

AGED EMPLOYEES AND THE WORKPLACE ENVIRONMENT

Alida LANGLOIS¹

Review article

Abstract: This article explores workplace safety dynamics amid demographic shifts, highlighting the increase in aged workers. It addresses their unique safety challenges, particularly with machinery. The article examines the physical and cognitive effects of ageing on safety and technological adaptation. Findings show aged workers' experience reduces risks but highlights challenges with new technologies and complacency. It suggests tailored training, ergonomic adjustments, and health strategies to support the ageing workforce.

Keywords: Ageing workforce, workplace safety, complacency, technology adaptation, machinery evolution.

Introduction

Currently, demographic trends are witnessing a significant shift characterized by an unprecedented increase in the ageing population. This provides opportunities and challenges in safety practice. This change is a global phenomenon, with projections of 2 billion people aged over 65 by 2050. Over the next 50 years the Organisation for Economic Co-operation and Development (OECD) estimates that its member countries will see a steep decline in working age populations, and a concurrent increase in elderly population (Kerpelman, 2011). China has also seen an increase, with people over 65 years old accounting for 18.74 % of the population in 2021. The standard value of ageing is 7 % and this greatly exceeds that figure (Fan et al., 2023). Canada is reporting their 65 and above population is also increasing. In 2016 Canada had 5.9 million people aged 65 and older which was 16 % of the population, and it is expected by 2036 they will have 10 million people over 65 which will be 25 % of the population. Of their aged population in 2003 16 % of people between 65 and 69 were in the labour force, which increased to 26 % by 2016 (Stoesz et al., 2020).

This is further evidenced by Vallejo's (2022) chart of the projections of the world population age structure from 1950 to 2100 as seen in Figure 1 (Ritchie et al. 2023; White et al., 2018). The accompanying visual representations in Figure 1 and 2 offer a clear depiction of these global ageing trends (Vallejo, 2022; Old-age dependency ratio, 2021, 2022).

This change in the general demographic, as shown in Figure 2, has a follow-on effect for all organisations and governments, to enable a productive workforce and economy. Figure 3 demonstrates the increasing old age dependency ratio which underscores the urgency of addressing the age-related shifts in population structure as shown in Figure 1 and 2.

This shift brings about a new focus on work safety concepts that involve an ageing society. There are currently critical problems in dealing with aged employees and their interaction in the workplace environment, including interaction with machinery. Such challenges are rarely considered in routine risk assessments or organisational risk reviews, and they greatly influence a worker's vulnerability.

Materials and methods

This literature review aims to explore the implications of an ageing workforce on occupational health and safety, with a focus on the interaction between aged employees and machinery, both old and new. It addresses the physical and cognitive changes associated with ageing, and the influence these factors have on safety and productivity in the workplace. A search was conducted of academic and grey literature using databases such as PubMed, Scopus, Web of Science, and Google Scholar. Key search terms included "ageing workforce," "workplace safety for aged employees," "ergonomics for aged workers," "technology adaptation in ageing employees," and "machinery evolution and worker safety." The search

¹ VSB - Technical University of Ostrava, Faculty of Safety Engineering, Ostrava, Czech Republic, alida.langlois.st@vsb.com

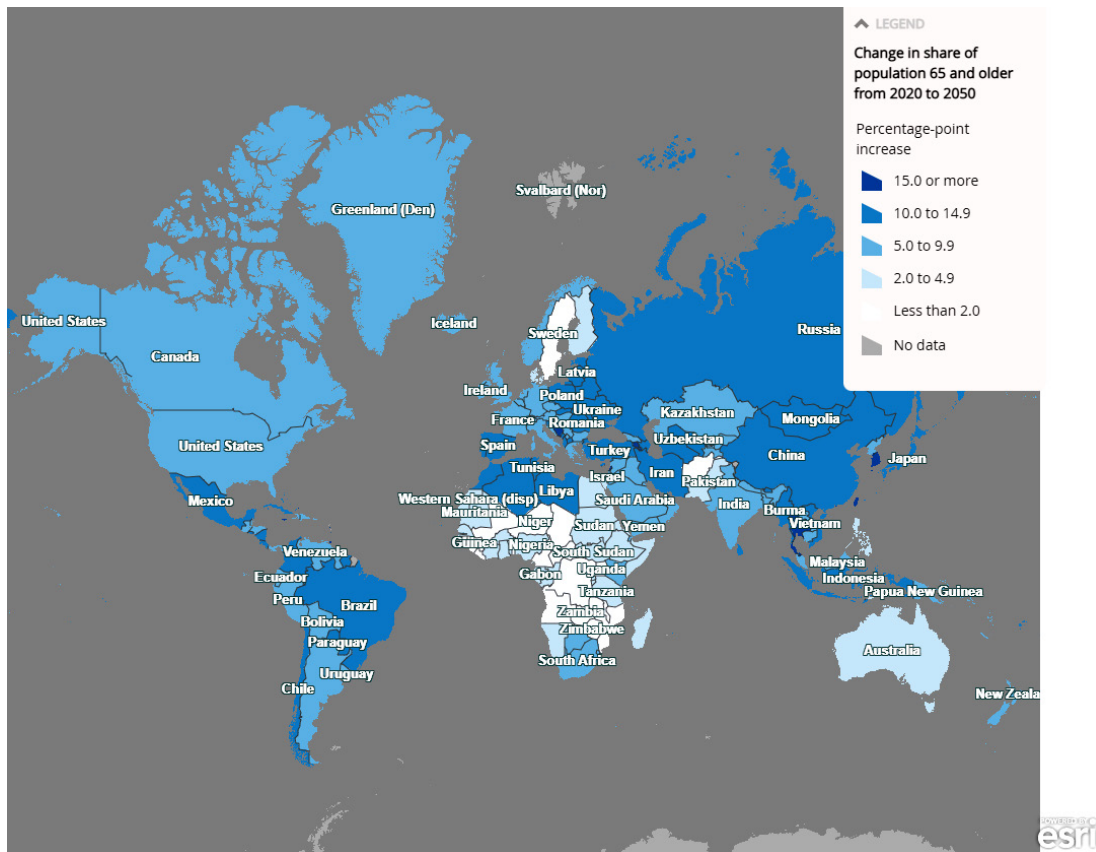


Figure 1. Changes in Share of Population 65 and Older from 2020 to 2050 (Vallejo, 2022)

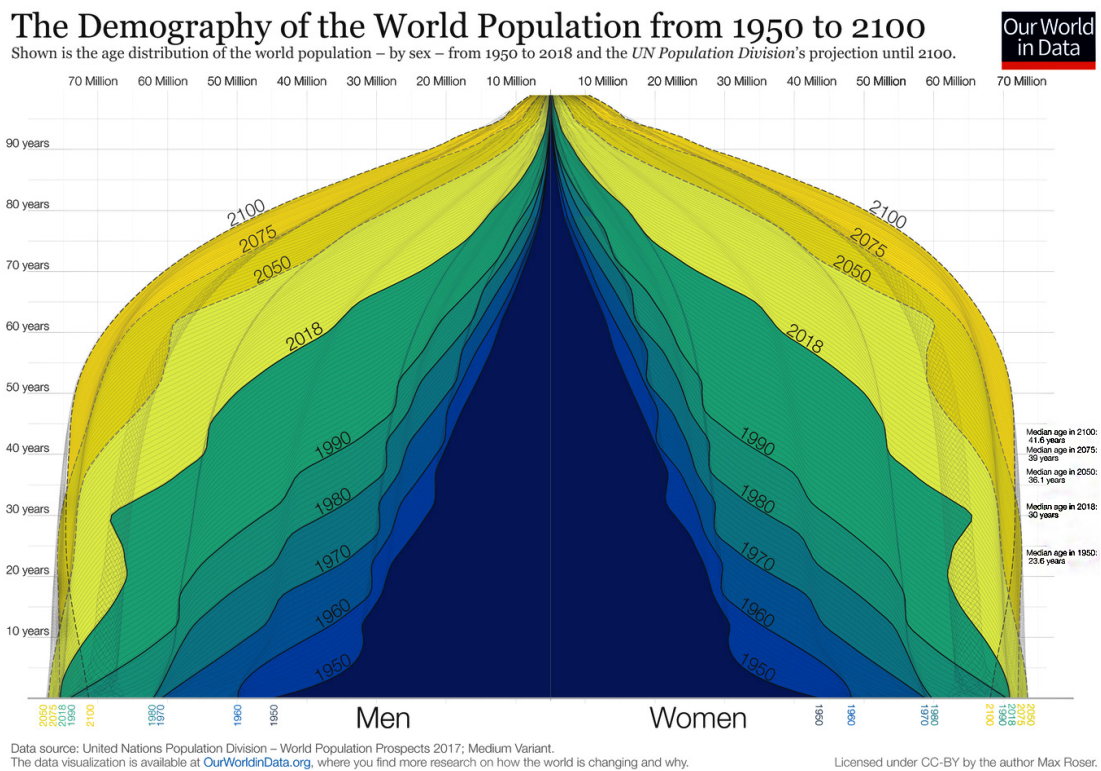


Figure 2. The Demography of the World Population from 1950 to 2100 (Roser, 2019)

Old-age dependency ratio, 2021



The number of elderly people (over 64 years old) relative to the number of working-age people (15-64 years). Figures are shown as the number of dependents per 100 working-age people. A value of 20% means that there are 20 people of old age for every 100 working-age people.

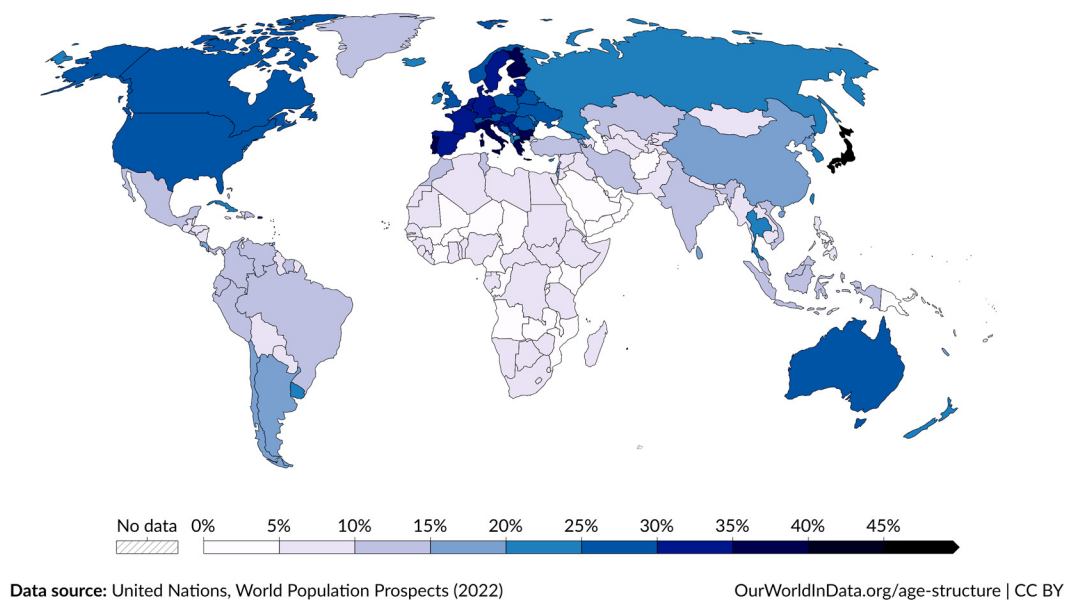


Figure 3. Old-age Dependency ratio, 2021 (Old-age dependency ratio, 2021, 2022)

was limited to documents published in English from January 1999 to February 2024. Inclusion criteria were established to select studies that specifically addressed the impact of ageing on workplace safety, the interaction between aged workers and machinery, and strategies for integrating technology to support aged employees. Both qualitative and quantitative studies were included to provide a comprehensive view of the topic. Exclusion criteria included studies that did not focus on the workplace environment or the aged demographic. Data was systematically extracted from each selected study, including author(s), year of publication, study objectives, methodology, main findings and conclusions. This information was tabulated to facilitate comparison and synthesis. A narrative synthesis approach was utilised to integrate findings from the included studies. This involved thematic analysis to identify common themes and patterns across the literature. The synthesis aimed to draw conclusions about the current state of knowledge regarding the ageing workforce and workplace safety, and to identify gaps in the research.

Results

The ageing workforce needs to be understood as having different interactions with machinery, procedures and situations, not only due to physical and cognitive effects that are associated with ageing, but also familiarity with the machinery. One important and strategic variable in reducing risk is understanding the impact of the age of machinery and advancement technology, which should be understood as a contributing causal factor to incidents and risk assessments (Xie et al., 2023; Chang et al., 2023). This presents opportunities and risks for the ageing workforce that should be carefully considered.

The ageing workforce has competencies and knowledge that are of advantage to many industries. Ability to operate and comprehend traditional machinery is particularly important in fields where there are still older machines, such as manual lathes or mechanically operated equipment. This is especially common in mining and manufacturing, where in some cases the manipulation required to complete the task could not be done without these machines.

Although these older machines may be more dangerous in design, there may be a risk reduction when an aged workforce is operating them. Due to their training and experience, older workers are aware of the machinery's limitations and potential risks (NIOSH, 2023). Such knowledge allows them to anticipate and prevent hazardous situations better than younger workers. The subtleties related to the weathering of machines can be managed by aged workers, to facilitate precision optimisation of the machine, increasing its lifespan as the aged workers would be more sensitive to such factors, whereas new technology would be computerised and automatically detect issues. Without this technology and only relying on self-awareness in the machine, the younger workforce might not understand nor have the experience to achieve the same level of proficiency and production as the older workforce (Voaklander et al., 2013). This can also be attributed to the training aged workers received during the early stages of their career. Apprenticeships and on-the-job training used to focus intensively on the specificities of each machine. This training would not be limited to basic operation but include understanding of the mechanics, maintenance needs, and potential failure points of the machinery. This comprehensive training is less common in modern apprenticeships as many of these areas are automated and controlled via computer systems rather than being manipulated by the operator (Maurer, 2014; Fozard and Gordon-Salant, 2001).

Employees who have been brought up in an era of digital technology could be insensitive to risks of older machinery that cannot be adjusted to receive advanced safety systems. This dependency on the safety systems can unintentionally build complacency, particularly on machines that lack the more modern level of automation and protection (SafeStart, 2020).

Digital transformation

Many organisations transitioning to more advanced technological safety systems and automation will find concerns with aged workers struggling to adjust after decades of very little change in this area, and if there was change it would not be systematic but rather in small increments (Furst, 2021). These advancements can be seen not only in the machinery but in digital interfaces, sophisticated control systems and in the safety interaction such as safety systems being only accessible through app-based applications (Spyridopoulos et al., 2023). For the younger workforce, it would have become a norm in their employment as well as personal life. This lack of familiarity by the aged workers could

lead to a lack of proficiency when dealing with digital interfaces. Of concern would be that these workers might inadvertently disable crucial safety measures as they may not be aware of the complexities and operation of new safety systems such as emergency stops, light curtains or barriers (Rogers et al., 2017)

Aged employees' lack of familiarity with digital platforms has a high risk of operational errors. Digital interfaces need to be suitable for those workers who need to utilise them. This includes machinery control panels, safety system accessible points like websites and apps, and safety guarding systems such as interlocks. The aged workers will not have the same skills or knowledge to understand the information and useability that the younger employees have. The aged worker may have an increased awareness of their limitations or perceived limitations with the technology, and have further concerns over job security that will be exacerbated by having to learn a new technology (Xie et al., 2023).

Safety professionals must also be aware of these when utilising off-the-shelf safety systems that incorporate training via digital means, as they move away from paper based and classroom training. Use of digital platforms and online learning programs are less accessible and useable for people with low digital literacy levels. Aged workers may face having to learn a digital system then be taught another digital system, thus complicating the entire training process (Xie et al., 2023; Chang et al., 2023).

Complacency

Another concern with operation of machinery and the ageing workforce is that of complacency. Research and literature have shown that lengthy experience causes complacency where the individual tends to ignore the latent risks and perils since they have not experienced any problems, resulting in a false sense of safety (Bottino, 2021; Furst, 2021).

On the one hand, aged employees have a lot of experience that can be invaluable to organisations and industries; on the other, it may produce an opinion that tasks are not dangerous, or safety controls are too cautious or redundant. This creates a poor understanding and perception of the hazards, giving rise to oversight of safety measures as well as underestimation of the risk.

The problem of complacency is one such complex problem that organisations tend to forget. It is not a flagrant disregard for safety, but the loss of caution and proactive safety behaviours in small increments over a longer duration that cannot be detectable to the worker. This can be observed in

the employees who, due to their working experience on similar tasks, develop a self-assurance that leads them to believe they can take shortcuts (Bottino, 2021; Furst, 2021; Kennedy, 2019).

Industries have a pressing need to realise that complacency is not a unique causational factor of the aged workforce, but is applicable to the entire workforce. All employees are affected, since complacency cuts across all those who have been in the same role or similar roles for a long period. In the aged workforce, the problem may be more pronounced because of longer tenures, and because age-related factors might affect how these employees approach safety, as well as with the task- and equipment-specific differences that may exist between this work group and the remainder of the workforce.

Although the accumulated experience of aged workers can offer much-needed expertise to the workforce in terms of skills and knowledge that might not be easily available through the rest of the workforce, it is important to note that complacency represents a complicated mixture of experience, familiarity, and dynamically changing workplace needs.

The consideration of the health challenges associated with ageing and how they may impact employees' interaction with workplace equipment is another critical aspect. Cognitive functions like memory, attention and adaptability tend to change with age. The efficiency of the aged workers in operating machines may hence be changed. As employees advance in age, mental functions decrease, and these employees may struggle with complex operating procedures or the ability to monitor how machinery is operating. This cognitive decline may undermine their ability to learn and incorporate new information, leading to operational errors or decreased effectiveness of training with new equipment or alterations in equipment. The outcomes of such changes in cognitive abilities among the aged workers include memory, attention and adaptability (Fleck, 2015).

These changes have the potential to impact an aged worker's ability to adapt in the workplace, which includes learning and utilising new technologies. There is a need to identify and control these changes in line with the ability of the worker, to ensure a safe working environment. Mental harm risk exists in the aged worker in relation to the inability to learn the technology, and the subsequent feeling of not being able to perform the role that many have completed for their entire careers. This situation needs to be managed to ensure no psychosocial harm is suffered by an aged employee (Xie et al., 2023).

Physical signs of ageing must also be addressed. As Shephard (1999) argued, the prevalence of ageing is characterised by declining muscle strength and endurance which can impact work capacity (Shepard, 1999). These physical changes have implications for the health and productivity of the ageing workforce. At an advanced age other factors such as osteoarthritis may increase these risks. In addition, the process is a significant challenge for aged workers since they cannot maintain similar work levels and effectiveness as before (Barakovic Husic et al., 2020).

An aged worker may therefore experience difficulties while performing such tasks as operating manual controls, or maintaining machinery that requires manual dexterity or sustained physical exertion. An employee is likely to have an accident especially when dealing with cumbersome equipment or machines. Carrying out routine tasks may become more difficult, leading to injury and aggravation of a pre-existing condition.

Going forward

Organisations need to acknowledge the importance of preventive health measures. The majority of employees in the United States have shown evidence of chronic disease, and early detection and care enabled by health screening can reduce morbidity and mortality, as well as the higher costs of advanced disease (Fragala et al., 2019). According to a study by the American Journal of Managed Care (Fragala et al., 2019) early identification and treatment of diseases like diabetes, chronic kidney disease, and colorectal cancer through regular health screenings can prevent disease progression and reduce health costs. The prevalence of these chronic conditions tends to increase with age. Hypertension and diabetes, for instance, are commonly observed among aged workers (Motuma et al., 2023, Song et al., 2017). These conditions, particularly when coexisting, can compound the risk of more severe health issues, such as cardio-cerebrovascular diseases (Motuma et al., 2023). The co-morbidity of these conditions often leads to a complex health management scenario, where multiple chronic diseases can significantly impact an individual's overall health and ability to work effectively.

Addressing these challenges requires a comprehensive workplace health management strategy, including supportive policies, flexible work arrangements, and access to healthcare and mental health resources.

A scoping review carried out by BMC Health Services Research shows, for aged employees, health checks, counselling and modifications in their workplace result in positive behavioural change and improved health status (Söderbacka et al., 2020). Therefore, there is a need to promote both physical and psychosocial health strategies in workplaces.

Interventions focused on individual-level health checks and counselling have shown promising results in changing employee lifestyles and increasing work ability (Söderbacka et al., 2020). Strijk et al. (2013) conducted a six-month intervention study that included activities like yoga and aerobic exercises, demonstrating improved work-related vitality among older employees (Strijk et al., 2013). Similarly, supervisor training and support have positively affected health outcomes and enhanced work ability (Strijk et al., 2013).

These health management strategies require recognising and catering for specific health requirements of aged workers, guaranteeing their safety. Reduction in disease progression allows extension of an employee's working life and minimisation of the effects of injuries or illness on the employees' health (Crawford et al., 2010).

The impact of injuries on aged workers tends to be more severe than on their younger counterparts. Research has shown that aged workers generally report fewer incidents. However the consequences of the injuries sustained are more significant, often involving longer recovery periods and in some cases, higher fatality risks. This is evidenced by variations in work-related injuries among aged workers across different occupations, with distinct risk factors and outcomes (Stoesz et al., 2020; Barakovic Husic et al., 2020).

Workplaces should also consider developing specific safety strategies that meet the needs of this aged workforce. Such strategies should be aimed at improvement of ergonomic design considering physical impairments. The redesign of workstations and tools for ergonomic efficiency including adjustable chairs and appropriate-height workbenches, and less manually strenuous tools, will minimise strain and injury risk (National

Research Council (US) and Institute of Medicine (US) Committee on the Health and Safety Needs of Older Workers, 2004).

Cognitive support and training should also be implemented. Memory improving exercises and digital interfaces' simplification might be elements of the training programs for cognitive re-orientation. Promotion of digital literacy should be considered, and various levels of digital literacy should be factored into the training programs.

Flexible work arrangements can also provide support to the aged workers by accepting that they may need different endurance levels and health measures. Such options as part-time work, job sharing, or reduced workload allocation can ensure productivity without sacrificing health.

Employers should recognise the value of the skills and knowledge of the aged workforce, through mentorship programmes that enhance experience sharing and collaboration across all employees. By understanding and addressing the concerns that the aged workforce brings, organisations have the potential to improve their productivity and safety due to the strength and skill level that is retained within the workplace.

Conclusion

The emergence of aged workers in the labour market poses novel challenges and opportunities to the field's safety and productivity. Adjusting to these changes calls for a diverse approach that considers the special requirements and requirements of aged workers. Employers should consider inclusive safety measures, ergonomic adjustments, and ongoing training as a means to adjust for physical and cognitive changes related to ageing. Through the creation of a learning and adapting culture, organisations can deliver a safe, efficient and respectful working environment for all employees. This will not only eliminate risks but also take advantage of the strengths of a diverse and skilled workforce, leading to increased organisational performance and sustainability.

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