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A Scoping Review of Integrating Occupational Health and Safety and Workplace Health Promotion Interventions

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ABSTRACT

Background: Growing evidence supports the integration of occupational health and safety and workplace health promotion approaches. However, the triggers and the methods for planning and implementing such approaches remain vastly unclear. This scoping review aimed to address this gap in the literature.

Methods: This review searched 43 databases (e.g. PubMed, Web of Science Core Collection, all EBSCOhost databases). Of the 7,142 results identified initially, systematic screening protocols led to the inclusion of 13 articles meeting the objectives of this review.

Results: Of the 13 articles included, five focused on physical activity interventions. Ten articles first set specific work-related issues to be addressed. Five articles highlighted the necessity of understanding the influence of pre-existing knowledge in the interventions of integrated approaches and the heterogeneity of mental perceptions among workers. Five articles acknowledged that tailoring and flexibility of integrated approaches were key success factors, and nine articles reported the benefits of utilizing online platforms to implement integrated approaches.

Conclusion: Future integrated interventions should consider not only tailoring, flexibility, and delivery modality but also the appropriate level of outcome changes to suit the actual needs of workers. Intervention researchers should consider more consistently how to enhance intervention sustainability and scalability. Further research is also required on work-related issues other than physical activity.

1. Introduction

In the context of advancing worker health, safety, and wellbeing, occupational health and safety (OHS) and workplace health promotion (WHP) serve different yet complementary functions. Grounded in implementation science, OHS seeks to prevent work-related diseases and injuries by reducing ergonomic, psychosocial, and material risks (e.g. physical, chemical, biological) of the work environments (Baker et al., 1996; Crane et al., 2019). Conversely, WHP primarily aims to provide health education and/or modify individual lifestyle factors to promote health behavior change and contribute to the mitigation of non-communicable diseases (e.g. obesity, cardiovascular diseases) in workers (Baker et al., 1996; Crane et al., 2019). An integrated approach that includes both OHS and WHP has been recommended by researchers and practitioners for the past few decades (Biswas et al., 2022; Biswas et al., 2021; Cooklin et al., 2017). Such an approach coordinates activities in ways that core efforts of OHS and WHP coexist, each influencing and informing one another (Biswas et al., 2021; Cooklin et al., 2017). Notable benefits of workplace-integrated approaches, compared to a single WHP or OHS intervention, have been evidenced in the growing literature, such as increasing intervention participation, successful chronic disease prevention and management, reduction of occupational injuries and disabilities, saving of healthcare and social costs, and improved worker productivity and

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morale (Biswas et al., 2022; Biswas et al., 2021; Cooklin et al., 2017; Nelson et al., 2015). Nelson *et al.* (2015) argued that workplace-integrated approaches that targeted multilevel changes, in contrast with WHP interventions that only targeted lifestyle issues, appeared to demonstrate more effective health outcomes and longer-term positive impacts, particularly relating to policy and environmental sustainability (Nelson et al., 2015). Growing evidence also suggests that such approaches are likely to lead to high worker engagement and widespread dissemination of implementation at the intrapersonal, interpersonal, and community levels (Biswas et al., 2022; Cooklin et al., 2017; Nelson et al., 2015). Extensive research has been undertaken in the healthcare context, with positive outcomes, regarding other areas of integrated approaches. Such interventions aim to bring individual healthcare services together in a coordinated approach (Trankle et al., 2019). In the implementation process of such interventions, the more components the interventions involved, the better the quality of life the interventions achieved. A successful example is multi-component case management interventions, which refer to the collaborative processes between case managers, care coordinators, and patients in various healthcare and social care settings (Woltmann et al., 2012). Woltmann *et al.* (2012) observed that multi-component interventions, involving at least three types of services, effectively improved the outcomes of patient mental health (Woltmann et al., 2012). Another positive example is multistep discharge management interventions that assist in the effective transition from hospital settings to other settings, consisting of the pre-discharge phase of support, transitional support, and post-discharge follow-up support (Flanagan et al., 2017). McMartin, for instance, purported that single discharge planning, in contrast to discharge planning combined with post-discharge follow-up, resulted in less positive outcomes of quality of life amongst patients with chronic conditions (McMartin, 2013). These findings highlight that a healthcare intervention that includes multiple, rather than single, strategies shows promise in leading to better health outcomes. This is because disease severity and treatment effectiveness may vary amongst patients; additional patients' needs (e.g. health, emotional, social aspects) may occur in the dynamic service delivery process. However, regardless of promising results, like the ones reported above, it remains uncertain how specific intervention strategies impact specific health outcomes. For example, a combined primary and secondary care intervention effectively improved patient quality of life, but it was unclear how individual components (e.g. liaison consultation, patient-controlled shared care record, computer access) contributed to these improvements (Flanagan et al., 2017). Another consideration is that integrated healthcare interventions appear to be effective only in improving one specific condition rather than multiple conditions (Flanagan et al., 2017). This suggests that each condition or each healthcare setting may need tailored strategies. Moreover, intervention planning and implementation-related factors may contribute to the effectiveness of integrated healthcare interventions. In the Western Sydney Integrated Care Program, one of the notable barriers was that of ineffective information technology between healthcare providers (Trankle et al., 2019). Discharge summaries sent to GPs via hard copy, paper mail, and facsimile led to delays in information sharing (Trankle et al., 2019). Additionally warranted were follow-up reminders by patients and health care providers (Trankle et al., 2019). Redesign of delivery modality, in this case, was particularly required. Findings like the ones above are also evidenced to a large extent in workplace-integrated approaches. Such findings contribute to the rationale and research questions of this scoping review, as elaborated below. First, the scoping review by Biswas *et al.* (2022) synthesized several overarching facilitators (e.g. leadership support, needs assessment, flexible delivery), barriers (e.g. limited resources), and the corresponding recommendations to improve the effectiveness of workplace-integrated approaches (Biswas et al., 2022). However, these recommendations, although promising at the abstract level, comprise common parameters for any organizational change and, hence, need more in-depth and systematic exploration of how to best apply them in practice. Second, the key intervention elements (e.g. intervention objectives) are not adequately summarized in the two published reviews of integrated approaches (Biswas et al., 2022; Cooklin et al., 2017). Some key issues remain to be answered, such as the important aspects to be considered in a needs assessment, how to design appropriate intervention objectives, and how to offer workers more ready-access integrated approaches. For example, the absence of intervention objectives might make the intervention evaluation problematic. These unknown areas mean that a more detailed investigation examining the intervention planning, implementation, and evaluation processes at the micro level is warranted. Third, the current evidence (Biswas et al., 2022), although offering overall insights into barriers to the implementation of integrated approaches does not report those for different contexts (e.g. occupational type). This area requires further investigation because a tailored approach in each context is crucial in considering the great heterogeneity in varied work contexts, particularly for each specific work-related disease and injury. Fourth, the limited reporting of intervention-related characteristics is a notable issue. Specifically, Cooklin *et al.'s* (2017) systematic review examined empirical evidence of workplace-integrated approaches and noted mixed outcomes of effectiveness of such approaches (Cooklin et al., 2017). Due to the limited reporting of implementation characteristics, the reasoning behind such outcomes remains unclear. As discussed previously, this makes it difficult to contextualize the reasons for the successes and failures of integrated approaches. In summary, although the two reviews discussed above provided conceptual insights into important integration aspects, more systematic and robust evidence is needed to deeply explore the factors that contribute to the effectiveness of workplace-integrated approaches, covering the full intervention-related (i.e. planning, implementation, evaluation) phases.

Especially warranted is a more detailed investigation to explore intervention-related operational mechanisms in differing workplace contexts from an implementation science perspective. Following the above, more research is required to understand why such approaches are planned and how to best plan and implement them. For intervention practitioners (e.g. OHS professionals, business managers, WHP practitioners), it is worthwhile receiving consolidated and more practical information on how to effectively plan and implement workplace-integrated approaches in the face of differing work-related diseases and injuries. Drawing upon the gaps identified above, this scoping review therefore aims to synthesize and criticize the latest evidence in this context. The following research questions underpinned this study: (1) What are the factors that have triggered the planning and implementation of integrated approaches? (2) How have integrated approaches been planned and implemented? (3) What are the reasons for the successes and failures of integrated approaches?

2. Materials and Methods

This scoping review adopted the 5-stage methodological framework developed by Arksey and O′Malley: (1) identify broad and appropriate research questions; (2) identify all potentially relevant studies from targeting sources; (3) select eligible studies based on the tailored inclusion and exclusion criteria; (4) data extraction; and (5) collate, summarize, and report results (Arksey & O'Malley, 2005). The description of each stage is discussed below. Stage 1: Research questions: The three research questions have been listed in the Introduction section above. Stage 2: Identification of possible studies: To determine the most appropriate search strategy, we conducted a preliminary literature search. A tailored search strategy was developed, modified, and finalized, with four key terms comprising "occupation", "health", "promotion", and "intervention". For each key term, relevant synonyms were identified as per our knowledge and published literature in similar disciplines. The final search string was: (employ* OR occup* OR OHS OR OSH OR WHS OR enterprise* OR organi* OR work* OR industr* OR business* OR person* OR staff) and (health* OR safe* OR wellness OR wellbeing* OR protect*) and (promot* OR integrat* OR combin* OR comprehensive OR complete* OR holistic* OR incorporat* OR blend*) and (activit* OR program* OR strateg* OR initiative* OR plan* OR interven*). Table 1 lists the 43 databases searched between May 2023 and June 2023. We searched only for titles satisfying the keywords above, given that we aimed at studies that were primarily focused on the reporting of workplace-integrated approaches. Stage 3: Study selection: Following our preliminary search suggesting there is scant literature related to workplace-integrated approaches, we included publications from any geographical region. Study inclusion criteria were (1) original full-text research studies; (2) published between January 2018 and June 2023, as explained below; (3) published in English; (4) researching integrated approaches of OHS and WHP; and (5) online and available from Queensland University of Technology library subscriptions. Having noted that the latest scoping review by Biswas *et al.* (2022) included studies published between 2008 and 2019 (Biswas et al., 2022), and that the work environments change rapidly (Evanoff et al., 2020), we decided to include more recent, contemporary studies published between January 2018 and June 2023. Peer-reviewed journal articles or conference papers were included; literature reviews, editorials, theses, industry and government reports, and articles in professional magazines were excluded as those do not typically undergo thorough peer reviews by external experts. Eligible studies should meet all five criteria mentioned above.

Table 1. A search of 43 databases

PubMed	Web of Science Core Collection	Biological Abstracts	Current Contents Connect	Chinese Science Citation Database℠
KCI-Korean Journal Database	MEDLINE®	Preprint Citation Index	ProQuest™ Dissertations & Theses Citation Index	SciELO Citation Index
Academic Search Elite	AgeLine	AMED - The Allied and Complementary Medicine Database	APA PsycArticles	APA PsycInfo
Art & Architecture Complete	Audiobook Collection (EBSCOhost)	Avery Index to Architectural Periodicals	Business Source Elite	CINAHL with Full Text
eBook Collection (EBSCOhost)	Education Source	Ergonomics Abstracts	ERIC	Film & Television Literature Index
Funk & Wagnalls New World Encyclopedia	GreenFILE	Legal Source	Library, Information Science & Technology Abstracts	MAS Reference eBook Collection
MAS Ultra - School Edition	Mental Measurements Yearbook with Tests in Print	Military & Government Collection	Music Index	OpenDissertations
Primary Search	Primary Search Reference eBook Collection	Regional Business News	Social Work Abstracts	SPORTDiscus
Violence & Abuse Abstracts	Scopus	Embase		

The database searches yielded 7142 results. Figure 1 presents the procedures for identifying eligible studies as instructed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram (Page et al., 2021).

Reasons for exclusion are listed in Figure 1. The first author of this article performed the first screening based on titles and abstracts. After screening the first 50 articles, the first author engaged the other two authors in assessing the eligibility of 15 different publications each, randomly selected. After cross-checking and discussion, all authors reached a full agreement about the eligibility of these publications without any contradictory views. Then, the first author proceeded with the full-text screening. Regular cross-checking and discussion processes also occurred in this screening stage. The three researchers initially identified 12 eligible studies. Following discussions within the research team, one additional study was considered eligible for inclusion. Thirteen studies were finally considered eligible and included in this review. Given that this review primarily aims to explore the implementation contexts of integrated approaches (e.g. why and how such approaches are planned and implemented), a quality assessment of study designs was outside the scope of the research.

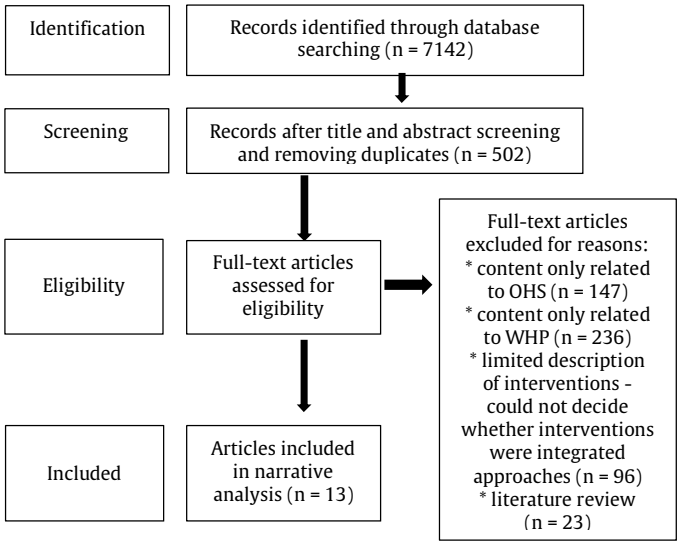

Figure 1. The study selection process as directed by the adapted Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram

Stage 4: Data extraction: Data related to intervention characteristics of integrated approaches were extracted (see Supplementary Table), consisting of the author, country of study, publication year, study population, intervention detail, intervention content, intervention evaluation, and intervention outcome. Data related to the triggers of integrated approaches, the mechanisms of how such approaches were planned and implemented, as well as the reasons for their successes and failures, were also extracted and presented in the Results section. Stage 5: Collating, summarizing, and reporting the results: The following section describes the key results concerning the planning, implementation, and evaluation processes of integrated approaches. More specifically, it refers to intervention outcomes, terminology use, theoretical development, triggers, pre-specified work-related issues, needs assessment, tailoring and flexibility, online delivery modality, intervention sustainability, and dissemination from research to practice. These themes were initially predetermined drawing on the findings from the existing literature, and further refined and finalized during the extraction of relevant information from the studies reviewed.

3. Results and Discussion

Six of the 13 studies were conducted in the United States of America (USA) (Aryal et al., 2019; Falk et al., 2022; Hammer et al., 2021; Mailey et al., 2022; Peters et al., 2018; Zoller et al., 2023), two in the United Kingdom (UK) (Dewitt et al., 2019; Edwardson et al., 2018), one in Switzerland (Aegerter et al., 2023), in Australia (Pereira et al., 2019), in Spain (Soler-Font et al., 2019), in China (Jia et al., 2018), and in Sweden (Halling Ullberg et al., 2023). Seven studies targeted office workers (Aegerter et al., 2023; Dewitt et al., 2019; Edwardson et al., 2018; Falk et al., 2022; Halling Ullberg et al., 2023; Mailey et al., 2022; Pereira et al., 2019), one included young workers from a city park and recreation program and Amazon Marketplace Mechanical Turk (Aryal et al., 2019), one involved workers in the USA Army and Air National Guard (Hammer et al., 2021), one targeted Spanish nursing staff (Soler-Font et al., 2019), one included construction workers in the USA (Peters et al., 2018), one involved staff from Chinese government agencies (Jia et al., 2018), and one targeted USA farm workers (Zoller et al., 2023). The 13 studies reported 12 workplace-integrated interventions, as two studies reported the same intervention (Falk et al., 2022; Mailey et al., 2022).

3.1 Intervention outcomes

On balance, across all 13 studies, the primary intervention outcomes were improved during the intervention implementation process or the post-intervention follow-up period. Outcomes mainly comprised health and safety knowledge, intervention satisfaction, work productivity and performance (e.g. job satisfaction, turnover intention, occupational functional impairment, sickness presenteeism and absenteeism), physical activity and sitting time, mental health (e.g. mood, fatigue), musculoskeletal disorders, and ergonomic practices. Regarding the intervention evaluation designs, eight studies were evaluated in randomized controlled trials (Aegerter et al., 2023; Edwardson et al., 2018; Falk et al., 2022; Hammer et al., 2021; Mailey et al., 2022; Pereira et al., 2019; Peters et al., 2018; Soler-Font et al., 2019), one through semi-structured interviews (Halling Ullberg et al., 2023), one based on a case study (Zoller et al., 2023), one in a two-group pretest-posttest study (Aryal et al., 2019), one in a mixed-method uncontrolled study (Dewitt et al., 2019), and one through a prospective self-controlled trial (Jia et al., 2018).

3.2 Terminology use and theoretical development

Based on our preliminary literature search, we noted several key terms commonly applied and considered in OHS

and WHP. For OHS interventions, common terms include "occupational health and/or safety" and "health protection". For WHP interventions, "health promotion" is the most common term applied. In our dataset, six studies (Aryal et al., 2019; Hammer et al., 2021; Jia et al., 2018; Peters et al., 2018; Soler-Font et al., 2019; Zoller et al., 2023) used the terms "health promotion" and "health protection", of which three (Hammer et al., 2021; Peters et al., 2018; Zoller et al., 2023) also used the term "integrated" and one (Zoller et al., 2023) also used the term "occupational health and/or safety". Three studies only used the term "health promotion" for WHP interventions, without referring to any of the aforementioned terms for OHS interventions (Aegerter et al., 2023; Halling Ullberg et al., 2023; Pereira et al., 2019). Four studies did not present any of the aforementioned terms for OHS and WHP interventions (Dewitt et al., 2019; Edwardson et al., 2018; Falk et al., 2022; Mailey et al., 2022). Instead, these studies described only the features of intervention strategies that were considered integrated approaches, which, nonetheless, fall under the scope of OHS and WHP. Only three out of the 13 studies reported the application of theories to inform the planning and implementation processes of integrated approaches. A USA study used organizational support theory and social support theory to address sleep problems in a military setting (Hammer et al., 2021). One UK study, aiming to reduce sitting time in office workers, used social cognitive theory, organizational development theory, habit theory, self-regulation theory, relapse prevention theory, the Behavior Change Wheel, and the associated opportunity, motivation, and behavior approach (Edwardson et al., 2018). One Chinese study used the Healthy Workplace Model on staff of government agencies (Jia et al., 2018).

3.3 Triggers and pre-specified work-related issues

Eleven studies reported why integrated approaches were planned and implemented. One study reported that workers younger than 24 years had higher incidence rates of non-fatal injuries and illnesses than their older counterparts (Aryal et al., 2019). Example triggers of integrated approaches included scarce experience (e.g. lack of knowledge of legal rights and prohibited tasks by labor laws), limited awareness of workplace hazards (e.g. low priority of worker safety), reluctance to report work-related injuries, the value of pleasing employers (e.g. under-reporting of work-related injuries), and inadequate training and quality of OHS training sessions. This study, whilst covering a broad range of intervention activities, did not report specific work-related diseases or injuries to be addressed; instead, it identified occupational settings and target groups as a starting point in the intervention planning process. In contrast, the rest ten studies first presented one particular work-related issue to be addressed (Aegerter et al., 2023; Dewitt et al., 2019; Edwardson et al., 2018; Falk et al., 2022; Halling Ullberg et al., 2023; Hammer et al., 2021; Mailey et al., 2022; Pereira et al., 2019; Peters et al., 2018; Soler-Font et al., 2019). Five studies specifically aimed at addressing physical inactivity and sedentary behavior (Dewitt et al., 2019; Edwardson et al., 2018; Falk et al., 2022; Halling Ullberg et al., 2023; Mailey et al., 2022). One study (Mailey et al., 2022), for example, aimed to reduce occupational sitting when working from home, planned and implemented multi-component interventions. The trigger of this study was that single environmental changes, such as the provision of height-adjustable desks, might not be adequately effective in supporting university employees to reduce daily sitting time and improving other physiological outcomes; additionally warranted were broad health education and training strategies of individual behavior changes to improve their motivations, knowledge, and skills. This was also the trigger for other physical activity-related research included in our scoping review. The underlying rationale of this trigger was to acknowledge the necessity of modifying both individual and environmental conditions in the physical activity context. These strategies were based on the notion that multiple risk factors contribute to negative health issues at different levels. Moreover, the trigger of a study about addressing sleep problems in a military setting was the little attention given to the efforts of organizational leaders and employers to improve the well-being of employees (Hammer et al., 2021). Another trigger was that the modification of psychosocial hazards was largely contingent on the extent of leadership support, which should be viewed as important as individual behavioral changes, such as changes in sleep habits (Hammer et al., 2021). Four studies targeted neck and musculoskeletal pain as work-related health issues to be addressed (Aegerter et al., 2023; Pereira et al., 2019; Peters et al., 2018; Soler-Font et al., 2019). In one Swiss study addressing work productivity loss resulting from neck pain (Aegerter et al., 2023), the trigger was previous empirical evidence demonstrating mixed results of the effectiveness of varying approaches (e.g. single or multiple strategies) to address this issue. This study, thus, aimed to understand how to best reduce neck pain-related work productivity loss. Another neck pain-related study in Australia employed a cluster randomized trial (ergonomics plus neck-specific exercise or health promotion), with health promotion combined with the ergonomic intervention serving as a comparator (Pereira et al., 2019). In two further studies first set focusing on musculoskeletal pain (Peters et al., 2018; Soler-Font et al., 2019), the trigger was that multiple risk factors (e.g. biological, psychosocial, cultural, individual, and environmental) contribute to the incidence of musculoskeletal pain. However, one Chinese study targeting staff from government agencies (Jia et al., 2018), whilst reporting similar triggers, did not clearly describe specific health issues to be addressed.

3.4 Needs assessment

Of 13 studies, nine did not report any information about needs assessment in target workers. Across the rest studies, pre-existing knowledge in the interventions of integrated approaches and heterogeneity of mental perceptions in target workers were the two key considerations.

3.4.1 Pre-existing knowledge

All four studies found that pre-existing knowledge of the interventions of integrated approaches impacted the intervention implementation process. Some young workers in one USA study reported that the content of the OHS training sessions was repetitive as they had already received mandatory worker safety training before participating in this study and thus demonstrated low satisfaction (Aryal et al., 2019). In the same study, other young workers from various workplaces (e.g. restaurants and retail stores), however, indicated that they did not see any duplication of the content. Similarly, another USA study (Mailey et al., 2022), targeting highly educated university employees, observed high interest in receiving integrated interventions at the community level, suggesting that a high level of pre-existing knowledge in the interventions of integrated approaches could promote participation. To optimize the intervention participation experiences, two studies also emphasized the importance of assessment of pre-existing knowledge in the interventions of integrated approaches, particularly regarding how workers perceived the severity of work-related health issues (Aegerter et al., 2023; Hammer et al., 2021).

3.4.2 Heterogeneity of mental perceptions

Individual perceived psychological activities, as part of mental perceptions, contributed to workers' participation levels of integrated approaches and intervention effectiveness. In one UK study promoting standing at work (Dewitt et al., 2019), participants reported that not all work tasks suited standing. Some preferred to stand only for less cognitively demanding tasks, as they believed that standing impaired their working performance for cognitively involved tasks. In contrast, other workers reported that, when standing, they could perform cognitively demanding tasks as they perceived standing as a break. In one USA study (Aryal et al., 2019), before participating in integrated approaches, some workers had already received similar intervention strategies (e.g. OHS training). However, they showed differing attitudes towards the duplicate content of integrated approaches in the participation process. Some workers found this useful, interesting, and engaging; some others viewed it as repetitive, boring, and long.

3.5 Tailoring and flexibility

Across five studies, tailoring and flexibility were key success factors, with such features, however, only evident in WHP rather than OHS. Two studies allowed participants to choose the tailored health promotion materials (Aegerter et al., 2023; Soler-Font et al., 2019). One UK study noted that device-delivered tailored feedback that helped develop health awareness of standing effectively expanded the transmission of a health mindset from one workplace to other sites (Dewitt et al., 2019). Workers in this study, although aware of the benefits of sitting less, indicated that they would only reduce sitting if they were more psychologically and physically capable of doing so. This may reaffirm the necessity of needs assessment as previously presented, and the consideration of tailoring in intervention development. One USA study, addressing sleep problems in a military setting, contained health protection in supervisor support training (i.e. sleep health), and health promotion in personalized sleep feedback to employees based on their individual needs (Hammer et al., 2021). Other than tailoring, flexibility was also crucial. In one Australian study (Pereira et al., 2019), the content of health promotion sessions varied from week to week, with the content being engaging and social.

3.6 Online delivery modality

Nine studies reported the use of online delivery modality to implement integrated approaches (Aegerter et al., 2023; Aryal et al., 2019; Edwardson et al., 2018; Falk et al., 2022; Halling Ullberg et al., 2023; Hammer et al., 2021; Mailey et al., 2022; Peters et al., 2018; Soler-Font et al., 2019), with six studies specifically highlighting its advantages. One USA study found that young workers demonstrated high levels of enjoyment when engaging in online components (Aryal et al., 2019). One Swiss study pointed to the possibility of applying an online delivery modality as an alternative to face-to-face interaction (Aegerter et al., 2023). Workstation ergonomic interventions, health education sessions, and neck exercises, which were part of the specific study, demonstrated greater flexibility of delivery modalities, as most content could be adapted easily in an online format (e.g. neck exercises delivered via a tailored app, health education podcasts, ergonomic checklist tool). These recommendations were also supported by one Australian study (Pereira et al., 2019). Moreover, one salient feature of the online delivery modality was the interaction between workers (Aryal et al., 2019; Falk et al., 2022). For instance, in one USA study (Falk et al., 2022), online discussion boards and video calls between participants were effective in promoting physical activity behavior change. Besides, the online delivery modality led to unanticipated positive consequences, such as changes in social norms. In another USA study prompting standing (Mailey et al., 2022), workers in home-working environments felt more comfortable standing during virtual interactions on Zoom or online discussion boards. The reason was that some co-workers would view standing or moving during meetings in real worksites as "weird" or "aggressive". Online delivery modality, in this instance, showed promise in progressively changing social norms at the individual and community levels to enhance intervention scalability.

3.7 Intervention sustainability

Four studies reported on intervention sustainability, which is a key consideration when the implementation of integrated approaches is completed. One USA study showed that the level of workplace safety knowledge, though

improved during the post-training period compared with baseline data, decreased in the subsequent follow-up period (Aryal et al., 2019). However, the reasons for such limited sustainability, which was also evident in one Spanish study (Soler-Font et al., 2019), were not reported in the study above. One Australian study observed that a combined exercise and ergonomic intervention was effective in reducing neck pain intensity in all workers and those with neck pain, immediately when the intervention implementation process was completed (Pereira et al., 2019). Yet, the outcome differences between intervention and control groups did not remain in the 12-month post-intervention period. In contrast, one physical activity study demonstrated relatively good intervention sustainability (Edwardson et al., 2018). After completing the particular intervention, a staff member provided continuous support by offering face-to-face or telephone-based coaching sessions in the first month and every three months thereafter, thus reviewing the progress and goals related to physical activity participation.

3.8 Dissemination from research to practice

Six studies reported the likely barriers to successfully translating the findings of research into large real-world settings. Four of those studies pointed to the limited generalizability of the research findings (Hammer et al., 2021; Jia et al., 2018; Mailey et al., 2022; Soler-Font et al., 2019). One USA study noted that relative to behavioral changes, environmental changes would be more difficult to implement in all office-based worksites (Mailey et al., 2022). Likewise, in another USA study undertaken in a military setting (Hammer et al., 2021), the generalizability of the findings in wider worksites was deemed relatively low as the integrated approaches implemented in this study may not be suitable for female workers. Female workers may likely have different sleep patterns compared with male workers, particularly regarding differences in responsive rates when receiving employers' support. In one Spanish study about reducing musculoskeletal pain (Soler-Font et al., 2019), the generalizability was also relatively low; it was possible that participants only focused on the most prevalent pain locations, subjectively evaluated the corresponding risk factors, and then prioritized their preferred preventive strategies. In addition to the relatively low generalizability across the aforementioned studies, limited reporting of intervention characteristics and relevant contextual information was a recurring barrier across most studies reviewed, rendering it difficult to synthesize elements that may have worked well for intervention effectiveness. For example, one Spanish study offered little description of how work environments were modified (Soler-Font et al., 2019). The specific study only implemented less expensive workplace changes, suggesting that feasibility and funding support might be key success factors. In one USA study (Peters et al., 2018), albeit with positive outcomes, there were also gaps in the reporting of needs assessment and the level of feasibility.

3.9 Discussion

This scoping review has provided important insights into the context of workplace-integrated approaches. Overall, all studies reviewed here reported improvements in major health and work-related outcomes, either in the intervention implementation process or in the postintervention follow-up period. The effectiveness of nearly half of the integrated approaches reviewed was evaluated by randomized controlled trials, which was not evident from the previous literature reviews on this topic. This means that there is growing research attention to systematically evaluate the effectiveness of workplace-integrated approaches in a more rigorous experimental design. Figure 2 presents the first conceptual framework we generated during the analysis of the studies we reviewed and below we discuss important conceptual and practical considerations about integrated approaches.

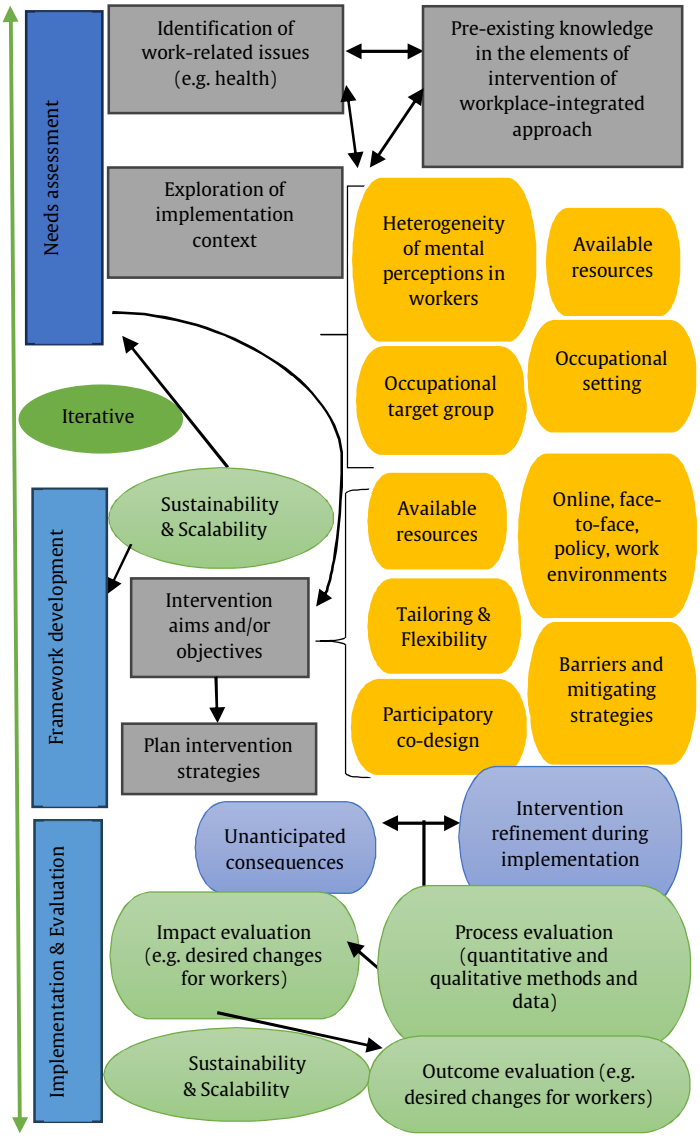

Figure 2. A conceptual framework for planning, implementing, and evaluating integrated approaches

3.9.1 Emerging research

Physical activity and sedentary behavior in the workplace were the primary focus of the studies reviewed. The trigger of these physical activity-related studies was mainly based on the notion that multiple-level strategies were required to promote physical activity participation. This is consistent with the extensive physical activity literature to date (Howlett et al., 2019; Kar & Hedge, 2020; Ma et al., 2021). The systematic conceptualization and implementation of integrated approaches, either in the general population or in addressing work-related issues other than physical activity, is still in its infancy. Such a finding may also be evidenced by the terms used to describe "integrated approaches" across the studies reviewed. Studies on physical activity portrayed specific intervention strategies rather than explicitly describing them as WHP, OHS, or integrated approaches. Hence, future empirical research could formally establish the conception of "integrated approaches" in the intervention planning, implementation, and evaluation processes. In addition, given the inconsistent terms to describe integrated approaches across the studies reviewed, it is worth investigating whether there exist overlapping elements between WHP and OHS interventions. For example, Claxton *et al.* (2022) noted in Western Australia that the 'pre-judging' culture was common in many business owners (Claxton et al., 2022). Therefore, the training of making assumptions on a factual base was required in OHS training (Claxton et al., 2022). However, WHP interventions can also provide similar training considering that educational activities are the key area of WHP interventions to enhance literacy.

3.9.2 Pre-specified issues and needs assessment

We carefully analyzed all studies included in this review and found that most of the studies, based on their description of study background or introduction, appeared to first set one specific work-related issue to be addressed, such as physical inactivity, neck pain, and musculoskeletal pain. From a practical perspective, the identification of specific work-related issues to be addressed was a reasonable and workable starting point, especially at the early stage of intervention development. It remained unclear how researchers and practitioners chose such issues and whether these studies conducted a needs assessment of their target workers. In a few of the studies we analyzed, pre-existing knowledge of the interventions of integrated approaches and the differences in mental perceptions in target workers were the two key elements related to worker needs. This suggests that interventions would be more effective if designed differently for worker cohorts with or without prior knowledge of any of the intervention elements. Moreover, presenting possible barriers to participating in integrated approaches to the target worker population may be a promising recruitment and intervention strategy, particularly amongst workers with high educational and knowledge levels. Traditionally, intervention practitioners are more likely to present all the advantages of receiving the interventions to potential participants in the recruitment process, without visibly acknowledging likely barriers to participation (Smit et al., 2021). However, the fact that, for instance, some workers aware of the benefits of standing in one UK study (Dewitt et al., 2019) found standing more tiring than expected and chose to sit, means that such discomfort should be addressed as part of the recruitment process, and confirms the necessity to inform potential participants of tangible barriers of taking health actions and the resultant mitigating strategies. Another success factor emerging from our study is the consideration of differences in mental perceptions. In the broader context of health interventions, intervention practitioners tend to encourage the optimized changes in intervention outcomes (e.g. frequency of health behavior, level of engagement) at the participant level (Bailey, 2019). Such optimized changes, underpinned by researchers' expectations, however, may not be suitable to the actual needs of participants. As such, in integrated approaches, the expected outcome changes from the researchers' perspective may differ from the desired and required outcome changes from the workers' perspective. The finding that some workers in one UK study (promoting standing) showed differing sitting behaviors when dealing with cognitively demanding tasks (Dewitt et al., 2019), means that relatively less standing time, in this case, may not necessarily be considered the ineffectiveness of integrated approaches. Likewise, Aryal *et al.* (2019) observed that some participants, although already having received the OHS training before participating in the intervention, demonstrated mixed attitudes towards the duplicated content of intervention strategies (Aryal et al., 2019). This means that in some cases, workers, while having relatively the same level of pre-existing knowledge, may demonstrate differing attitudes towards the same intervention strategy. Future intervention planning, therefore, should consider not only the tailoring and flexibility of intervention strategies but also the appropriate level of outcome changes in workers. In turn, the evaluation designs of integrated intervention effectiveness should be adjusted accordingly. To what extent integrated approaches should be implemented by practitioners and received by workers, and how to best define and evaluate the "success" of intervention effectiveness are key issues to be explored.

3.9.3 Online delivery modality and intervention sustainability

Online delivery modality shows promise in providing more ready access to workers when implementing integrated approaches. It is usually thought feasible and convenient. Of note, the observation that online interactions positively influenced social norms to promote health culture (i.e. standing more) in worksites was an unanticipated impact of the intervention from the perspectives of the researchers (Mailey et al., 2022). Hence, integrated intervention practitioners should consider how to take advantage of similar benefits and refine intervention strategies to improve

intervention sustainability and scalability. Notably, in implementation science, only in the intervention evaluation process do intervention practitioners usually consider intervention scale-up and sustainability (Koorts et al., 2018). However, evidence supports that intervention practitioners should consider sustainability and scalability at the early stage of intervention development (Koorts et al., 2018; Wong et al., 2022). For example, after the intervention implementation is completed, employers could encourage employees who support integrated approaches as champions to create online platforms to continually advance worker health and wellbeing at the peer level. However, across the studies reviewed, online delivery modality appeared to be mainly situated in the WHP part of integrated approaches. Hence, the application of online tools in OHS part in differing contexts requires careful consideration, as it may potentially hamper the quality of OHS-related hazard identification and risk management. Such activities are typically delivered in person, such as safety inspections in construction workers, and the use of personal protective equipment in cleaners (Duryan et al., 2020; Shapoval et al., 2022).

3.9.4 Research and practice implications

As previously discussed, there exists a key question of to what extent these integrated approaches reviewed could be effectively translated into similar or large-scale, real-world occupational settings. In real-world settings, OHS interventions usually refer to enforceable preventive actions workers must follow to protect the health and safety of themselves and others (Hough et al., 2023). OHS, apart from the duty of care of employers for staff, includes also a duty of workers to attend to their health and safety by complying with the reasonable instructions of employers (Hough et al., 2023). On the other hand, WHP interventions are more likely to serve as a voluntary and lifestyle-related activity (Crane et al., 2019). However, across all studies reviewed, the notion of enforcement of OHS was not evident. There could be several reasons. First, for ethical reasons, researchers and practitioners cannot force potentially eligible participants to receive intervention strategies; participants are entitled to withdraw from the study at any time. Second, all studies we reviewed were mainly focused on relatively low-risk health issues, which are commonly addressed through the mindset of "encouragement" rather than "enforcement". Therefore, examining how to best plan and implement integrated approaches in high-risk occupational settings with more severe work-related health issues may provide an interesting avenue for future research. Furthermore, inadequate description of contextual and intervention-related information across most studies reviewed seems common for health intervention studies, which traditionally have a strong emphasis on the measurement of outcome variables instead of detailing the intervention planning process (Wigginton et al., 2020). For example, most studies reviewed in this work did not report the information as to why and how researchers decided to choose these specific work-related issues to be addressed, where the funding supporting environmental and behavioral changes came from, and how researchers engaged with employers, employees, and other stakeholders in intervention development. The paucity of descriptions of these topics makes it difficult to understand the mechanisms and reasoning behind how integrated approaches can be best planned and implemented in both conceptualization and practice.

3.9.5 Theoretical development and methodology

Across all studies reviewed, process evaluations and qualitative methods were not consistently employed in the intervention evaluation process. Although most studies used quantitative assessment methods, process evaluations, employing qualitative methods, could be useful to explore how OHS and WHP best inform and influence each other. Also, in addition to the themes we identified and discussed above, several of the studies we reviewed with a focus on physical activity and sedentary behavior predominately reported the use of theories to inform intervention development. This is because physical activity-related strategies have been extensively researched and validated with good outcomes. However, none of the studies reviewed here reported the detailed process of how they used theories to inform intervention development, which renders it difficult to understand the strengths and limitations of the theories used. This also does not allow us to explore the inherent relationships between OHS and WHP. Future research should have a more detailed description of this. Given the above, future research could apply validated theories in similar contexts as a starting point for conceptualizing integrated approaches more consistently and transparently. As a positive example of the above, in one Spanish study of integrated approaches (Soler-Font et al., 2019), musculoskeletal pain was managed via three types of disease prevention, grounded in the notion of natural history of disease progression. Specifically, primary prevention included health protection that modified occupational risks through participatory ergonomics, as well as the promotion of healthy lifestyles at work. Secondary and tertiary prevention encompassed early identification of musculoskeletal pain, prognosis improvement, reduction of sickness absence, and safe and sustainable work return. Although not suitable for all contexts, such strategies may be useful for intervention development, especially when considering the evolving process of modification of specific work-related hazards. Furthermore, the interpersonal social psychology theories in WHP can inform the delivery process of OHS interventions. Valipour *et al.* (2023) employed health education theories to inform OHS intervention development (Valipour et al., 2023). Similarly, Rantala *et al.* (2022) observed that training and coaching were the most feasible OHS strategies to enhance individual risk assessment skills. Group-based, instead of individual-oriented, hazard identification training, could lead to more effective learning outcomes. The delivery process of OHS training can be influenced by the WHP's theory, namely Social Learning

Theory, which is a key element of peer influence (Rantala et al., 2022).

3.9.6 Strengths and limitations

Although we are confident we reviewed the latest empirical evidence related to workplace-integrated approaches, our study is not free of limitations. First, this review only included studies published in English and available online, potentially omitting integrated approaches published in other languages and available offline or behind paywalls that our university does not subscribe to. Also, due to our focus on peer-reviewed publications, no grey literature was included in this review (e.g. industry and government reports) that could have offered some more information from the practice field. Moreover, given the primary purposes of this review, a quality assessment of study designs was not conducted, meaning that our findings referring to the several studies reviewed do not necessarily reflect the same level of evidence strength. Furthermore, across most studies reviewed, there were gaps in reporting of contextual and intervention-related characteristics. Most studies reviewed had succinct descriptions of intervention strategies. Moreover, process evaluations employing qualitative methods (e.g. participating experiences) were not mainly reported. These gaps did not allow the researchers to provide more specific examples to support the themes and claims made. However, all relevant information from the studies reviewed was extracted and the first conceptual integration framework has been created from an implementation science perspective. Also, a large number of databases were searched to identify the relevant studies. This review has provided more in-depth, detailed practical, and conceptual insights into future planning, implementation, and evaluation of integrated approaches. The review has also offered several interesting future research directions in this context.

4. Conclusion

The 13 publications reviewed in this study suggest there is no published framework to inform interventions integrating OHS and WHP, indicating a knowledge and practice gap. Following the analysis of the specific publications, we suggested a conceptual framework which, nevertheless, needs to be further complemented, tested, and revised through respective studies. In general, current empirical research appears to be situated mainly in the physical activity context, where the triggers of such approaches are related to the modification of both behavioral and environmental risk factors of physical inactivity. Also, most studies we reviewed first set specific work-related issues to be addressed, comprising physical inactivity, sleep, neck pain, and musculoskeletal pain. Therefore, future research should focus on work-related issues other than physical activity, with an in-depth exploration of implementation contexts warranted. Furthermore, nearly half of the studies reviewed pointed to the necessity of understanding the influences of pre-existing knowledge in the interventions of integrated approaches and the heterogeneity of mental perceptions in workers, indicating that a comprehensive needs assessment in target workers is required in future intervention planning. Also, while the identification of work-related issues in target workers could be a useful starting point when planning integrated approaches, tailoring, flexibility, and online delivery modality of integrated approaches could be key success factors. Yet, intervention sustainability should be further improved. Besides, future intervention planning should consider the appropriate level of outcome changes to suit the actual needs of workers, and intervention practitioners should contemplate how to enhance intervention sustainability and scalability, particularly at the early stage of intervention development. Last, a process evaluation with a mix of quantitative and qualitative data and methods would be useful to explore how OHS and WHP best inform and influence each other.

Authors' Contributions

Yanming Lu: Conceptualization; Methodology; Writing. Nektarios Karanikas: Conceptualization; Methodology; Writing. Julie-Anne Carroll: Conceptualization; Methodology; Writing.

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There were no ethical considerations to be considered in this research.

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