle, and reduced social interaction, leading to additional psychosocial and ergonomic risks for workers. Musculoskeletal disorders (MSDs) and mental health problems are particularly prevalent, posing a significant burden. To address these challenges, organisations can implement digital or blended interventions targeting MSDs and mental health problems. However, there is still limited evidence on combined workplace interventions targeting both MSDs and mental health problems and respective facilitators and barriers for their successful implementation and sustainability. The objective of this scoping review is to identify barriers and facilitators to the implementation of blended and digital interventions targeted at combined mental health and MSDs in the workplace.

Methods Bibliographic databases will be searched for studies published since 2014 and reported on the implementation of interventions with a digital component targeted at mental health and MSDs in the workplace. Studies will be included if the intervention was delivered within, or access provided through, the workplace. The title and abstract screen and the full-text screening will be completed independently by two reviewers, with a third reviewer resolving any arising conflicts in the process.

Results Descriptive characteristics of the study design, workplace sector, mode of working, intervention details, mode of intervention delivery, outcomes, and barriers and facilitators will be extracted. Results will be reported in accordance with the PRISMA for Scoping Reviews checklist and a narrative synthesis used to summarise characteristics of included studies, as well as barriers and facilitators to the implementation of interventions.

*Correspondence:
Eve Griffin
evegriffin@ucc.ie
Full list of author information is available at the end of the article

Discussion The findings from this review will provide practical recommendations relevant to researchers and practitioners developing or implementing digital interventions in the workplace targeting mental health conditions and MSDs.

Systematic review registration Research Registry, reviewregistry1847, https://www.researchregistry.com/browse-the-registry#registryofsystematicreviewsmeta-analyses/registryofsystematicreviewsmeta-analysesdetails/66671b683a0f410028a230bd/.

Keywords Mental health, Musculoskeletal disorders, Intervention, Implementation, Barriers, Facilitators, Digital, Occupational health, Workplace

Background

Musculoskeletal disorders (MSDs) and mental health conditions are among the most prevalent health problems in the workforce. MSDs represent the main physical health reason for work absenteeism globally [1]. In the EU, a recent survey by the European Agency for Safety and Health at Work indicated that approximately 60% of workers report MSD complaints, including low back pain, neck and upper extremity pain, and disorders [2]. Internationally, there is consistent evidence of the increasing prevalence of work-related MSDs in recent decades, as indicated by the Global Burden of Disease Study [3].

Mental health difficulties are also common in the working population. They represent a significant burden and contribute to increased absenteeism, presenteeism, and workplace accidents and decreased productivity [4]. The recent COVID-19 pandemic has clearly accelerated the shift to teleworking and blended working arrangements in many workplaces, and there is evidence that this has contributed to the onset of worsening of a range of mental health problems, particularly depressive and anxiety symptoms and burnout, and MSDs as well [5, 6]. The impact of mental health problems within the workplace on individuals, the economy, and wider society is considerable. Solely for work-related depressive conditions, it is estimated that the total cost to the EU economy is approximately EUR 620 billion per year, roughly equivalent to 4% of gross domestic product [7]. There is evidence of comorbidity of MSDs and mental health problems among workers in different sectors. It is thus important to consider interventions that target both physical and mental health to maximise their effectiveness and provide adequate support to workers experiencing comorbid conditions [8, 9].

The ongoing digital transition in the workplace and recent events such as the COVID-19 pandemic have greatly accelerated the pace of change in workplace settings, with important consequences for workers' wellbeing. The EU Strategic Framework on Health and Safety at Work 2021–2027 indicated that almost 40% of workers began to work remotely after the start of the COVID-19 pandemic [10]. New work practices and forms of work management have thus emerged, with remote-working trends such as permanent connectivity and reduced social interaction leading to additional psychosocial and ergonomic risks for workers [11]. Additionally, other factors such as the demographic change due to an ageing workforce and increased sedentarism pose important challenges to the physical and mental health of workers [12].

Consequently, there are strong reasons for organisations to implement interventions and programmes that target MSDs and mental health conditions [13]. Interventions in the workplace can take place at different levels, including organisational, peer, or individual aspects and target different aspects such as prevention (of ill health), promotion (of positive health), and/or support (with existing health conditions) [14]. Additionally, they can be delivered face to face, digitally, or in a blended fashion. Existing literature seems to suggest that multilevel interventions targeting both the individual and the organisational level are more likely to be effective in the promotion of mental well-being and in supporting individuals experiencing a range of mental health conditions [15–17]. Furthermore, there is some evidence that integrated interventions which prevent mental health problems by reducing risk factors, promoting mental wellbeing in the workplace and addressing mental health conditions among workers may provide the greatest benefits [18]. With regard to workplace interventions targeting MSDs, prevention programmes and ergonomic interventions in the workplace have shown some evidence of effectiveness [19, 20]. Similar to interventions targeting mental health, a recent review of reviews indicated that multicomponent programmes targeting MSDs (e.g. through changes to the working environment and concurrent physical training) provide various advantages and are associated with a higher likelihood of successful delivery [21].

While there is no scarcity of studies examining the effectiveness of interventions targeting physical and mental health in the workplace, there is still limited evidence on the facilitators or barriers for the successful

implementation and delivery of interventions. Implementation science can be used to examine the specific process factors that may facilitate or hinder interventions targeting MSDs and mental health conditions in the workplace [22]. Currently, however, there is a paucity of implementation research in work settings with robust evaluations, and this is particularly true for those blended and digital interventions that have mostly been implemented in recent years [23]. Arguably, digital interventions will become more and more common in the near future. Several recent studies suggest that, in fact, digital and blended interventions can provide various advantages for implementation in a workplace (e.g. accessibility, shorter duration, flexibility of timing) [24–27]. However, they may also pose additional challenges with regard to factors such as uptake, adherence, confidentiality issues, and continued engagement [24–27]. In addition to the mode of delivery of the intervention, the workplace setting and work arrangement may also have an impact, as there is evidence of high prevalence and negative impacts of both poor mental health and MSDs among workers in the construction and healthcare sectors and for workers in telework and ICT-based mobile work (TICTM) arrangements [1, 8, 9, 17, 28, 29].

Promoting positive mental and physical health at work in a changing environment: a multi-level approach (PROSPERH) is a Horizon Europe — the Framework Programme for Research and Innovation (2021–2027), funded programme of research which aims to improve physical and mental health in the workplace by developing, implementing, and evaluating a multi-level intervention. The intervention will include a digital platform with three components focusing on combined physical and mental health promotion, online self-management, and signposting or coaching referral pathways. Development of the PROSPERH platform will build on existing tools developed exclusively for mental health and knowledge developed in a previous Horizon 2020-funded project Mental Health Promotion and Intervention in Occupational Settings (MENTUPP, https://www.mentupppproject.eu). The current review is thus warranted to summarise recent evidence on barriers and facilitators to the implementation of a specific delivery mode, digital (fully or partly) interventions, targeted at a specific intervention focus, combined mental health problems and MSDs, in specific work sectors and working arrangements [27]. In congruence with the outlined purposes, a scoping review approach is recommended when seeking to identify key factors or characteristics related to a concept alongside the intention of the resulting findings informing best practice [30].

The aim of this systematic scoping review is to identify barriers and facilitators to the implementation of blended and digital interventions targeted at combined mental health and MSDs in the workplace. While studies examining interventions in all sectors and modes of work will be considered, results will be synthesised by sector for a specific focus on implementation learnings in line with the focus of the PROSPERH project, the construction and healthcare sectors, and TICTM arrangements.

Methods/design

Protocol and registration

The development of the protocol was guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) extension for Scoping Reviews (PRISMA-ScR) checklist [31]. The completed checklist is included as an additional file. The protocol has been registered with the Research Registry, reviewregistry1847, and can be accessed at https://www.researchregistry.com/browse-the-registry#registryofsystematicreviewsmeta-analyses/registryofsystematicreviewsmeta-analysesdetails/66671b683a0f410028a230bd/.

Information sources and search strategy

A comprehensive search strategy will be developed with input from medical librarians from University College Cork, Cork, Ireland, and University of Stirling, Stirling, Scotland. The search strategy will be composed of free text and controlled vocabulary terms for the key concepts listed above. The search strategy will be adapted and conducted in four electronic databases: MEDLINE, APA PsycINFO, Academic Search Complete, and Business Source Complete. A full electronic search strategy for each database can be found in Supplementary File 1. It is anticipated that searches will be conducted by members of the research team in June 2024. Forward and backward citation chaining will be completed on included studies and backward citation chaining of all systematic reviews and protocols of systematic reviews or scoping reviews identified after the first screening. Limited hand-searching of the two journals where included papers were published most frequently will also be conducted as recommended by a university librarian.

Selection of sources of evidence

The main aim of the review will be to identify barriers and facilitators to the implementation of interventions with a digital component targeted at mental health and MSDs in the workplace. More specifically, results will be synthesised by sector for a specific focus on implementation learnings from within the construction and healthcare sectors and also TICTM modes of working.

Eligibility criteria

Key definitions

The definitions of the following key concepts guided the development of the search protocol, proposed screening process, eligibility criteria, and the expected data extraction:

- *MSDs* are defined as 'impairments of bodily structures such as muscles, joints, tendons, ligaments, nerves, cartilage, bones and the localised blood circulation system' [32]. All MSDs, chronic and non-specific, will be included and documented as specified. Conditions related to diabetes mellitus, acute injuries, fractures, sprains, or accidents will be excluded.
- *Mental health* is defined as 'a state of mental wellbeing that enables people to cope with the stresses of life, realise their abilities, learn well and work well, and contribute to their community' [33]. A broad approach to the inclusion criteria for mental health will be utilised to encompass mental wellbeing, burnout, depression, and anxiety disorders and symptoms. Severe mental health problems (e.g. schizophrenia, psychosis) will be excluded.
- *Workplace settings* are defined as an enterprise, irrespective of size, which operates with paid employees. Workplace settings within all industry sectors will be included if the intervention was delivered within or access was provided through the workplace.
- *Workplace interventions* are health promotion and occupational health strategies implemented within an organisation to protect health, to promote health and wellbeing, and/or to manage illness within the workplace.
- *Digital workplace interventions* refer to interventions delivered via an application or website, facilitated by technology, with access provided in the workplace (e.g. awareness and informational resources, training materials, screening questionnaires, self-monitoring, self-management, signposting of online supports, care pathway recommendations).
- *Blended workplace interventions* include the combined approach of intervention elements delivered in-person within the workplace in addition to a digital intervention.
- *Barriers* are any factors that act as challenges for delivering or implementing interventions to address MSDs and mental health conditions in workplace settings [34].
- *Facilitators* are any factors that act as an enhancement for delivering or implementing interventions to address MSDs and mental health conditions in workplace settings [34].

Study designs

All study designs, quantitative, qualitative, or mixed methods, will be included that report in the title or abstract relevant aspects of implementation in relation to combined MSDs and mental health interventions containing a digital component delivered in or through the workplace. For inclusion, studies must be published in English language peer-reviewed journals, and all opinion articles and grey literature will be excluded, as within this context they are unlikely to provide the required robust and high-quality evidence typically found in peer-reviewed publications. Grey literature, including reports from organisations that may have inherent biases due to particular interests, may negatively impact the reliability of our findings on barriers and facilitators for interventions implemented in the workplace. Additionally, the proposed scoping review is part of a larger EU-Horizon funded project with predetermined milestones and deliverables to achieve, and a complete exploration of grey literature is unfeasible within these time constraints.

Population

Studies will be included that involve participants within the working population, who are employed (full-time, part-time, contract, on leave) within the workplaces and settings where the respective combined MSDs and mental health intervention was delivered.

Interventions

The aims of the included workplace interventions must target combined mental health and MSDs, as defined above. Interventions with a singular focus on either physical or mental health or objectives aimed at broad health promotion (e.g. physical activity, blood pressure, healthy eating) or workplace-specific initiatives (e.g. job satisfaction, work engagement) will be excluded.

Studies with workplace interventions will be included that are delivered via or contain a digital element. A blended workplace intervention approach of involving both a digital and in-person element will also be included. However, workplace interventions delivered solely in-person, print-based (information leaflet, brochure, flyer, or poster), or are a one-off occurrence (guest speaker) will be excluded. A guest speaker would be deemed to be a one-off if it was not mentioned that it was a part of a larger intervention. Likewise, an informational resource will also be excluded if it is also deemed to not be a part of a larger intervention. The judgement of the intervention scope will be made at the full-text review stage based on the description provided. In cases of uncertainty, the research team will make contact with the corresponding authors for more detailed descriptions of the interventions.

Outcomes of interest

Included studies must report barriers or facilitators on at least one component related to implementation research of workplace interventions. In line with the RE-AIM framework, any one of the following implementation outcomes must be reported for inclusion of the study: reach, effectiveness, adoption, implementation, fidelity, maintenance and sustainment, or additional contextual factors [35]. For the included studies, primary and secondary outcomes related to the intervention effectiveness will be charted, if available. Studies that solely report on the effectiveness of the intervention and do not report on the barriers and facilitators of implementation will be excluded.

Types of settings

The studies included will have delivered the intervention or provided access to the intervention within or facilitated through the workplace setting. All modes of working, industry sectors, organisation size, and geographical locations will be included and categorised.

Language

Included studies will be limited to peer-reviewed literature published in the English language as translation services are not available. To mitigate the limitation of potential language bias, we will consult with experts within our international consortium of 16 academic partners representing 11 different languages for any publications in languages other than English which may be relevant to consider for inclusion in the review.

Publication date

The inclusion criteria will be set for studies published in the previous 10 years, from 2014 to June 2024. The most recent published literature is of relevance to the review in order to account for the rapidly changing work environments arising from the digital and green transitions, in addition to the impacts of the COVID-19 pandemic [36]. As the findings will inform the development, implementation guidance, and evaluation of an intervention designed for workplaces, recently published information will be of most relevance.

Study selection

All citations will be imported into Covidence systematic review software to provide a web-based collaborative platform to remove duplicates and for two reviewers to screen titles and abstracts and review full-text studies [37]. Two reviewers will independently and blindly review titles and abstracts for retrieval and inclusion in the full-text review stage. The involvement of a third reviewer is required to resolve any arising conflicts in the assessment process. All studies moved forward to the full-text review stage will also be reviewed and assessed independently and blindly by two reviewers to verify the inclusion criteria are satisfied. Similarly, a third reviewer will be consulted to resolve any conflicts for final inclusion into the review. The search process and reasoning for exclusion at the full review stage will be documented and reported within a PRISMA flow diagram [38].

Data charting process

The Template for Intervention Description and Replication (TIDieR) checklist and RE-AIM framework will inform the intervention and implementation data extraction charting [35, 39]. A data extraction template will be developed, pilot tested on four included studies, and revised as needed to ensure alignment with the study objectives. Descriptive characteristics of the study, study design, workplace sector, workplace size and mode of working, implementation details including barriers and facilitators, characteristics of the intervention, mode of intervention delivery, and primary and secondary intervention effectiveness outcomes, if available, will be extracted from the included studies. Two reviewers will independently extract the data from 15% of the included studies to verify accuracy and completeness [40]. Arising conflicts or uncertainties will be resolved in discussions with a third reviewer or with contacting authors to request further information or clarity.

Quality appraisal

Quality appraisal of the included studies is often not carried out within scoping reviews; however, it is recommended if there are recommendations for practice or policy arising from the review [30]. The current scoping review aims to inform the implementation guidelines for the PROSPERH intervention. Consequently, the Mixed Methods Appraisal Tool (MMAT) Version 2018 will be used to appraise the methodological quality of the included studies [41]. Two reviewers will independently complete the checklist according to the study methodology and provide comments on each criterion related to the methodological quality. As recommended, results from each criterion will be presented to inform the overall quality appraisal rather than an overall score [41].

Synthesis of results

Results of the systematic scoping review will be guided by and reported in accordance with the PRISMA-ScR checklist [31]. A narrative synthesis will be conducted on the descriptive characteristics of the included studies. The identified barriers and facilitators, contributing factors, and strategies to address the factors will be reported. A detailed description of the characteristics of the included

interventions will be reported (e.g. aims, description of the components, frequency, duration, and mode of delivery). The overall presentation of findings will be cross-sectoral as it is anticipated that a range of workplace sectors will be represented. As stated, we are also specifically interested in the construction, healthcare, and TICTM sectors and will report on findings within these sectors where there is sufficient sector-specific data from individual studies or from cross-sector studies which also sufficiently report separate findings on specific sectors. If sources of evidence provide sector and workplace details, sector-specific data will also be summarised according to the European Union classification of economic activities for the construction and healthcare sectors [42]. The construction sector includes civil engineering and general and specialised construction activities (divisions 41–43) [42]. The healthcare sector includes the provision of human health activities in hospitals, medical and dental practice settings, and residential nursing and care settings and facilities (divisions 86–87) [42]. In addition to highlighting sector-specific findings, evidence of barriers and facilitators by mode of working, such as remote working or digital technology assisted working enabled by digital technologies outside the employers' office or premise (TICTM), will be reported [43].

Discussion

The summarised main results will be focused on identifying implementation considerations, both barriers and facilitators, for combined mental health and MSDs interventions in the workplace to inform the development, feasibility testing, and evaluation. Specifically, the initial synthesis of main findings will be cross-sectoral to inform and support the development of the implementation guidance for the PROSPERH project. Specifically, findings and considerations will be shared with the PROSPERH project team to inform decision-making in relation to intervention content, features, and optimal delivery. If evidence is available, implications and specific recommendations relevant for the construction and healthcare sector will be shared to improve interventions targeted at the respective sector. Likewise, evidence of considerations for the implementation of interventions conducted in workplaces with TICTM arrangements will also be highlighted and potential implications for practice discussed. The findings are expected to provide a unique contribution and be relevant to researchers, policymakers, and practitioners designing, developing, and implementing digital interventions in the workplace targeting both mental and physical health aspects to overcome the identified barriers and leverage the facilitators. Specifically, it is expected that the findings from the review will inform the design of practical recommendations for the development and implementation of interventions in occupational settings and, where possible, sector-specific recommendations. With regard to indicating specific strategies for different industries, previous digital mental health interventions have recommended attention to the use of language that may be interpreted as too abstract or too theoretical in developing materials for use within the construction sector [44]. Furthermore, for workers in the healthcare sector, consideration should be given to the developed materials to ensure they are not perceived as too basic as they typically benefit from more advanced information [44]. Lastly, for employees working in the ICT sector, allowing time for access to the digital intervention within working hours may accommodate engagement within this industry [44]. Limitations of the scoping review process will be thoroughly reported in the final review. This will include the acknowledgement of the potential limited sector-specific findings and potential language bias deriving from excluding studies not published in the English language, which could impact the generalisability of the findings for all sectors and countries. Finally, application to practice and potential for generalisability for industry practitioners and areas for future research based on identified remaining gaps in the literature will be highlighted.

Abbreviations

MSDs	Musculoskeletal disorders
MENTUPP	Mental Health Promotion and Intervention in Occupational Settings
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
PRISMA-ScR	Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Reviews
PROSPERH	Promoting positive mental and physical health at work in a changing environment: a multi-level approach
RE-AIM	Reach, effectiveness, adoption, implementation, and maintenance
TICTM	Telework and ICT-based mobile work
TIDieR	Template for Intervention Description and Replication

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13643-025-02881-5.

Supplementary Material 1. Full electronic search strategy: MEDLINE Search Strategy. PsycINFO Search Strategy. Business Source Complete Search Strategy. Academic Search Complete Search Strategy.

Supplementary Material 2. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist.

Acknowledgements

The authors express their gratitude to the librarians at University College Cork and the University of Stirling for their guidance and review of the search strategy. The authors would also like to express appreciation to all other PROSPERH Consortium partners as follows: Benedikt Amann, Székely Bandi, Rui Barbosa, Henrique Barros, Joana Bucker, Carlos Campos Rodriguez, Laura Cano Roch, Ciaran Clissmann, Louise Dalsager, Arilda Dushaj, Pia Hauck, Eileen Hegarty, Ulrich Hegerl, Bridget Hogg, Wendy Iverson, Elona Krasniqi, Paul Lambert, Nanna P. Larsson, Caleb Leduc, Rebecca Loudoun, Raquel Lucas, Jeroen Luyten, Ida E.H. Madsen, Niall McTernan, Virginia Mendes Conceicao, Antonio Montes, Karen Mulcahy, Sevim Mustafa,

Danielle Nicholson, Sandra Nielsen, Mariana Nunes, Kylie O'Brien, Oznur Ozdamar, Helena Pardina Torner, Gyorgy Purebl, Juan Ramon Castano, Hanna Reich, Silvia Riva, Reiner Rugulies, Maura Smiddy, Katharina Schnitzspahn, Merel Schuring, Consol Serra, Jeppe Karl Sørensen, Andras Szekely, Alicia Valiente-Gómez, Chantal Van Audenhove, Rocio Villar, Kristian Wahlbeck, and Kyra Ubaghs.

Authors' contributions

The systematic scoping review protocol was conceptualised, reviewed, and approved by all authors. AS, ML, MM, EG, MK, BG, and BA contributed to the writing of the protocol draft. MM, EG, ML, AS, and MK contributed to the search strategy development. AS and MK contributed to the data extraction pilot testing. All other co-authors have also contributed to the revision and editing of the protocol manuscript.

Funding

Funded by the European Union under grant agreement no. 101137256. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or Horizon Europe. Neither the European Union nor the granting authority can be held responsible for them.

Data availability

Data generated or analysed during this study will be included in the published scoping review manuscript and will be available upon reasonable request to the corresponding author.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

Author details

[1]School of Public Health, University College Cork, 4th Floor, Western Gateway Building, Western Road, Cork, Ireland. [2]National Suicide Research Foundation (NSRF), 4th Floor, Western Gateway Building, Western Road, Cork, Ireland. [3]Nursing, Midwifery and Allied Health Professions Research Unit (NMAHP-RU), University of Stirling, Stirling FK9 4LA, UK. [4]National Research Centre for the Working Environment, Lersø Parkallé 105, 2100 Copenhagen, Denmark. [5]European Alliance Against Depression (EAAD), Goerdelerring 9, 04109 Leipzig, Germany. [6]Depression Research Center of the German Depression Foundation, Heinrich-Hoffmann-Str. 10, 60528 Frankfurt Am Main, Germany. [7]Katholieke University Leuven, Oude Markt 13, 3000 Leuven, Belgium. [8]Erasmus Universitair Medisch Centrum, Rotterdam 3015 GD, the Netherlands. [9]EPIUnit — Institute of Public Health, University of Porto, Praca Gomes Teixeira-Edificio Gomes Teixeira, 40550 290 Porto, Portugal. [10]Hospital del Mar Research Institute, Passeig Maritim de La Barceloneta, 25-29, 08003 Barcelona, Spain. [11]The Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, Hempstead, NY, USA. [12]Finnish Institute for Health and Welfare (THL), Mannerheimintie 166, P.O. Box 30, 00271 Helsinki, Uusimaa, Finland. [13]Community Centre for Health and Wellbeing (CCHW), Rezidenca Kodra E Diellit 1, 1019 Tirana, Albania. [14]Per Mendje Te Shendoshe (PMSH), Prizren, Kosovo. [15]Gazi Mustafa Kemal, Izmir Bakircay University (IZBU), Kaynaklar Cd., Menemen, İzmir 35665, Turkey. [16]Pintail Ltd, Blackrock, Co., Dublin, Ireland. [17]Vegeken Mental Health Foundation (VEA), Budapest, Hungary. [18]Innovagency, R. Joshua Benoliel 6-2A, 1250-133 Lisbon, Portugal. [19]St Mary's University, Twickenham, Waldegrave Rd, Twickenham TW1 4SX, UK. [20]Griffith University, Parklands Dr, Southport, QLD 4222, Australia.

Received: 5 July 2024 Accepted: 6 June 2025
Published online: 12 July 2025

References

1. Crawford GO, Berkovic D, Erwin J, Copsey SM, Davis A, Giagloglou E. Musculoskeletal health in the workplace. Best Pract Res Clin Rheumatol. 2020;34:101558.
2. Caprile, Maria, Juan A, Sanz, Pablo. Telework and health risks in the context of the COVID-19 pandemic: evidence from the field and policy implications | Safety and health at work EU-OSHA. Available from: https://osha.europa.eu/en/publications/telework-and-health-risks-context-covid-19-pandemic-evidence-field-and-policy-implications. Cited 2024 Apr 3.
3. Ahmad KA. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. 2018;392:1789–858.
4. OECD. Sick on the job?: Myths and realities about mental health and work. 2012. Available from: https://www.oecd-ilibrary.org/social-issues-migration-health/mental-health-and-work_9789264124523-en . Cited 2024 Apr 3.
5. COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. Lancet (London, England). 2021;398:1700.
6. Hong QN, Li J, Kersalé M, Dieterlen E, Mares A, Ahmadian Sangkar Z, et al. Work disability and musculoskeletal disorders among teleworkers: a scoping review. Journal of Occupational Rehabilitation. 2024. https://doi.org/10.1007/s10926-024-10184-0
7. OECD/European Union. Health at a Glance: Europe 2018: State of Health in the EU Cycle. Available from: https://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-europe-2018_health_glance_eur-2018-en. Cited 2024 Apr 3.
8. Çiftçi B, Demirhan F. Investigating the impacts of working at home among office workers with neck pain on health status, depression and sleep quality during the COVID-19 pandemic. Int J Occup Saf Ergon. 2023;29:970–8.
9. Zhang W-R, Wang K, Yin L, Zhao W-F, Xue Q, Peng M, et al. Mental health and psychosocial problems of medical health workers during the COVID-19 epidemic in China. Psychother Psychosom. 2020;89:242–50.
10. European, Commission. EU strategic framework on health and safety at work 2021–2027 Occupational safety and health in a changing world of work. European Commission; 2021.
11. European Foundation for the Improvement of Living and Working Conditions. The rise in telework: impact on working conditions and regulations. LU: Publications Office; 2022. Available from: https://data.europa.eu/doi/https://doi.org/10.2806/069206. Cited 2024 Apr 3.
12. Bueno-Antequera J, Munguía-Izquierdo D. Physical inactivity, sedentarism, and low fitness: a worldwide pandemic for public health. Integrated Science of Global Epidemics. Springer, Cham; 2023. p. 429–47. Available from: https://link.springer.com/chapter/https://doi.org/10.1007/978-3-031-17778-1_19. Cited 2024 Apr 3.
13. Nielsen K, De Angelis M, Innstrand ST, Mazzetti G. Quantitative process measures in interventions to improve employees' mental health: a systematic literature review and the IPEF framework. Work Stress. 2023;37:1–26.
14. Day, Arla, Nielsen, Karina. An Introduction to Work and Organizational Psychology. 2017. Available from: https://books.google.com/books/about/An_Introduction_to_Work_and_Organization.html?id=bTpKDgAAQBAJ. Cited 2024 Apr 3.
15. Linzer M, Poplau S, Grossman E, Varkey A, Yale S, Williams E, et al. A cluster randomized trial of interventions to improve work conditions and clinician burnout in primary care: results from the healthy work place (HWP) study. J Gen Intern Med. 2015;30:1105.
16. Havermans BM, Boot CR, Brouwers EP, Houtman IL, Heerkens YF, Zijlstra-Vlasveld MC, et al. Effectiveness of a digital platform-based implementation strategy to prevent work stress in a healthcare organization: a 12-month follow-up controlled trial. Scand J Work Environ Health. 2018;44:613–21.
17. Petrie K, Joyce S, Tan L, Henderson M, Johnson J, Nguyen H, et al. A framework to create more mentally healthy workplaces: a viewpoint. The Australian and New Zealand journal of psychiatry. 2018;52. Available from: https://pubmed.ncbi.nlm.nih.gov/28835112/. Cited 2024 Apr 3.
18. LaMontagne AD, Martin A, Page KM, Reavley NJ, Noblet AJ, Milner AJ, et al. Workplace mental health: developing an integrated intervention approach. BMC Psychiatry. 2014;14:1–11.
19. Safarian MH, Rahmati-Najarkolaei F, Yaghoubi M. A comparison of the effects of ergonomic, organization, and education interventions on reducing musculoskeletal disorders in office workers. Health Scope. 2018;8:e68422.

20. Hemati K, Darbandi Z, Kabir-Mokamelkhah E, Poursadeghiyan M, Ghasemi MS, Mohseni-Ezhiye M, et al. Ergonomic intervention to reduce musculoskeletal disorders among flour factory workers. Work. 2020;67:611–8.
21. Pieper C, Schröer S, Eilerts A-L. Evidence of workplace interventions—a systematic review of systematic reviews. Int J Environ Res Public Health. 2019;16:3553.
22. Bauer MS, Kirchner J. Implementation science: what is it and why should I care? Psychiatry Res. 2020;283:112376.
23. De Angelis M, Giusino D, Nielsen K, Aboagye E, Christensen M, Innstrand ST, et al. H-WORK project: multilevel interventions to promote mental health in SMEs and public workplaces. Int J Environ Res Public Health. 2020;17:E8035.
24. Toth MD, Ihionvien S, Leduc C, Aust B, Amann BL, Cresswell-Smith J, et al. Evidence for the effectiveness of interventions to reduce mental health related stigma in the workplace: a systematic review. Bmj Open. 2023;13:e067126.
25. Lanhers C, Pereira B, Garde G, Maublant C, Dutheil F, Coudeyre E. Evaluation of "I-Preventive": a digital preventive tool for musculoskeletal disorders in computer workers-a pilot cluster randomised trial. BMJ Open. 2016;6:e011304.
26. Stansfeld SA, Kerry S, Chandola T, Russell J, Berney L, Hounsome N, et al. Pilot study of a cluster randomised trial of a guided e-learning health promotion intervention for managers based on management standards for the improvement of employee well-being and reduction of sickness absence: GEM Study. BMJ Open. 2015;5:e007981.
27. Paterson C, Leduc C, Maxwell M, Aust B, Strachan H, O'Connor A, et al. Barriers and facilitators to implementing workplace interventions to promote mental health: qualitative evidence synthesis. Syst Rev. 2024;13:152.
28. Niedhammer I, Bertrais S, Witt K. Psychosocial work exposures and health outcomes: a meta-review of 72 literature reviews with meta-analysis. Scand J Work Environ Health. 2021;47:489–508.
29. Aust B, Leduc C, Cresswell-Smith J, O'Brien C, Rugulies R, Leduc M, et al. The effects of different types of organisational workplace mental health interventions on mental health and wellbeing in healthcare workers: a systematic review. Int Arch Occup Environ Health. 2024;97:485–522.
30. Munn Z, Peters MDJ, Stern C, Tufanaru C, McArthur A, Aromataris E. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. BMC Med Res Methodol. 2018;18:143.
31. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018;169:467–73.
32. European Agency for Safety and Health at Work. Work-related musculoskeletal disorders: prevalence, costs and demographics in the EU. 2019 p. 1–215. Report No.: 1831–9343. Available from: https://osha.europa.eu/en/publications/msds-facts-and-figures-overview-prevalence-costs-and-demographics-msds-europe.
33. World Health Organisation. WHO guidelines on mental health at work. Geneva; 2022.
34. Paterson C, Leduc C, Maxwell M, Aust B, Amann BL, Cerga-Pashoja A, et al. Evidence for implementation of interventions to promote mental health in the workplace: a systematic scoping review protocol. Syst Rev. 2021;10:41.
35. Glasgow RE, Harden SM, Gaglio B, Rabin B, Smith ML, Porter GC, et al. RE-AIM planning and evaluation framework: adapting to new science and practice with a 20-year review. Frontiers in Public Health. 2019;7. Available from: https://www.frontiersin.org/articles/https://doi.org/10.3389/fpubh.2019.00064. Cited 2022 Dec 12.
36. European Commission: Directorate-General for Research and Innovation. Horizon Europe strategic plan 2025–2027. Publications Office of the European Union; 2024.
37. Covidence systematic review software. Melbourne, Australia: Veritas Health Innovation; 2024. Available from: www.covidence.org.
38. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372: n71.
39. Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: Template for Intervention Description and Replication (TIDieR) checklist and guide. BMJ. 2014;348:g1687.
40. Taylor KS, Mahtani KR, Aronson JK. Summarising good practice guidelines for data extraction for systematic reviews and meta-analysis. BMJ Evid Based Med. 2021;26:88–90.
41. Mixed Methods Appraisal Tool (MMAT), version 2018. Industry Canada.
42. Eurostat. NACE Rev. 2 – statistical classification of economic activites in the European community. Luxembourg; 2008.
43. Eurofound. Telework and ICT-based mobile work: flexible working in the digital age. Luxembourg: Publications Office of the European Union; 2020.
44. Tsantila F, Coppens E, De Witte H, Arensman E, Amann B, Cerga-Pashoja A, et al. Outcome assessment of a complex mental health intervention in the workplace. Results from the MENTUPP pilot study. Int Arch Occup Environ Health. 2023;96:1149–65.

Publisher's Note