School of Forestry

ENFO 410 – Forest Engineering

Final Dissertation

Effectiveness of mental wellbeing interventions and their potential to provide support the New Zealand forestry work environment

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Abstract

New Zealand forestry workers are exposed to an array of psychosocial risks in their work environments, which leads to work-related stress. Despite several studies focusing on work-related stress and mental wellbeing of forest workers in New Zealand, limited information exists regarding effective mental wellbeing interventions in forestry workplaces. This study aims to address this gap by exploring interventions that target work-related stress and mental wellbeing in blue-collar work environments globally, with the goal of informing future implementation within New Zealand's forestry sector.

Fifteen studies were selected based on their relevance to forestry and their reporting of successful mental wellbeing interventions. These interventions were classified into five categories: skills training, improvement of working conditions, enhancement of occupational qualifications, relaxation techniques, and physical exercise. A discussion is presented on the applicability of these interventions within a forestry work environment, focusing on meeting the basic needs of blue-collar forestry workers.

This research contributes to understanding which interventions have the potential to improve mental wellbeing in forestry workplaces, offering insights into outcomes that may result from their implementation.

Table of Contents

Introduction

Why worker health is important

"Health is an important resource contributing to economic and social well-being" (Welch, 2009, as cited by Best et al., 2021). New Zealand was ranked fourth highest in forestry worker fatalities among occupational groups, with 121 deaths per 100,000 workers per year (Feyer et al., 2000; as cited by Lilley et al., 2002). The challenge for New Zealand's forest industry to construct a workplace framework that has the potential to mitigate impairment to mental wellbeing of workers beyond inter-organisational boundaries also introduces a moral and economic contingency. If the industry can prioritise on worker wellbeing, specifically mental wellbeing, over mitigation of hazards (physical and psychosocial), workers will have a heightened potential to engage in a healthier, more balanced lifestyle with increased motivation and attitude, while organisations will see benefits of a devoted and more dependable, productive workforce (Best et al., 2021; Best, 2022; Lovelock, 2019).

Mental wellbeing intervention

The term 'mental wellbeing intervention' refers to interventions or programmes designed to remedy (by intervening psychosocial hazards/stressors to better mental wellbeing), prevent (suppress further development of symptoms resulting from exposure to psychosocial stressors, hinder the development of mental health disease), and promote (improve mental health by stimulating positive components of mental health) mental health and wellbeing (World Health Organisation, 2002, as cited by Paterson et al., 2021).

Psychosocial hazard

The New Zealand Workplace Barometer (Bentley et al., 2019, as cited by Best et al., 2021) and the World Health Organisation report on psychosocial hazards at work (Leka & Jain, 2010, as cited by Best et al., 2021) define psychosocial hazards as:

"those aspects of work design and the organisation and management of work, and their social and environmental contexts, which have the potential for causing psychosocial or physical harm." (Cox et al., 2003, p 195, as cited by Best et al., 2021).

A workplace environment in which workers' exposure to psychosocial hazards is relatively limited has shown to improve the function, motivation, wellbeing, personal fulfilment and efficiency of the workplace (Bergman & Jean, 2015; Lovelock, 2019).

Work related stress

In extant literature, work-related stress can be directly related to how a worker fits or does not fit into their work environment. (Väänänen et al., 2014, as cited by Best et al., 2021). Work-related stress is regarded as external pressure on the psychological state of a worker, which yield one or more negative psychophysiological reactions as a result of work environment demands that transcend the physical or mental capacity of the worker, the worker's resources, or when fundamental needs of workers are not satisfied by the work environment. It is

theorised that work-related stress develops when the difference between required worker capacity and actual worker capacity becomes persistent or unmanageable (Chirico et al., 2019, Dewe & Cooper, 2017; Forastieri, 2016, Leka et al., 2015, as cited by Best et al., 2021).

Work-related stress in our work environments

The World Health Organisation states that health is a fundamental human right that extends further than 'the absence of harm' with an obligation to include physical, mental and social wellbeing, and should be represented by organisations further than harm mitigation or elimination. (World Health Organisation 2019; Leka et al., 2015, as cited by Best et al., 2021). Furthermore, achieving wellbeing does not mean eliminating stress. Rather, it means having the correct skills and resources to moderate life's stressors to so that they become beneficial challenges for development (Martin et al., 2017; as cited by Best, 2022).

Physical wellbeing can be improved by eliminating or mitigating hazards, while psychosocial factors (such as the nature of work and workplace conditions) are on a spectrum from causing harm to providing wellbeing to workers. However, instead of focusing on improving worker wellbeing by addressing these psychosocial hazards, occupational health and safety frameworks in many developed countries prioritise preventing harm by reducing or eliminating the risks these conditions pose to workers' health (Bentley et al. 2019; Chirico et al. 2019; Leka et al. 2015, as cited by Best et al. 2021; Lovelock, 2019). Wellbeing interventions should focus on enhancing the working environment to satisfy these areas of lifestyle for the workers, while actively reducing exposure to detrimental practices and poorly designed working structures and work environments (Bergman & Jean, 2015; Lovelock, 2019). In summary, the difference is highlighted between managing hazards to enhance wellbeing versus just preventing harm.

In New Zealand, there is an estimated total cost of NZ$1.5 billion across government agencies dealing with an approximate 60,000 health and disability benefit recipients facing a primary barrier to work of mental ill health (Ministry of Health, 2018). Employing a workforce that is susceptible to, or affected by, work-related stress through exposure to psychosocial hazards at work can be detrimental to both the individual and the organisation. This will lead to deterioration of personal health of workers, consequently affecting performance and increasing absences from work (Hassard et al., 2014).

Research on the wellbeing of blue-collar workforces indicate that those working in manual or machinery based labour have relatively high levels of distress. As reported by Lingard and Turner (2014), a 2013 study by Børsting Jacobsen et al. found that rates of work-related mental distress levels of construction workers are reported to be twice that of general male populations. A 1998 study by Petersen and Zwerling reports that rates of emotional and/or psychiatric disorders, particularly burnout (Oude Hengel et al., 2012), seen in construction workers is high, which can lead to early retirement or early dismissal (Lingard & Turner, 2014). In England and Wales, rates of suicide among construction workers are reported to be high relative to other occupations (Meltzer et al. 2008, as cited by Lingard & Turner, 2014). In New Zealand, work-related suicide is a significant yet often under-addressed issue. The construction industry is reported to have the highest rates of male suicide victims (approximately 6.9%) (Mates, 2024), while the forestry and farming industry together are reported to comprise

approximately 6.8% of male suicide victims in New Zealand (Suicide Mortality Review Committee, 2016, as cited by Best et al., 2021).

This distress also has physical consequences. A study carried out at a construction site in Queensland, Australia, included a general survey-style questionnaire for the workers on the site. Results from the survey showed that the construction workers' physical functioning, musculoskeletal pain and general health scores were higher than the Australian population standard, but survey scores for social functioning and mental health were below the Australian population standard (Lingard & Turner, 2014).

Lingard and Turner (2014) also examined the workplace conditions that was contributing to this distress by conducting a survey of blue-collar workers at a Queensland construction site. Survey participants identified that long working hours, paired with six-day working weeks were a substantial hurdle to making healthier lifestyle choices outside of work. Additionally, some workers had to account for a lengthy travel time to and from the worksite every day. This time poverty resulted in workers' inability to allocate time to prepare nutritious food or consistently follow a healthy, balanced diet, while also acting as a barrier to engage in physical exercise before or after work. Daily burnout and fatigue reported by workers in the survey was another reason as to why physical exercise outside of work was a challenge for workers. Other factors were described by workers, such as difficulty tending to family matters during their limited time after work, and desires to engage in unhealthy lifestyle habits such as alcohol consumption and smoking were reported often. Survey participants were aware of the benefits associated with making lifestyle changes to improve their physical wellbeing, and consequently, their mental wellbeing, but finding the time and energy to achieve such changes was regarded as a significant challenge. What it suggests is that skilled manual work and the way it is organised are not only psychosocial hazardous but also contain significant obstacles to any intervention aimed at improving psychosocial health.

Examples of stressors reported in New Zealand forestry work environments

Health and Safety

Forestry is one of the most hazardous occupational industries in New Zealand, and internationally (Bentley et al., 2005; as cited by Hinze et al., 2021). It is suggested that New Zealand forestry workers suffer from work-related stress induced by exposure to workplace hazards, and that physical hazards associated with forestry work environments can lead to work-related stress and, consequently, result in an increase in workplace accidents (Slappendel et al., 1993; as cited by Hinze et al., 2021). Constant awareness of these risks can generate anxiety and lead to the development of a state of reduced cognitive wellbeing in workers regarding personal safety and co-worker safety. Hinze et al. (2021) strongly associated mental fatigue and physical exhaustion with daily work in challenging environments such as typical New Zealand forestry work environments.

The Health and Safety at Work Act (2015) presents a clear expectation that psychosocial risks related to the work at hand and/or the workplace are to be managed by the people in charge of the work or workplace (Health and Safety at Work Act, 2015, as cited by Best et al., 2021). New Zealand's forest industry predominantly relies on service contracts, indicating that

managing these issues through workplace design and the introduction of interventions has been challenging in the past. This is due to a common disconnection between the frontline workers, contractors, employers and managers (Bergman & Jean, 2015; Best et al., 2021). A "person conducting a business or undertaking" (PCBU) is accountable for the management of worker wellbeing under the Health and Safety at Work Act 2015. No matter which area of the organisation or work process the risk develops, the PCBU must bear the responsibility for managing the risk of a negative health outcome occurring from mental distress. Best et al. (2021) recall that the duty to manage risk, alongside work-related stress, extends beyond being a legal issue or an economic framework. Work, work environment and the conditions surrounding the work should not be exclusive of workers' physical and mental wellbeing, or workers' ethical stature. Forastieri (2016) stated, as cited by Best et al. (2021), that work should provide consistent potential for the workers' improvement to lifestyle, personal accomplishment, self-fulfilment and provide philanthropy to communities through beneficial practices.

High Productivity Demands

It is reported that burnout is the event leading up to sickness absence. Demanding work schedules with high workloads and high pace are work-related psychosocial factors leading to burnout that are prevalent in New Zealand forestry (Leka & Cox, 2008, as cited by Bentley et al., 2019; Best et al., 2021). Additionally, extended shift scheduling has been known to be practiced among New Zealand's forestry industry (Lilley et al., 2002). With the main symptoms experienced by workers reported to be mental ill health, behavioural disorders alongside cardiovascular and musculoskeletal disease. These findings verify the importance of adequate energy levels and appropriate motivation as a barrier to unsafe work practices. Put simply, energy and motivation act to reduce risk of injury and death (Toppinen-Tanner et al., 2005, as cited by Best et al., 2021; Korneeva et al., 2022). Korneeva et al. (2022) also found that burnout is heavily associated with negative health and safety outcomes (affecting work environment), and with negative health outcomes (affecting the individual). Stress is known to lead to absence from work, indicating that these work environment practices are causing a feedback cycle and must be changed (Hassard et al., 2014).

Maslach and Leiter (2016), as cited by Best et al. (2021), report on three of the six domains (workload, control, reward, community, fairness and values) as fundamental actuators for burnout within the New Zealand forest industry. The 'rewards' domain, and the function of rewards, be it financial, institutional and/or social, play a large role in worker burnout, alongside the 'fairness' and domain (how work-related and project-related decision making is recognised) and the 'values' domain (individual's values relative to the values established within the organisation for which the work is being conducted. Forestry service contracts could encompass how risk, reward and known psychosocial hazards should be reported and managed to ensure that business agreements, work arrangements and worker merit can remain of fair and unbiased stature. This is especially important as New Zealand's forest sector workforce is made up of approximately 34% Māori. (Ministry of Business, Innovation and Employment, 2023).

Work-Life Imbalance and Isolated Working Conditions

Forestry work often involves long hours and time away from home, which has been known to affect work-life balance. Shift working, night shifts, inflexible work schedules, unpredictable hours, and long or unsociable hours are some of the psychosocial hazards that can lead to a decrease in worker mental wellbeing. This home-work interface imbalance can strain relationships, be an underlying cause of family tension, and contribute to feelings of guilt, frustration, or stress (Leka & Cox, 2008, as cited by Bentley et al., 2019; Best et al., 2021).

Limited Access to Mental Health Support

Poor communication, low levels of support for problem solving and personal development, lack of definition of, or agreement on, organisational objectives can be psychosocial hazards experienced within forestry work environments in New Zealand (Leka & Cox, 2008, as cited by Bentley et al., 2019; Best et al., 2021). The remote locations where forestry workers are based often limit access to healthcare, including mental health services, meaning that workers have limited access to mental health support outside of work.

Job Insecurity

Job insecurity is a vital factor to consider when reflecting on work-related stress in the New Zealand forest industry as the nature of service contracts do not always account for future work opportunities, facilitating a sense of work instability or uncertainty can invariably occupy one's mind, resulting in a subpar work performance. Because New Zealand's forest workers are typically contracted to an hourly wage or paid by volume rates or piece rates, shifts in log market patterns, rate changes in the log market or other unforeseen market variability has the potential to significantly affect workers' mental wellbeing over a short timeframe, indicating that job insecurity is identified as a critical source of work-related psychosocial pressure (Best et al., 2021).

Mental wellbeing interventions and New Zealand forestry

While several studies have focused on work-related stress and the mental wellbeing of forest workers in New Zealand (Hinze et al., 2021; Best et al., 2022), there is limited information on the types of mental wellbeing interventions that have been tried and tested in forestry workplaces. Consequently, which wellbeing interventions carry the greatest potential to overcome the negative effects associated with workplace psychosocial hazards is largely unknown. That makes predicting what interventions are likely to work difficult, and means that types of mental wellbeing interventions applied in forestry workplaces represent a relevant topic for research. It is important to know which interventions that showed evidence of improvement of mental wellbeing can be introduced into forestry workplaces, and the expected range of outcomes that these interventions may bring, both positive and negative outcomes.

Contextual fit

Bergman and Jean (2015) describe the significance of recognising the difference between the context of workers for the success of implemented interventions (i.e. a managerial positioned worker, and the different types of psychosocial hazard to which they may be exposed, relative

to a frontline worker, such as a labourer working at a construction site or a tree-harvesting machine operator, and the psychosocial hazards that surround this line of work). It is vital for persons conducting mental health assessments, or analysing sources of psychosocial hazards to recognise the differences between positions of the organisation and the significance of this within the organisation's framework. This is especially the case within New Zealand's forest industry where contract-based services are practiced nationwide.

The nature of work and work environments in the New Zealand forest industry are comparable to those typically seen in the construction industry, and other blue-collar industries (Bergman & Jean, 2015). This suggests that individuals who work in these industries can be grouped (role, age, gender, experience and culture), indicating that interventions implemented in construction and similar blue-collar workplaces, that have a positive effect on the worker and the organisation, can be applied to forestry settings too.

Studying mental wellbeing interventions for implementation in forestry workplaces is both relevant and important for protecting both the mental and physical health and safety of workers. It is also important for supporting best practices regarding health and safety and environmental sustainability within the forest industry, and may help meet surrounding legal obligations. By addressing the mental health needs of forestry workers through evidence-based interventions, organisations can create more supportive and resilient work environments, benefiting both the workers and the forest industry in the long term.

Objective

The objective of this study is to investigate which mental wellbeing interventions have been tried and tested in blue-collar work environments globally, and explore their potential for success New Zealand forestry work environments.

This study aims to explore which interventions to target work-related stress and mental wellbeing have been implemented and tested in blue collar work environments around the world. Currently, most available studies associated with mental wellbeing interventions have not been carried out exclusively in a forest work environment. Interventions that may have the potential to provide benefit and support to forestry organisations in New Zealand will be identified. This study will aid the current understanding of the effects and feasibility of mental wellbeing interventions in New Zealand forest work environments, and may encourage implementation of interventions to target work related stress.

Methods

The methods for this report consisted of a literature search followed by a literature screening process to identify studies that show relevance to forestry. Then, literature review and analysis of intervention types and intervention outcomes was carried out. For the results section, relevant studies were classed into five categories. Finally, a discussion identified which intervention types may be relevant to a forestry setting in New Zealand, and which interventions may have the potential to provide benefit and support to forestry organisations in New Zealand.

Literature search

A literature search was carried out using online academic databases:

- Google Scholar
- Scopus
- ResearchGate
- Science.gov

The built-in search function was used in conjunction with a set of key words. The key words are shown in Table 1. The most effective key words (key words that yielded the highest rates of relevant studies) are highlighted in Table 1 in green.

Table 1 – Examples of key words used for academic database literature search.

Intervention	Construction
Mental wellbeing/health	Burnout
Blue-collar	Social support
Work related stress	Anxiety/depression
Peer support	Forestry/logging
Therapy	Emotional regulation
Counselling	Relaxation
Occupational health	Lifestyle changes
Awareness	Exercise/physical activity
Job satisfaction/meaning	Time management
Leadership/team-building	Financial literacy
Flexible working	Worker inclusion

The preliminary literature search produced 87 studies that had relevant titles (any kind of mental health improvement programme for any kind of workers, or any kind of intervention carried out with a sample of blue-collar workers). The studies were saved to an online folder and were ready to be screened for relevance.

Literature screening

The first screening phase aimed to exclude studies for the following reasons:

- Whole, or most of study focusing on physical interventions.
- Study considering only white-collar workers (not a blue-collar study).

Twenty-six studies that explored only mental wellbeing programmes and were focused only on blue-collar workers were identified, and the second screening process was carried out. This involved applying exclusion criteria to the remaining studies (see Table 2). Studies were excluded if the work environment or workplace was not relevant enough to forestry. Studies that reported on interventions that showed no significant positive effects were excluded. A discussion as to why they may not improve stress levels and what can be done to improve the intervention is outside the scope of this report and should be a topic for separate study. Interventions that were largely focussed on smartphone methods were also excluded. Bennett (2022) reports that some smartphone and digital-based interventions, specifically mental health/wellbeing smartphone applications, are controversial due to their low, or often uncertain, effectiveness. It was also reported that after 3-7 days of these interventions, the

applications showed very steep drop offs in user rates (Bennett, 2022; Milner et al., 2018; 2019; MATES in Construction New Zealand, 2024). Fifteen studies remained at the end of the second screening.

Table 2 – Exclusion criteria for second screening of intervention literature.

Exclusion criteria
1. Not relevant enough to forestry work environment.
2. Mental wellbeing intervention showed no significant signs of efficacy among workers.
3. Study too focused on smartphone apps or digital-based interventions.

Following the two stages of screening, a modified data extraction template sourced from Dataprev Project (Czabała et al., 2011) was filled out with key attributes (author, year, country, study type, intervention type, population, sample size, instruments/indicators, and the main outcomes of the intervention) of each of the intervention studies. The data extraction templates for the 26 studies identified through the first screening and their treatment through the second screening are shown in Table 3 through Table 10.

Dataset (relevant studies reporting successful mental wellbeing intervention results)

The finalised dataset for this report consisted of studies that were selected as *'relevant studies reporting successful mental wellbeing intervention results'*. The interventions described in each of these studies were classed into five categories. The five categories (interventions focusing on skills training, improvement of working conditions, improvement of occupational qualifications, relaxation techniques, physical exercise) made the foundation for the discussion in this report.

Literature analysis

The finalised dataset of 15 relevant mental wellbeing intervention studies were printed to be analysed and annotated using colour-coded pens, highlighters, sticky-notes for a hand-written analysis system. This involved organising and labelling intervention types, key attributes, results, patterns and other important data with brief, descriptive verbal tags, colour-codes, and drawing diagrams of concepts between studies. The outlined method for analysing the intervention studies was the most time-efficient method and allowed for notes and connections between various studies to be made in a fast and logical manner. The hand-written analysis focussed on addressing the five categories (skills training, improvement of working conditions, improvement of occupational qualifications, relaxation techniques, physical exercise) and classifying the type of intervention from each of the 15 studies into one of these five categories.

Discussion

A discussion point was made for each of the five categories of interventions. A discussion was formed to describe how each of the selected intervention studies fit into their respective category, and why the intervention approach explored in each study may be relevant to a New Zealand forestry context. Any outstanding strengths of interventions are noted as well as any major findings from the studies that have significance to forestry. Other points that are

discussed included the ability for the intervention to be implemented successfully in a New Zealand forestry work environment or New Zealand forestry organisations, simplicity, or difficulty of implementation and management of the intervention framework.

Results

Fifteen studies were selected as *'relevant studies reporting successful mental wellbeing intervention results'*. The interventions described in each of these 15 studies were classed into five categories.

Intervention categories

Although there is a large volume of mental wellbeing intervention studies explored in this review, more than 50% of the interventions shared a similar set of aims (objectives and outcomes) which were largely independent of the type of blue-collar work environment, indicating that the interventions implemented in one blue-collar workplace, could be successfully implemented in other blue-collar workplaces. This is an important observation as the potential for these interventions to be implemented in forestry workplaces depends on this high versatility of interventions and interchangeability between differing blue-collar workplace structures (i.e. an occupational mental wellbeing intervention, originally implemented in a construction work environment among construction personnel, can be implemented in a forestry setting, such as a work environment consisting of machine-harvesting contractors). However, there is still a relatively high level of heterogeneity between the intervention programmes themselves; intervention design, techniques, procedures, implementation methods and worker characteristics differ between the studies reviewed.

The interventions outlined in the dataset consisting of the fifteen most relevant intervention studies were categorised into five groups:

1. Skills training
2. Improvement of working conditions
3. Improvement of occupational qualifications
4. Relaxation techniques
5. Physical exercise

For each of the five intervention categories, the best-fitting intervention studies (studies that reported successful intervention results, and covered interventions that had a high relevance to a New Zealand forestry work environment) were included. This approach allows for qualitative analysis of interventions that have the potential to provide support to distinct components of the work environment seen within forestry organisations. The categories were developed with a focus to cover the basic needs of blue-collar forestry workers.

Exclusion criteria 1: INTERVENTION SHOWED NO SIGNIFICANT SIGNS OF IMPROVEMENT

Table 3 – Four out of eleven studies excluded because their respective intervention showed no significant signs of improvement.

	Author (year), country	**Study type**	**Intervention approach**	**Population and sample size**	**Instruments and indicators**	**Intervention outcome**
1.	Addley et al. (2014), United Kingdom	RCT	Health risk appraisal intervention (HRA)	180 workers	–	Participation in the HRA associated with a higher likelihood of perceived lifestyle behaviour change.
2.	Gupta et al. (2018), Denmark	–	Participatory physical and psychosocial workplace intervention (PIPPI)	Industrial workers sample size = 415 intervention group n = 193 control group n = 222	Planned workshops conducted, questionnaires	No significant between-group improvements for any of the outcomes were found in intention-to-treat multi-level mixed models.
3.	Kobayashi et al. (2007), Japan	RCT	MHACL on reducing job stressors	Intervention group n = 321 Control group n = 750	The Mental Health Action Checklist for a Better Workplace Environment (MHACL)	No significant favourable effect of the program was observed among male, blue-collar workers.
4.	Milner et al. (2015), Australia	RCT	Effectiveness of a multimedia-based intervention aimed at reducing stigma	682 blue-collar workers	Self-stigma was assessed using the Self-Stigma of Depression Scale at post-intervention.	There were reductions in stigma in both the intervention and control groups, but the intervention had no significant effect on self-stigma.

Exclusion criteria 2: NOT RELEVANT ENOUGH TO FORESTRY WORK ENVIRONMENT

Table 4 – Five out of eleven studies excluded because their respective intervention was not relevant enough to forestry work environments.

	Author (year), country	**Study type**	**Intervention approach**	**Population and sample size**	**Instruments and indicators**	**Intervention outcome**

5.	Cook et al. (2009),	–	The Working People program, based on a social-learning model designed to prevent alcohol misuse	108 blue-collar workers (printing company)	–	Results of this study suggest that alcohol consumption can be reduced among adults who participate in this type of worksite program.
6.	Matthews et al. (2021), Australia	–	Employee Assistance Programs (EAP)	44 workers 32 (white collar) 12 (blue collar)	–	Some elements identified in the barriers to EAP use are more entrenched than were previously estimated and these need to be a priority for action to increase confidence in EAP services by end-users.
7.	Shirom & Kirmeyer (1988)	–	Unions intervention	214 full-time unsupervised manufacturing blue collar workers	–	For union members, higher perceived performance of the union was associated with lower perceived stress and strain.
8.	Tsutsumi et al. (2009),	–	Participatory intervention for workplace improvement	97 workers (47 assembly line workers; 50 control group participants)	–	This participatory intervention for workplace improvement can be effective against deterioration in mental health and for improving job performance.
9.	Xing et al. (2019), China	RCT	Emotional and mental inducement	10 high-altitude construction workers	Tri-dimensional emotion model (i.e. the VDA model) is applied to evaluate the effects of the proposed	The combined effects of the progressive muscle relaxation and trigeminal nerve stimulation sessions in adjusting adverse emotional and mental

					multicomponent intervention	states of high-altitude construction workers are determined by statistical analysis.

Exclusion criteria 3: SMART PHONES

Table 5 – Two out of eleven studies excluded because their respective intervention was too focused on smartphone- and digital-based intervention programmes.

	Author (year), country	**Study type**	**Intervention approach**	**Population and sample size**	**Instruments and indicators**	**Intervention outcome**
10.	King et al. (2022), Australia	Two-arm RCT	Blended face-to-face and smartphone intervention	Construction workers	Mixed-model repeated measures (MMRM) analysis	No significant effect for suicide prevention literacy or help-seeking from formal sources. Increase in help-seeking from MATES worker, and from a workmate.
11.	Nwaogu et al. (2021), Nigeria	Non-probability sampling trial	determine the use of digital interventions for mental health	Construction personnel	Qualitative inductive content analysis	A total of 6 barrier and 3 motivator themes were identified. An understanding is provided of the design needs required to facilitate sustained self-management of mental health of construction personnel with digital interventions.

Category 1: SKILLS TRAINING

Table 6 – Four intervention studies included in the skills training category.

	Author (year), country	**Study type**	**Intervention approach**	**Population and sample size**	**Instruments and indicators**	**Intervention outcome**

12.	Iremeka et al. (2021), Nigeria	RCT	Group Rational Emotive Behaviour Therapy (Group REBT)	Skilled construction workers	Perceived stress scale-14 (PSS-14)	REBT significantly improved stress and work-related irrational belief scores. Scores were sustained at follow-up.
13.	Malkinson et al. (1997),	RCT	Rational Emotive Behaviour Therapy (REBT)	27 female, blue-collar workers	–	Four of the five measures in the intervention group were significantly reduced compared to the control group. At the 12-month follow-up, tension and burnout were still reduced compared to baseline. Booster sessions are recommended.
14.	Okereke et al. (2021), Nigeria	RCT	Rational Emotive Behaviour Therapy (REBT)	125 Construction and mechanical trade artisans	Copenhagen Burnout Inventory	Significant reduction in mean burnout after 10-week REBT program
15.	Vasse et al. (1998),	–	Health Profile that was offered to blue-collar workers	–	–	Significant improvement of awareness of own health behaviours and attitudinal changes. No changes in social support, self-efficacy or the intention to change behaviours. A personalised Health Profile can help make workers aware of their personal risk behaviours.

Category 2: IMPROVEMENT OF WORKING CONDITIONS

Table 7 – Seven intervention studies included in the improvement of working conditions category.

	Author (year), country	**Study type**	**Intervention approach**	**Population and sample size**	**Instruments and indicators**	**Intervention outcome**
16.	Cestrand et al. (2021), Sweden	CCT	Co-creating occupational health intervention	Stakeholders	Semi-structured interviews	Respondents were satisfied with engaging in co-creation. Reported increased awareness of risk factors of stress and how these should be handled. Co-creation enhances implementation and contextual fit.
17.	Demerouti et al. (2020),	RCT	Job-crafting intervention (similar to co-design concept)	–	–	Reported lower levels of exhaustion, improved cognitive and behavioural attitudes towards change, and increased safety behaviour. The intervention was found to improve the affective, cognitive, and behavioural components of a change attitude due to increases in seeking challenges.
18.	Finstad et al. (2019), Italy	CCS (cross-sectional study)	Components of the JDCS and the health of the workers considering workplace bullying as a mediating variable	400 blue-collar workers	–	Workplace bullying mediates the relationship between JDCS components and health outcomes. The study adds new insights into the relationship between violence seen as a form of social behavioural strain and

						the psychological health of workers.
19.	Jahncke et al. (2017),	Questionnaire study	Web-based questionnaire	122 blue-collar workers (55 out of 122 workers were female)	–	More alternations were desired, and workers preferred performing a physical task after a mental and vice versa.
20.	Kim et al. (2014), South Korea	RCT	Participatory action-oriented training (PAOT) and individual management	24 workers	Korean Occupational Stress Scale (KOSS), Worker's Stress Response Inventory (WSRI)	For blue-collar workers, psychosocial factors such as the physical environment, job demands, organisational system, lack of rewards, and occupational climate were significantly improved.
21.	Nwaogu, J. & Chan, A. (2021), Nigeria		(Co-design) Evaluation of multi-level intervention strategies	Construction industry experts	Questionnaire survey consisting of 31 intervention strategies was administered	Strategies focusing on boosting employee morale, engagement and interpersonal relationship offered higher chances of improving mental health among construction personnel.
22.	Sponselee et al. (2022), Netherlands	Qualitative analysis	Interview analysis	20 interviews were reviewed	–	Stakeholders expressed a sense of professional obligation toward workplace health promotion, validating the opportunity to implement interventions to promote healthy eating and physical activity.

Category 3: IMPROVEMENT OF OCCUPATIONAL QUALIFICATIONS

Table 8 – One intervention study included in the improvement of occupational qualifications category.

	Author (year), country	**Study type**	**Intervention approach**	**Population and sample size**	**Instruments and indicators**	**Intervention outcome**
23.	Busch et al. (2017),		Peer-mentoring and teaching of peer-mentoring to line managers	421 low-skilled, blue-collar workers, (sample of workers was 50% female)		Increases in peer-mentor support. Peer-mentors initiated high-quality improvements at work. Reduction in blood pressure and somatic complaints in intervention-group workers.

Category 4: RELAXATION TECHNIQUES

Table 9 – One intervention study included in the relaxation techniques category.

	Author (year), country	**Study type**	**Intervention approach**	**Population and sample size**	**Instruments and indicators**	**Intervention outcome**
24.	Leung et al. (2022),	RCT	Mindfulness-based Stress Reduction (MBSR)	Construction Professionals (CPs)	Questionnaire survey, semi-structured interview	MBSR had a direct effect on CPs, improving mindfulness characteristics and enhancing performance by reducing their stress

Category 5: PHYSICAL EXERCISE

Table 10 – Two intervention studies included in the physical exercise category.

	Author (year), country	**Study type**	**Intervention approach**	**Population and sample size**	**Instruments and indicators**	**Intervention outcome**
25.	Campbell et al. (2002),	RCT	Health Works for Women (HWW) intervention	9 workplaces 854 female blue-collar workers	–	At the 18-month follow-up, the intervention group had increased fruit and vegetable consumption by 0.7 daily servings. (Control group saw no change).

						Intervention group demonstrated improvements in strengthening and flexibility exercise.
26.	Fogawat et al. (2024),	RCT	Yoga-based loosening exercises (YLE)	128 blue collar workers	Chalder Fatigue Scale (CFS), Visual Analog Scale for pain, Oldenburg Burnout Inventory (OLBI), Short Form-8 (SF-8) questionnaire	The yoga group reported significant reductions in fatigue, pain, and burnout and significant improvements in flexibility, strength, and quality of life.

Figure 1 shows a diagram relating work-related factors (psychosocial hazards) that are known to lead to the listed symptoms in workers who become chronically exposed to these factors. The diagram outlines intervention types from the dataset for this report to show that each type of psychosocial hazard has the potential to cause and/or exacerbate multiple symptoms.

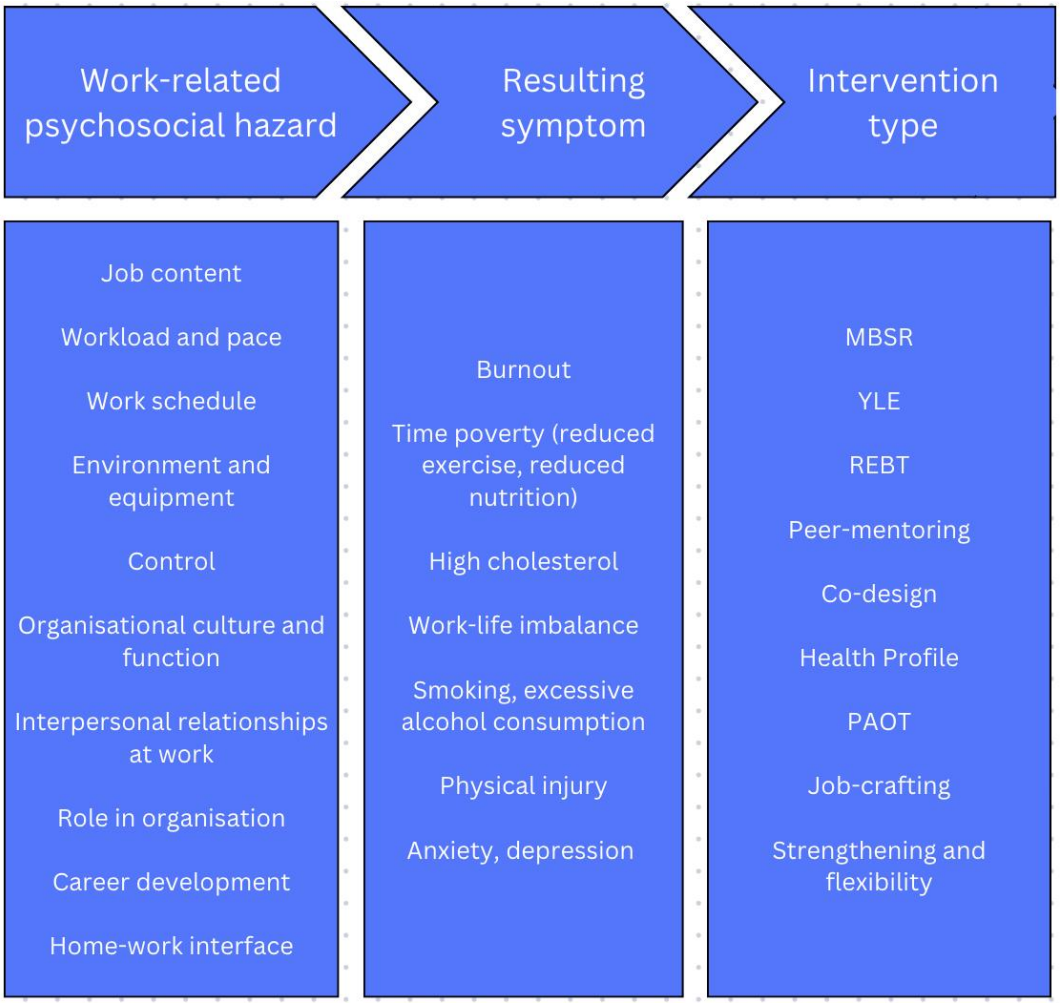

Figure 1 – Diagram showing the relation between psychosocial hazards, symptoms and interventions.

The first column lists work-related psychosocial hazards commonly seen in New Zealand forestry work places. The second column describes the symptoms which may develop in workers as a result of the psychosocial hazards outlined in the first column. The symptoms appear in no particular order, and can correlate to multiple, if not all, of the psychosocial hazards listed in column one. The final column of Figure 1 lists intervention types explored in this study which have shown evidence of efficacy in work environments outside of forestry, which can be implemented to help mitigate psychosocial hazards from column one, and prevent adverse worker symptoms seen in column two. The listed factors influencing decreased psychosocial functioning as a response to mental ill health will typically act in conjunction with one or more of these factors (Forastieri, 2016; Leka & Jain, 2010; Solar & Irwin, 2010, as cited by Best et al., 2021; Best, 2022; Lovelock, 2019).

Discussion

In the following section, the intervention approaches from the dataset of 15 relevant mental wellbeing interventions, which were classed into five categories (skills training, improvement of working conditions, improvement of occupational qualifications, relaxation techniques, physical exercise), are discussed regarding their potential for implementation in New Zealand forestry work environments.

1. Skills Training

Three interventions were classed into the skills training category. Two of the three interventions were based on rational emotive behaviour therapy. Rational emotive behaviour therapy (REBT) is a form of cognitive-behavioural therapy developed by Albert Ellis. It focuses on identifying and challenging irrational beliefs that lead to emotional distress, and replacing them with rational, low-stress thoughts. Ellis' theory is that thoughts shape an individual's emotional and behavioural response, not external events. By changing irrational thinking, individuals, such as workers facing stressors within their work environment, can alter their response in managing emotions, improving their state of mental wellbeing.

Referring to the stressors commonly experienced in New Zealand forestry work environments, this core theory of REBT is that it is not the stressors or the events themselves that directly cause emotional or behavioural reactions, but rather the psychological response from the individual. By recognising that emotional responses come from these irrational beliefs and thoughts, not the events themselves, individuals can learn to challenge and change irrational thinking, leading to healthier emotions and more adaptive behaviours. REBT carries potential to benefit forestry workers in New Zealand by helping them learn to better manage work-related stress, while training workers with the ability to apply these skills outside of work to improve management of personal stress. REBT-based interventions have a strong positive correlation with New Zealand forestry work environments due to higher potential of workers to face irrational thought patterns associated with geographical isolation, frequent exposure to physical hazards, longer productive working hours by season or by project, and repetitive work.

The third intervention in the skills training category focuses on the effectiveness of a Health Profile that was offered to blue-collar workers in the study by Vasse et al. (1998). The importance of a Health Profile accompanies the reason why REBT is a beneficial tool for individuals working in blue-collar environments. In the study by Lingard and Turner (2014), workers reported that repeated physical and mental strain (burnout) and a repetitive daily schedule may induce an illusive state where workers become so used to (performing tasks or) their daily schedule that they become unaware of factors that negatively influence their mental wellbeing, and become used to activities which reduce their mental health. The implementation of a Health Profile for blue-collar workers showed a significant improvement of awareness of individuals' own health behaviours. Significant attitudinal changes were also achieved, which is an essential component of the increase in awareness and improvement of mental wellbeing at work. Once individuals can change their attitude (i.e. reduce stigma associated with mental health and mental health support), their response to psychosocial hazards will change consequently, eventually leading to a chain reaction of awareness and

practices involving personal mental wellbeing improvement, and the ability to extend these positive effects to co-workers when necessary (Lingard & Turner 2014).

REBT is based on the identification of irrational beliefs that lead to emotional distress, and working to change the attitude surrounding these beliefs by replacing them with rational and positive outlooks. A Health Profile intervention can work alongside a REBT-based intervention to ensure that individuals have the capability to actively identify irrational beliefs. Increasing awareness of mental health and psychosocial hazards prior to the implementation of a REBT-based intervention will likely result in increased acceptance of REBT as a means for intervention, and increase the likelihood of the REBT intervention succeeding.

2. Improvement of Working Conditions

Three studies exploring high-quality interventions fit into the second category of interventions focusing on the improvement of working conditions. The first study in this category, by Cestrand et al. (2021), highlights the importance of co-design in the development and design of occupational health interventions.

Co-design (also called co-creation) is a collaborative process where stakeholders, including researchers, practitioners, and employees (managers and workers), work together to design, develop, and implement interventions for their own work environment. This approach integrates diversified perspectives, increasing the likelihood of the intervention's contextual relevance, which can allow the intervention to be better specified to the needs of the work environment (Cestrand et al., 2021; Sponselee et al., 2022). Co-creation can also offer significant benefits regarding the acceptance and uptake of interventions in the workplace. This may be an important factor to consider when designing interventions for forestry work environments due to the broad demographic of blue-collar workers in New Zealand originating from varying backgrounds, as well as the structure of New Zealand forestry organisations.

Co-creation is important for the forest industry in New Zealand because it actively involves workers, employers, and stakeholders in designing organisational or individual interventions that have a greater likelihood of success. The main benefits include a higher engagement and acceptance, addressing specific needs for forestry workers, cultural and environmental fit, and the building of trust and communication – two important pillars associated with improved mental wellbeing in work environments (Best, 2022), and the overall improvement of effectiveness, which is a large focus of intervention trials as successful mental wellbeing interventions with lasting effects are still emerging and have only been trialled or implemented in a narrow range of industries, with the majority being in white-collar work environments which do not have a direct correlation to forestry work environments.

Jahncke et al. (2017) investigated how alternating between mentally and physically demanding tasks at work affect worker wellbeing and found that on average, workers stated that they would prefer at least 0.4 more alternations between mentally and physically demanding tasks in their current work-day schedule (actual alternations 3.7, desired alternations 4.1), and that they believed that this change would improve their overall short-term occupational wellbeing. This finding can also act an example of a design element for the co-design of interventions for blue-collar work environments.

Specific Needs

Forestry workers face unique stressors when compared to many other blue-collar industries; physical hazards, isolation, and demanding working conditions. Co-design allows those directly affected to contribute their insights, helping ensure that mental well-being programmes are relevant, practical, and address real needs in the industry, which simultaneously forms a direct link to an increase in engagement and acceptance from workers, which has proven to be an issue in some intervention studies (Lingard & Turner, 2014; Busch et al., 2017).

Engagement and Acceptance

When workers are involved in creating interventions, they are more likely to feel a sense of ownership and trust in the process, leading to an increase in their engagement and willingness to participate in the programmes which has been a barrier in the past. Demanding schedules and stigma are the reasons for such barriers (Busch et al., 2017). By involving all parties in the development of interventions, there's a higher chance the interventions will be sustainable over time. Workers and employers are likely to continue using and refining strategies that have shown greater efficacy and the potential to modify interventions that have been directly created by organisations and surrounding parties to fit into the work environment as the industry evolves will be greater for co-created interventions.

Cultural Fit

New Zealand's forestry industry involves workers from different cultural backgrounds. Co-design can ensure that intervention strategies are culturally sensitive and culturally relevant.

Communication and Effectiveness

Involving workers in the design process ensures interventions are practical and workable in the real-world conditions of forestry. This leads to more effective strategies that workers are likely to use regularly. Co-creation fosters better communication between employers, contractors, and workers. This collaborative approach builds trust, improves relationships, and promotes a culture of openness around mental health within organisations, which is vital in industries where mental health can often be stigmatised (Demerouti et al., 2020; Nwaogu & Chan, 2021; Sponselee et al., 2022).

Intervention aims are comparable across the four co-design studies discussed, but the relatively high level of heterogeneity between the intervention programmes themselves; intervention design, techniques, procedures, implementation methods and worker characteristics differ between the studies reviewed. This point serves as evidence that co-design is a necessary for organisations to consider when constructing occupational health interventions.

The study carried out by Finstad et al. (2019) analysing how the job demand-control-support model (JDCS) components (workload, lack of control, lack of support) are impacted by workplace bullying. Although this issue is under reported throughout New Zealand's forest

industry, it is known to be present (Bentley et al., 2019; as cited by Best et al., 2021). If mental wellbeing interventions that are based primarily around the root-cause of mitigation of psychosocial stressors present in most forest work environments (workload, lack of control, lack of support), then this has the potential to directly mitigate levels of verbal abuse, physical abuse or bullying that may be present in work environments. Workplace bullying has a very high potential to cause greater mental harm when paired with burnout, financial stress, and has been known to lead to reduced mental health (Best et al., 2021, Gullestrup et al., 2011). In New Zealand, bullying and harassment have been experienced by more than 10% of study participants resulting in the New Zealand Workplace Barometer having included forestry as one of the industries which see the most frequent reports of workplace harassment and bullying (Best et al., 2021).

Participatory action-oriented training (PAOT) was trialled in a South Korean study carried out by Kim et al. (2014). The study proved that through the implementation of training intervention programmes at all levels in the work environment (organisational and individual), there was a reduction of adverse psychosocial factors and stress related symptoms.

Involvement of the participants, where participants consist of all members of an organisation, can enhance autonomy, justice, and social support, which are the directly influence the basic components of work-related psychosocial hazards (Karasek, 2004; as cited by Kim et al., 2014). Organisations are ever-changing, the number employees, organisation structure and task structure can change over time. Interventions based on PAOT theory can help fortify organisational structure through changes in the organisation, while ensuring that all hierarchical levels of workers are accounted for, as the PAOT structure encourages collaboration and communication across all levels. If PAOT can be paired with co-design, there is a high potential for improvement in organisational structure, as psychosocial factors dictating the mental wellbeing of workers are addressed, at the very least, positive changes, such as increases in awareness, will act to begin to push the organisational structure to identify and eventually mitigate psychosocial hazards from the work environment (Cestrand et al., 2021).

Furthermore, the study by Kim et al. (2014) discussed a simple, inexpensive, clever (SIC) contest. The SIC contest included team leaders who participated in the facilitator workshop, one of the components of the PAOT intervention, and involved the evaluation of action plans, workers also presented improvement activities that they had developed, as well as practices to reduce work-related stress were shared. The simplest, most cost effective and most clever improvement practices were chosen by a voting system and awarded. This is a key component of the interventions that was considered when studies were selected to make up the dataset for this report. In other studies, simplicity of intervention design was an important factor for the success of implementation of interventions, and for participation, as workers did not feel like they were being burdened with additional work on top of their busy working schedule (Okereke et al., 2022).

3. Improvement of Occupational Qualifications

In the study by Busch et al. (2017), a peer-mentoring programme was implemented where external agencies provided teaching of peer-mentoring principles to managers of several

organisations that employ blue-collar workers. The peer-mentors that were recruited from the organisations were highly motivated to participate in this intervention programme, eager to learn strategies to solve problems in the work environment after completing peer-mentor training.

Peer mentors introduced straightforward changes in the workplace through a collaborative approach, an aspect that can be associated strongly with the co-design approach and PAOT approach from studies by Cestrand et al. (2021) and Kim et al. (2014), respectively. The changes implemented by peer mentors included enhancing the organisation of shift patterns, allowing workers to experience less time-burdened daily schedules, establishing a new rest area which involves a different environment in which breaks are taken allowing workers to refocus, and naturally enhance attention, energy levels and manage the timing of their schedule mentally. The changes implemented through peer-mentoring training also included tidying up workspaces, which helps foster clear-headedness across workers, and mitigating social conflicts in the workplace, which is a psychosocial hazard associated with a wide range of detrimental symptoms, such as anxiety and depression, tendency for bullying or peer-to-peer stigma, and mental fatigue. While the study found that the perceived rise in peer mentor support was not statistically significant, both the effect size and qualitative findings suggest there was a notable shift in terms of peer mentor support across the organisations in which this intervention programme was implemented.

It must be noted that line managers explained they lacked motivation to take part in an intervention designed to support their subordinates' work situation and health improvement, as they were feeling too stressed themselves (Busch et al., 2017). This issue highlights flaws in the organisational structure of the company from which this finding was obtained, and can point to co-creation as a solution. The co-creation in this instance can include methods such as REBT, MBSR, or other cognitive-state altering and perception-shifting intervention strategies that have shown evidence of reducing stress among participants discussed in this report.

Additionally, Lingard and Turner (2014) reported that workers advocated that systems of mentoring, role modelling and peer support had potential to ensure *sustained changes* to positive lifestyle transformation, and declared the value that these forms of wellbeing interventions would bring to their lifestyles, especially how these types of low-scale interventions could directly support them at work and translate into betterment of their personal lives outside of work.

4. Relaxation Techniques

In the category for interventions which focused on relaxation techniques for blue-collar workers, the study by Leung et al. (2022) stood out for its simplicity, while retaining positive results. Mindfulness-based stress reduction (MBSR) intervention structure itself is based on intrinsic values which humans experience in every-day life. The pillars of MBSR loosely consist of reducing or eliminating judgement, acceptance and letting go (of past events, irrational beliefs – similar to REBT theory), patience, and expressing trust, love and gratitude.

The potential for stigma exists with an intervention approach such as MBSR when implementation in New Zealand forest industry is considered, however, with the addition of co-design, the development of a MBSR-based programme could not only overcome the issue faced with stigmatisation, but also reinforce the pillars of the MBSR model throughout all hierarchical levels of the organisation before implementation, increasing awareness and acceptance.

5. Physical Exercise

Campbell et al. (2002) presented a study about a Health Works for Women (HWW) intervention, an intervention programme addressing the general wellbeing of female blue-collar workers. The intervention included education about diet, strengthening and flexibility. The reported effects were positive for both the diet and the physical exercise aspects of the programme, however there were no other intervention studies included in this report that had a large enough focus on nutrition, so only the physical exercise aspects (strengthening and flexibility) are considered in this report. The positive results of the physical exercise and flexibility activities tested in the study by Campbell et al. (2002) provide evidence that strengthening and flexibility programmes have the potential to provide a cost-effective method of improving both the physical and psychological aspects of worker health. This study had a sample of female blue-collar workers and, while forestry work environments in New Zealand are predominantly male, the proportion of female workers in steadily increasing annually, with 10% of forestry logging workers being female, and approximately 33% of all forestry workers being female (Muka Tangata – Workforce Development Council for Food and Fibre Sector, 2024).

Yoga has been reported to reduce symptoms stemming from stressors commonly present in work environments, Hartfiel et al. (2011; 2012), Wolever et al. (2012); as cited by Fogawat et al. (2024), however, there is a gap in knowledge on how yoga-based exercises can fit into a blue-collar setting and target stressors associated with blue-collar work environments. The final category in this report for effective mental wellbeing intervention examples is physical exercise, featuring a study carried out by Fogawat et al. (2024) which explored the effectiveness of a yoga-based programme on 128 blue-collar workers.

The yoga-based loosening exercises (YLE) were carried out in the workplace daily, for forty minutes each day for one month, and targeted musculoskeletal pain, mental burnout and physical fatigue. The workers then had one more month of unsupervised YLE practice at home before results were collected. The results from this study were promising with 86% of the intervention participants following the YLE practices in the work place and 70% following the home-assigned YLE practices. The participants not only reported significantly reduced levels of burnout, musculoskeletal pain and physical fatigue, but they also reported on significantly noticeable improvements in physical aspects like flexibility, movement and strength, but also psychosocial aspects such as an overall improvement of quality of life.

Although workers may be aware of the positive effect of physical exercise practices such as YLE (Asztalos, 2008), there are significant challenges in introducing yoga programmes to blue-collar workers, including low self-confidence in practising yoga, concerns about the safety, the perceptions of efficacy of such practices, and stigma surrounding the practice (Spadola et al.,

2017; as cited by Fogawat et al., 2024). Demanding work schedules also stand as a barrier to implementation of YLE into the daily routines of blue-collar workers, but if the intervention programme were to be integrated into the working day appropriately, the potential for participants to notice benefits of the programme and begin at-home practices of YLE increases greatly (Fogawat et al., 2024).

Conclusion

The designs of the outlined interventions are simple, but have proven to be effective if they are implemented correctly, especially if participation is high (Okereke et al., 2022). From analysis of intervention studies it was learned that an important factor to consider for implementation of these mental wellbeing intervention strategies is that the intervention should not feel like it is increasing the workload of the workers and managers, meaning that the intervention meetings, training and participation should be timed appropriately by those leading the implementation. This was highlighted in the study by Busch et al. (2017). This result can have several explanations, but the most plausible hypothesis is that the intervention might have put an additional burden on the workers already facing high work demands. In addition, there may have been an insufficient contextual fit between the targeted outcomes and the intervention components, or unsuccessful implementation into the work environment may have occurred. These potential explanations need to be investigated using process evaluation data (Gupta et al., 2018).

This paper has reviewed mental wellbeing interventions that have been implemented in blue-collar work environments, and aims to identify which of these tried and tested mental wellbeing interventions may carry potential for benefit of blue-collar workers in forestry settings in New Zealand. The studies categorised and the remaining studies reviewed outlining mental wellbeing interventions that have been tried and tested in blue-collar work environments, there was a strong correlation between simplicity of the intervention, both implementation of the intervention and the activities required to participate, and the level of success seen from the intervention. A likely reason for this is that complex interventions, interventions consisting of multiple components, or layers, start to become washed out, inconclusive and can appear as an extra burden on top of the already demanding working day for many blue-collar workers.

References

Addley, K., Boyd, S., Kerr, R., McQuillan, P., Houdmont, J. & McCrory, M. (2014). The impact of two workplace-based health risk appraisal interventions on employee lifestyle parameters, mental health and work ability: results of a randomized controlled trial. *Health Education Research, 29*(2), 247-258. https://doi.org/10.1093/her/cyt113

Asztalos, M., Wijndaele, K., De Bourdeaudhuij, I., Philippaerts, R., Matton, L., Duvigneaud, N., Thomis, M., Duquet, W., Lefevre, J. & Cardon, G. (2008). Specific associations between types of physical activity and components of mental health. *Journal of Science and Medicine in Sport, 12*(4), 468-474. https://doi.org/10.1016/j.jsams.2008.06.009

Bennett, H. (2022). Effectiveness of Wellbeing Interventions. *The Business Leaders' Health and Safety Forum.* https://www.forum.org.nz/assets/Uploads/Effectiveness-of-wellbeing-interventions-July-2022.pdf

Bergman, M. E. & Jean, V. A. (2015). Where Have All the "Workers" Gone? A Critical Analysis of the Unrepresentativeness of Our Samples Relative to the Labor Market in the Industrial–Organizational Psychology Literature. *Industrial and Organizational Psychology 2016, 9*(1), 84-113. https://doi.org/10.1017/iop.2015.70

Best, T. (2022). The Construction of Operator Stress and Wellbeing in Aotearoa New Zealand's Logging Industry. https://ir.canterbury.ac.nz/server/api/core/bitstreams/ec95434c-edf4-4311-84b4-367a26cc39bf/content

Best et al. (2021). Stress, psychosocial factors and the New Zealand forest industry workforce: Seeing past the risk of harm to the potential for individual and organisational wellbeing. *New Zealand Journal of Forestry Science 51*(5). https://doi.org/10.33494/nzjfs512021x93x

Busch, C., Koch, T., Clasen, J., Winkler, E. & Vowinkel, J. (2017). Evaluation of an organizational health intervention for low-skilled workers and immigrants. *Human Relations, 70*(8). https://doi.org/10.1177/0018726716682308

Campbell, M. K., Tessaro, I., DeVellis, B., Benedict, S., Kelsey, K., Belton, L. & Sanhueza, A. (2002). Effects of a Tailored Health Promotion Program for Female Blue-Collar Workers: Health Works for Women. *Preventive Medicine, 34*(3). 313-323. https://doi.org/10.1006/pmed.2001.0988

Cedstrand, E., Nyberg, A., Bodin, T., Augustsson, H., & Johansson, G. (2020). Study protocol of a co-created primary organizational-level intervention with the aim to improve organizational and social working conditions and decrease stress within the construction industry–a controlled trial. *BMC Public Health, 20*(424), 1-8. https://doi.org/10.1186/s12889-020-08542-7

Cook, R. F., Back, A. S. & Trudeau, J. (2009). Preventing Alcohol Use Problems among Blue-Collar Workers: A Field Test of the Working People Programme. *Substance Use & Misuse, 31*(3), 255-275. https://doi.org/10.3109/10826089609045812

Czabała, C., Charzyńska, K. & Mroziak, B. (2011). Psychosocial interventions in workplace mental health promotion: an overview. *Health Promotion International, 26*(1), 70-84. https://doi.org/10.1093/heapro/dar050

Demerouti, E., Soyer, L. M. A., Vakola, M. & Xanthopoulou, D. (2020). The effects of a job crafting intervention on the success of an organizational change effort in a blue-collar work environment. *Journal of Occupational and Organizational Psychology, 94*(2), 374-399. https://doi.org/10.1111/joop.12330

Finstad, G. L., Ariza-Montes, A., Giorgi, G., Lecca, L. I., Arcangeli, G. & Mucci, N. (2019). The JDCS Model and Blue-Collar Bullying: Decent Working Conditions for a Healthy Environment.

International Journal of Environmental Research and Public Health, 16(18). https://doi.org/10.3390/ijerph16183411

Fogawat, K., Keswani, J., Sharma, H., Tewani, G. R., Kodali, P. B., Nair, P. M. K. (2024). Randomized controlled trial investigating the role of yoga at workplace in improving fatigue, burnout, pain, strength, and quality of life among blue-collar workers. *Journal of Education and Health Promotion 13*(1), 152. 10.4103/jehp.jehp_541_23

Gullestrup, J., Lequertier, B. & Martin, G. (2011). MATES in Construction: Impact of a Multimodal, Community-Based Program for Suicide Prevention in the Construction Industry. *International Journal of Environmental Research and Public Health, 8*(11), 4180-4196. https://doi.org/10.3390/ijerph8114180

Gupta, N., Wåhlin-Jacobsen, C. D., Abildgaard, J. S., Henriksen, L. N., Nielsen, K. & Holtermann, A. (2018). Effectiveness of a participatory physical and psychosocial intervention to balance the demands and resources of industrial workers: A cluster-randomized controlled trial. *Scandinavian Journal of Work, Environment & Health, 44*(1), 58-68. https://www.jstor.org/stable/44709302

Hassard, J., Teoh, K., Cox, T., Cosmar, M., Gründler, R., Flemming, D., Cosemans, B. & van den Broek, K. (2014). Calculating the cost of work-related stress and psychosocial risks. *European Agency for Safety and Health at Work.* 10.2802/20493

Hinze, A., König, L. & Bowen, J. (2021). Worker-fatigue contributing to workplace incidents in New Zealand Forestry. *Journal of Safety Research, 79*, 304-320. https://doi.org/10.1016/j.jsr.2021.09.012

Iremeka, F. U., Okeke, S. A., Agu, P. U., Isilebo, N. C., Aneke, M., Ezepue, E. I., Ezenwaji, I. O., Ezenwaji, C. O., Edikpa, E., Chukwu, C. J., Eze, A. F., Omeje, H. O., Okereke, G. K. O., Ogidi, C. I. & Chukwuji, C. (2021). Intervention for stress management among skilled construction workers. *Medicine, 100*(28). 10.1097/MD.0000000000026621

Jahncke, H., Hygge, S., Mathiassen, S. E., Hallman, D., Mixter, S. & Lyskov, E. (2017). Variation at work: alternations between physically and mentally demanding tasks in blue-collar occupations. *Ergonomics, 60*(9), 1218-1227. https://doi.org/10.1080/00140139.2017.1282630

Kim, SA., Suh, C., Park, MH., Kim, K., Lee, CK., Son, BC., Kim, JH., Lee, JT., Woo, KH., Kang, K. & Jung, H. (2014). Effectiveness of a Comprehensive Stress Management Programme to Reduce Work-Related Stress in a Medium-Sized Enterprise. *Annals of Occupational and Environmental Medicine, 26*(4). https://doi.org/10.1186/2052-4374-26-4

King, T. L., Fleitas Alfonzo, L., Batterham, P., Mackinnon, A., Lockwood, C., Harvey, S., Kelly, B., Lingard, H., Cox, L. & LaMontagne, T. D. (2023). A blended face-to-face and smartphone intervention to improve suicide prevention literacy and help-seeking intentions among construction workers: a randomised controlled trial. *Social Psychiatry and Psychiatric Epidemiology, 58*(6), 871-881. https://doi.org/10.1007/s00127-023-02429-9

Kobayashi, Y., Kaneyoshi, A., Yokota, A. & Kawakami, N. (2008). Effects of a Worker Participatory Programme for Improving Work Environments on Job Stressors and Mental Health among Workers: A Controlled Trial. *Journal of Occupational Health, 50*(6), 455-470. https://doi.org/10.1539/joh.L7166

Korneeva, Y., Simonova, N., Shadrina, N. (2022). The Psychosocial Risk Factors Evaluation and Management of Shift Personnel at Forest Harvesting. *Forests 2022*, *13*(9), 1447. https://doi.org/10.3390/f13091447

Leung, M. Y., Ahmed, K. & Famakin, I. O. (2024). Impact of mindfulness-based stress reduction intervention on the performance of construction professionals. *Engineering, Construction and Architectural Management, 31*(2), 662-680. https://doi.org/10.1108/ECAM-01-2022-0005

Lilley, R., Feyer, A., Kirk, P. & Gander, P. (2002). A survey of forest workers in New Zealand: Do hours of work, rest, and recovery play a role in accidents and injury? *Journal of Safety Research, 33*(1), 53-71. https://doi.org/10.1016/S0022-4375(02)00003-8

Lingard, H. & Turner, M. (2014). Improving the health of male, blue collar construction workers: a social ecological perspective. *Construction Management and Economics 2015*, *33*(1), 18–34. http://dx.doi.org/10.1080/01446193.2014.997259

Lovelock, K. (2019). Psychosocial hazards in work environments and effective approaches for managing them. *WorkSafe New Zealand.* ISBN 978-1-98-856731-0

Malkinson, R., Kushnir, T. & Weisberg, E. (1997). Stress management and burnout prevention in female blue-collar workers: Theoretical and practical implications. *International Journal of Stress Management, 4*(1), 183-195. https://doi.org/10.1007/BF02765323

MATES in Construction New Zealand. (2024). SUICIDE PREVENTION IN THE CONSTRUCTION INDUSTRY. *MATES in Construction New Zealand*. https://mates.org.au/newzealand/#:~:text=The%202018%20BRANZ%20Mental%20Health,all%20industries%20in%20New%20Zealand%E2%80%9D

Matthews, L. R., Gerald, J. & Jessup, G. M. (2021). Exploring men's use of mental health support offered by an Australian Employee Assistance Programme (EAP): perspectives from a focus-group study with males working in blue- and white-collar industries. *International Journal of Mental Health Systems, 15*(68). https://doi.org/10.1186/s13033-021-00489-5

Milner, A., King, T. L., Scovelle, A. J., Batterham, P. J., Kelly, B., LaMontagne, A. & Lockwood, C. (2019). A blended face-to-face and smartphone intervention for suicide prevention in the construction industry: protocol for a randomized controlled trial with MATES in Construction, *19*(1), 1-8.

Milner, A., Law, P. C. F., Mann, C., Cooper, T., Witt, K. & LaMontagne, A. D. (2018). A smart-phone intervention to address mental health stigma in the construction industry: A two-arm

randomised controlled trial, *SSM - Population Health, 4*(1), 164-168. https://doi.org/10.1016/j.ssmph.2017.12.007

Milner, A., Witt, K., Burnside, L., Wilson, C. & LaMontagne, A. D. (2015). Contact & connect—an intervention to reduce depression stigma and symptoms in construction workers: protocol for a randomised controlled trial. *BMC Public Health, 15*(1062). https://doi.org/10.1186/s12889-015-2394-x

Ministry of Business, Innovation and Employment (2023). Māori Workers. *Health and Safety at Work Strategy 2018-2018.* https://www.mbie.govt.nz/assets/11fc443f2b/maori-workers.pdf

Ministry of Health. (2018). Appendix 1: Cross-government mental health strategy development. *In Submission to the Inquiry into Mental Health and Addiction*. Wellington: Ministry of Health. https://mentalhealth.inquiry.govt.nz/assets/Summary-reports/He-Ara-Oranga.pdf

Muka Tangata – Workforce Development Council for Food and Fibre Sector (2024). Forestry – Workforce Demographics. *Workforce Development Plans.* https://mukatangata.workforceskills.nz/explore-industries/forest-industry/workforce/workforce-demographics#:~:text=Around%20one%20third%20of%20workers,compared%20to%2010%25%20in%20Logging.

Nwaogu, J. M. & Chan, A. P. (2021). Evaluation of multi-level intervention strategies for a psychologically healthy construction workplace in Nigeria. *Journal of Engineering, Design and Technology, 19*(2), 509-536.

Nwaogu, J. M., Chan, A. P., Naslund, J. A., Hon, C. K., Belonwu, C. & Yang, J. (2021). Exploring the barriers to and motivators for using digital mental health interventions among construction personnel in Nigeria: qualitative study. *JMIR formative research, 5*(11). 10.2196/18969

Okereke, G. K. O., Omeje, H. O., Nwaodo, S. I., Chukwu, D. U., Asogwa, J. O., Obe, P. I., Uwakwe, R. C., Uba, M. B. I. & Edeh, N. C. (2022). Reducing burnout among building construction and mechanical trade artisans: the role of rational emotive behaviour intervention. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 40*(1), 61-74. https://doi.org/10.1007/s10942-021-00399-y

Paterson, C., Leduc, C., Maxwell, M., Aust, B., Amann, B. L., Cerga-Pashoja, A., Coppens, E., Couwenbergh, C., O'Connor, C., Arensman, E., & Greiner, B. A. (2021). Evidence for implementation of interventions to promote mental health in the workplace: A systematic scoping review protocol. *Systematic Reviews*, *10*(41). https://doi.org/10.1186/s13643-020-01570-9

Shirom, A. & Kirmeyer, S. (1988). The effects of unions on blue collar role stresses and somatic strain. *Journal of Organizational Behavior, 9*(1), 29-42. https://doi.org/10.1002/job.4030090104

Sponselee, H. C. S., ter Beek, L., Renders, C. M., Robroek, S. J. W., Steenhuis, I. H. M. & Kroeze, W. (2022). Stakeholders' Perceptions Regarding Adaptation and Implementation of Existing Individual and Environmental Workplace Health Promotion Interventions in Blue-Collar Work Settings. *International Journal of Environmental Research and Public Health*, *19*(20). https://doi.org/10.3390/ijerph192013545

Tsutsumi, A., Nagami, M., Yoshikawa, T., Kogi, K. & Kawakami, N. (2009). Participatory Intervention for Workplace Improvements on Mental Health and Job Performance Among Blue-Collar Workers: A Cluster Randomized Controlled Trial. *Journal of Occupational and Environmental Medicine 51*(5), 554-563. 10.1097/JOM.0b013e3181a24d28

Vasse, R., Nijhuis, F. & Kok, G. (1998). Effectiveness of a Personalized Health Profile for Blue-Collar Workers. *Journal of Occupational & Environmental Medicine 40*(1), 69-75. 10.1097/00043764-199801000-00013

Xing, X., Li, H., Li, J., Zhong, B., Luo, H. & Skitmore, M. (2019). A multicomponent and neurophysiological intervention for the emotional and mental states of high-altitude construction workers. *Automation in Construction*, *105.* https://doi.org/10.1016/j.autcon.2019.102836