4 Advancing Age-Friendly Workplaces Through the NIOSH National Center for Productive Aging and Work

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Introduction

The workforce in the USA and other industrialized countries is aging, mainly because of increased life expectancy, the presence of the "baby boom" generation, and declining fertility rates (National Research Council and the Institute of Medicine, 2004, p. 1). More specifically, emerging trends, such as the shift toward nonstandard or contingent work arrangements and the erosion of defined-benefit plans, will require workers to prolong their stay in the workforce. Potential changes in state pension and retirement plans worldwide are expected to have an impact on retirement benefits as well as increase the age of retirement eligibility (Harris, 2017; Johnson & Steuerle, 2003). Early retirement is decreasing, and more people are continuing to work longer (Silverstein, 2008). Hence, understanding the safety and health needs of aging workers is a necessity, not only to better protect and advance the safety, health, and well-being of those who work into later life but also to take advantage of the important contributions that older individuals can make to their employers and society as whole.

The National Institute for Occupational Safety (NIOSH) has long recognized the growing need to examine the impact of age-related changes on the occupational safety and health (OSH) outcomes and well-being of aging workers. In 2015, NIOSH launched the National Center for Productive Aging and Work (NCPAW). Drawing from the concept *of productive aging* first articulated in the 1980s and adapting it to OSH, NCPAW seeks to advance the safety, health, and lifelong well-being of workers of all ages. This mission can be accomplished through the support of safe and healthy work environments for everyone through comprehensive strategies that allow workers to be safe, healthy, and productive at all ages. Older workers in particular are often the most skilled and the most susceptible to health and safety risk factors:

> Employers who do not anticipate the physical and cognitive capacities of older workers and who fail to provide the programs and policies needed to support their productive capacities and minimize their vulnerabilities will experience adverse impacts on quality, productivity, workplace safety, and workers' compensation. (Silverstein, 2008, p. 270)

As the populations of the USA and other developed countries have changed, so too has our

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

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general outlook on the aging process and its interaction with work. While this chapter primarily discusses aging and work in a US context, the issues reflect similar international trends that pertain to the aging workforce. The purpose of this chapter is to explore the productive aging concept as it applies to workers of all ages. This chapter also applies this concept to workers' personal and professional development and their contributions to their organizations as they transition throughout the life cycle. Next is a review of the current landscape of the aging workforce in the USA and then a discussion of *productive aging* as a guiding framework for "age-friendly" workplaces, where the physical and psychosocial safety of all workers regardless of age is adequately sustained (de Guzman, Amrad, Araullo, & Cheung, 2014. This chapter also provides an overview of NCPAW's approach to *productive aging* in the context of occupational safety and health (OSH) and its research and practical implications.

The Aging Workforce

In the USA in 2015, persons 65 years or older represented 14.9% of the US population. By 2050, this figure is expected to grow to 22.1% (He, Goodkind, & Kowal, 2016). As the population ages, so does the workforce. In 2015, there were seven people of working age for each older (65+ years) person throughout the world; by 2050 that ratio will decrease to 3.2 or lower (United Nations, 2015). In 1994, the number of US workers 55 years and older was 15.5 million. Since then, the number has significantly increased to 23 million in 2004 and 33.9 million in 2014 and is projected to grow to 40.6 million in 2024. This group's share of the labor force has increased from 11.9% in 1994 to 21.7% in 2014, and it is projected to reach approximately 25% in 2024 (Toossi, 2015). These trends are mirrored in other parts of the world.

Also, most organizations in the USA have four or five generations of employees working side by side, something that workplaces have not seen until this point in history (Hammill, 2013; Knight, 2014). Similar trends can be seen in the advanced economies of Europe and East Asia (Coleman, 2015). Driving the aging of the workforce are longer life expectancies, falling fertility rates, and baby boomers staying in the workforce longer. Older workers are crucial for the prosperity of the US economy. Although millennials have overtaken the baby boomers in becoming the largest generation (Fry, 2016), employers will need to rely on older workers to remain competitive (Leoppke et al., 2013). Companies will need the contributions of workers of all ages while considering their health and safety needs.

Who Is an "Older" Worker?

To understand the occupational safety and health implications of an aging workforce, it is useful to examine certain assumptions associated with aging, health, and work. First, defining who is "older" often depends on the regulation being considered or the organization making the determination. The Age Discrimination in Employment Act (ADEA) protects workers 40 years of age and older from employment discrimination in the USA. The United Nations recommends 60+ years as the age at which an individual can be considered older (United Nations Population Fund & HelpAge International, 2012). The US Bureau of Labor Statistics has used both ages of 55 and 65 years old as cutoff points separating older employed adults from younger age groups in their statistical reports (Toossi, 2015; US Bureau of Labor Statistics, 2008). In Europe, the focus is typically directed toward workers age 45 or older (National Research Council and the Institute of Medicine, 2004, p. xii).

Chronological age has traditionally been used as an indicator of the physical, cognitive, and social changes that occur with aging and as the leading sorting variable by which a person is considered older (Truxillo, Cadiz, Rineer, Zaniboni, & Fraccaroli, 2012). Chronological age is a measure of time, a proxy variable used to understand age-related changes (Schwall, 2012). However, chronological age does not fully represent the age-related processes that influence the nature

and trajectory of aging, and it does not explain the variation in functioning among older individuals. Older individuals tend to have greater variability in functioning than younger individuals, which suggests that chronological age by itself can be an incomplete way to gauge whether or not an older person can do a task or activity (Grosch & Pransky, 2010). A better predictor might be subjective age, which is how old or young one feels relative to their chronological age (Beier, 2015; Kunze & Boehm, 2015; Montepare, 2009). Exposure to work-related safety and health hazards in early life can have an impact on subjective age and consequently influence later life safety and health outcomes. Hence, it is vital to respond to safety and health hazards that pose threats throughout the life-span.

Impacts of an Aging Workforce

The process of aging influences the safety and well-being of workers in both positive and negative ways (Leoppke et al., 2013). Age can be positively related to safety performance and organizational citizenship behavior (Ng & Feldman, 2010). In addition, older workers tend to experience lower rates of nonfatal work-related illness and injury compared to younger workers; however, fatality rates are higher for older workers (Silverstein, 2008; Topf, 2000). Unavoidable age-related changes in function do not necessarily lead to reduced job performance or incapacity. While some older workers leave work because of illness or limitations, many do remain, according to Silverstein.

There are certain occupational risks associated with aging on the job. For instance, the changes in different organ systems of the body (e.g., musculoskeletal, cardiovascular, respiratory, sensory, and immune) typically result in declines in functional capacities that influence worker safety, health, and well-being (Maertens, Putter, Chen, Diehl, & Huang, 2012). Moreover, research suggests that some cognitive functions such as working or fluid memory, decision-making, and problem solving tend to decline as people age; however, job performance does not always suffer (Jex, Wang, & Zarubin, 2007; Park, 2000; Rizzuto, Cherry, & LeDoux, 2012). The rate of cognitive decline often depends on the nature of the job or the health of the individual. Some mental functions that involve spatial abilities, processing complex stimuli, and problem solving are particularly age-sensitive (Silverstein, 2008). Controlling for a number of demographic and health variables, cognitive decline after retirement has been shown to be slower among individuals who held with higher mental demands (Fisher et al., 2014). Therefore, as discussed earlier, there is great variability in the changing physical and cognitive capabilities of older workers.

The positive and negative aspects of aging are not unique to older workers. A life-span approach to protecting an aging workforce acknowledges age diversity and differences among age groups. One dimension of variability is the perception and influence of time. Socioemotional selectivity (SES) theory points to perception of time as the influence on people's selection and pursuit of goals (Carstensen, 1995; Carstensen, Isaacowitz, & Charles, 1999). When time is viewed as more unrestricted, workers prioritize knowledge acquisition, as is the case with many younger workers. It makes sense, then, that older workers place more emphasis on emotion regulation, which is more oriented to the present rather than the future. Ng and Feldman (2010) use SES to explain the relationship between age and job attitudes. Their meta-analysis found that age was related to many job attitudes, such as satisfaction and involvement, and with older adults focusing more on emotionally fulfilling activities than on acquiring knowledge.

Older and younger workers exhibit attitudinal differences in the context of work, particularly in their attitudes toward supervision. Older workers tend to value authority and rules but highly regard freedom from supervision (Joyner, 2000). Younger workers dislike being micromanaged, but they tend to want strong leadership and clear instruction (Joyner, 2000). While younger workers appear to require regular feedback, older workers might be insulted by it (Jurkiewicz & Brown, 1998). Training needs also differ among

younger and older workers. Whereas younger workers prefer to learn both hard (e.g., computer programing, machine operation) and soft skills (e.g., communication skills, teamwork) on the job, older workers welcome hard skills training through instruction (Deal, 2007). Although there are differences, the generations display similarities (Giancola, 2006), such as their work ethic (Smola & Sutton, 2002) and what motivates them to be engaged (Towers Perrin, 2006).

An aging worker population has some economic implications. Silverstein (2008) predicts that employment policies will likely be adapted to accommodate workers who want and need to stay on the job longer. There also will be a greater need for private health insurance until the age of 65 because of rising healthcare costs and the shift from defined benefit pensions plans to contribution-based retirement programs. Add to this the likelihood that continued employment of older workers will be crucial to the USA and global economy because employers will not have the steady stream of younger workers to depend on to remain globally competitive (Harris, 2017; Leoppke et al., 2013).

Age diversity in the workplace is not the only reason that productive aging is relevant across the working life. Workers young and old go through the aging process. Aging involves physical, cognitive, and socio-emotional changes that affect how people do their work and how they have to make adaptations to how they do their jobs and the environments in which those jobs are performed. Maximizing worker health and safety is beneficial at all life stages, is an investment that saves money, and reduces chronic health conditions later on in life (Leoppke et al., 2013).

Productive Aging and Work

Background

The concept of productive aging has been used to address the opportunities and challenges that come with an aging workforce (Cole & Macdonald, 2015; O'Reilly & Caro, 1994). It provides a context for how interventions, training, and educational material about worker safety and well-being can capitalize on the assets older workers bring to organizations (Wheeler & Giunta, 2009). Within the workplace, productive aging does not merely relate to older workers' ability to continue performing their jobs, but it also refers to how workers can thrive and make important contributions throughout their working lives (Butler, 1985; Butler & Schechter, 1995).

Not until the 1980s did the OSH field begin to direct interest toward the interface of work and aging. Cross-sectional studies among municipal employees emerged in 1981 and were conducted by the Finnish Institute of Occupational Health (FIOH) (Ilmarinen & Tuomi, 2004). Early efforts to study productive aging stem from concerns over negative perceptions of older people and the loss of their abilities (Bass, 2002). To combat perceptions that older adults were an economic burden on society, Butler (1985, 2002) introduced the term *productive aging* to provide a more well-adjusted view of the value and competencies of older adults. In response to the dominant discourse of dependency and burden that framed the discussion of older individuals in society, Butler and others sought to introduce a counterbalancing perspective that recognized the actual and potential contributions of older people to their work, community, and family (Leland, Elliott, & Johnson, 2012). Accordingly, productive aging emphasizes that older individuals have the skills, expertise, and experience needed to meaningfully engage in productive behavior in later life in different domains, such as paid labor, volunteer work, continuing education, housework, and caregiving at home.

There is some disagreement as to what should be considered and included under the umbrella of productive aging. Should only activities within the labor market be considered productive? Should it also include activities outside the traditional labor market such as volunteering, housework, childcare, homecare, and continuing education? The absence of a universal definition reflects these different preoccupations. For instance, productive aging may refer to any activity that produces goods or services, whether paid or not, or develops the capacity to produce goods

or services (Bass & Caro, 2001). Morgan (1986) defines productive activities as "activities that produce goods or services that otherwise would have to be paid for" (p. 74). Herzog, Kahn, Morgan, Jackson, and Antonucci (1989) define productive aging as "any activity that produces goods and services, whether paid or not, including activities such as housework, child care, volunteer work, and help to family and friends" (p. 130). Butler and Schechter (1995) describe productive aging as "the capacity of an individual or a population to serve in the paid workforce; to serve in volunteer activities; to assist in the family; and to maintain to varying degrees, autonomy and independence for as long as possible" (p. 824). Albeit these definitions differed in the range of activities considered to be productive aging, they all seek to recognize the value of older people.

Productive aging might be conflated with *successful aging*, which Rowe and Kahn (1998) define as "growing old with good health, strength, and vitality" (p. 33). People who age successfully remain actively engaged with their social networks, exhibit a low risk for disease and disability, and have high mental and physical functioning. Successful aging can also mean being able to make plans and have control over one's life, practicing healthy habits, and continuing some activities they have enjoyed in the past (Carlson, Clark, & Young, 1998). Compared with successful aging, *productive aging* is placed within the context of work, whether it be paid, volunteer, or in the form of caretaking (Butler & Schechter, 1995; Schulte, Grosch, Scholl, & Tamers, 2017). Cole and Macdonald (2015) also argue that productivity refers to both paid and unpaid occupations (e.g., student, caregiver, volunteer) that enhance individual and society-level development. While aging can be associated with cognitive and physical losses (e.g., hearing loss, diminished visual acuity), it is also linked with gains and growth (e.g., higher job satisfaction, lower rates of injury overall) (Silverstein, 2008). Focusing on the gains can help workers increase their sense of self-management (i.e., taking charge of one's own aging process), use social connections, and participate in self-fulfilling activities to continue to contribute in meaningful and productive ways (Cole & Macdonald, 2015) both in and outside the work environment (Caro & Bass, 1995; Hinterlong, 2008). The implication is that a multifaceted view of aging and occupational safety and health (OSH) can facilitate work environments that are supportive of health, well-being, and productivity to sustain workers throughout their working lives (Schulte, Grosch, et al., 2017).

As a construct, productive aging has important limitations and criticisms that need consideration. Remaining productive in later life often is not a choice, but a necessity for many (Wheeler & Giunta, 2009), especially for historically marginalized groups like women and ethnic monitories who are obliged to remain productive due to economic vulnerability and/or social commitments (Estes, 1999). Thus, social dimensions such as gender, race, ethnicity, and socioeconomic status play a major role in shaping one's experience in old age. Each of these characteristics, along with age, can add obstacles to workers' safety and health (NIOSH, ASSE, 2015). Consequently, critics suggest that such a concept needs to explicitly recognize the social structures and power relations that determine older people's opportunities, choices, and experiences related to the many forms of "productive" or "nonproductive" activity they undertake (Estes & Mahakian, 2001).

Additionally, productivity is not just about participation in the labor market; people also can be productive when they engage in leisure activities, volunteering, caretaking, and other endeavors outside of work (Butler, Oberlink, & Schechter, 1990). As previously discussed, earlier conceptualizations overlook continued personal growth and enrichment through the life-span, and the benefits of maintaining a physically active lifestyle (Bass, 2002). While leisure activities and other endeavors outside of work might not seem tied directly to traditional labor, they are a part of what contributes to an individual's self-actualization (Wheeler & Giunta, 2009), which can have a significant impact on the kinds of contributions employees make in the workplace, such as modeling safer work practices,

calling attention to hazards in the physical environment, or transferring knowledge to co-workers who have less experience on the job.

The National Center for Productive Aging and Work (NCPAW)

Early in the twenty-first century, NIOSH and its partners asked the National Research Council and Institute of Medicine to examine the interaction between work and the aging process. This investigation resulted in the identification of some pressing needs for advancing the health and safety needs of older workers: (1) improved databases and data systems for conducting informative research, (2) research that leads to a better understanding of the factors that relate to the health and safety needs of older workers, and (3) identification and clarification of the aspects of policies, programs, and interventions that benefit older workers (National Research Council and Institute of Medicine, 2004).

In 2012, NIOSH and the American College of Occupational and Environmental Medicine (ACOEM) convened a summit to discuss barriers to integrating programs that protect aging workers' health (Leoppke et al., 2013). Attendees produced recommendations for establishing best practices, such as prioritizing work flexibility, managing environmental hazards, providing interventions that promote healthy lifestyles, and requiring aging workforce skills training for managers. Leoppke et al. also argue that a widespread discourse is needed to build awareness for protecting and promoting the health of aging workers.

Current projects at NIOSH that address aging include training for the design of age-friendly workplaces for nurses, examination of the long-term health and economic consequences of work, age-awareness training for workers and employers, chronic illnesses and conditions that affect older workers, and the development of resources to help organizations meet the needs of their aging workers ("Productive aging and work: Current research." NIOSH, 2015a). Notwithstanding current and published research on the aging workforce, there exists a substantial gap between what we know about the aging process and how it interacts with the experiences of workers. In addition, to increase collaboration and interaction among investigators, NIOSH strives to build more structured and continuous activities in research and practice in order to better meet the health, safety, and wellness needs of aging workers.

To better meet these needs, NIOSH officially launched the National Center for Productive Aging and Work (NCPAW) in 2015. The purpose of NCPAW is to pool the knowledge and expertise on aging within NIOSH and to work with external partners to develop resources for advancing "age-friendly" workplaces. The fourfold mission of NCPAW is to:

- Develop institute-wide research goals and leadership with regard to workers of all ages, *as they age*.
- Facilitate both intramural and extramural collaboration when it comes to advancing research on the aging workforce.
- Further develop knowledge on interventions and best practices for creating an "age-friendly" workplace from the physical, emotional, economic, and labor relations perspectives.
- Develop and promote a broad range of translational products and resources that target workers, organizations, and sectors where aging issues are particularly salient.

The center's approach to productive aging emphasizes the importance of the work environment and changes to the environment that ideally benefit both workers and organizations. Programs and strategies designed to meet the changing needs of aging workers are not just intended to benefit older employees (e.g., those aged 50 and over), but those of all ages.

Work Ability

NCPAW's approach to productive aging is informed by the concept of work ability, which

was first introduced and developed by researchers at the Finnish Institute for Occupational Health (FIOH) (Ilmarinen, Gould, Järvikoski, & Järvisalo, 2008; Ilmarinen et al., 1991a. 1991b). Work ability refers to a worker's capacity to continue working in his or her current job, given adequate working conditions and available resources (Ilmarinen et al., 2008). Working conditions include aspects of the work environment such as physical characteristics (e.g., ergonomic issues), work organization (schedule flexibility), and supervision. Resources include health, functional abilities, job skills, and family/community support (Ilmarinen, 1999). Work ability—perceived or actual—is an important factor in preventing early departure from work due to debilitating injuries or illnesses (McGonagle, Fisher, Barnes-Farrell, & Grosch, 2015). McGonagle et al. have found that personal factors, such as emotional stability and sense of control, have found to be more reliable predictors of perceived work ability than more physical indicators of health status, such as environmental conditions or body positioning.

Strategies to maintain or improve work ability can be grouped into four basic areas: (1) working conditions (ergonomics, industrial hygiene, and safety), (2) employee health (healthy lifestyles, functional capacity), (3) professional skills (job-related knowledge and competence), and (4) psychosocial factors (work arrangements and flexibility, social support, and culture) (Ilmarinen, 1999; Silverstein, 2008). Research in this area resulted in the development of the Work Ability Index (WAI) (Ilmarinen & Tuomi, 2004), which has been shown to be a reliable measure applied to the research and practice of occupational healthcare (de Zwart, Frings-Dresen, & van Duivenbooden, 2002).

Total Worker Health®

NCPAW's approach to productive aging is also informed by Total Worker Health® (TWH), which is characterized by "policies, programs, and practices that integrate protection from work-related safety and health hazards with promotion of injury and illness prevention efforts to advance worker well-being" ("What is Total Worker Health®?" NIOSH, 2016c). TWH integrates workplace interventions that protect workers' safety and health with activities that advance their overall well-being, on and off the job. The emphasis on integration reflects the fact that occupational safety and health programs have traditionally been compartmentalized and often function as disjointed components, and a growing body of research suggest that an integrated approach is more effective than traditional safety and health programs that operate in isolation (Schill & Chosewood, 2013).

TWH not only prioritizes a hazard-free work environment for all workers. But it also comprehensively addresses other workplace systems, including those relevant to the control of psychosocial hazards and exposures, the organization of work, compensation and benefits, and work-life management efforts. Encouraging optimum well-being includes employee engagement, support for healthier behaviors, and more balance between work and life (Schill & Chosewood, 2013). TWH calls for a holistic understanding of the factors that contribute to worker well-being, one of which is aging. Workplace risk factors previously considered unrelated to work (e.g., obesity, sleep disorders, cardiovascular disease, depression) can be especially problematic for older workers. Also relevant to older workers is productive aging and preparing for a healthier retirement.

Both TWH and work ability provide useful frameworks for productive aging within the context of work. The emphasis rests on developing sustainable, well-coordinated strategies that span several different dimensions of safety and health, including factors outside of the workplace. These strategies are not limited to a specific age group and are intended to have benefits for workers of all ages.

Model of Productive Aging and Work

Drawing on both work ability and TWH, NCPAW strives to support productive aging across the

life-span by encouraging age-friendly workplaces. Such workplaces are those that use best practices and interventional strategies to keep employees of all ages healthy and safe, thus helping them to reduce or manage their risks throughout their working lives (Johns & Weissman, 2015). Age-friendliness has both physical (e.g., office design, provision of healthcare services) and psychological aspects (e.g., employee involvement, bullying prevention) (de Guzman et al., 2014). NCPAW's approach to productive aging has four attributes suggesting that age-friendly workplaces embody (1) a life-span perspective, (2) a comprehensive and integrated framework, (3) outcomes that recognize the priorities of both workers and organizations, and (4) a supportive multigenerational work culture.

A Life-Span[1] Perspective A goal of productive aging is to better understand the pattern of change that occurs during different periods of a person's life (i.e., life-span) and to identify the forces that underlie such patterns (Baltes, Lindenberger, & Staudinger, 2006; Sigelman & Rider, 2015). These transitional patterns ensue from the first day on the job to post-work retirement. Age-related transition is experienced by all workers, not just those over a certain age. In other words, everyone ages, and this aging process is dynamic, influenced by the environment and culture, and is marked by both gains and losses.

In addition to chronological age previously discussed, there is subjective age (perceptions of age), identity age (the age group with which one feels connected to), felt age (the age one feels), and cognitive age (how one looks, feels, acts, and interests are affiliated with) (Truxillo et al., 2012). These different measures of age can give more information on how workers perceive and approach the characteristics of their jobs and how well they are able to perform them (Cleveland & Hanscom, 2017). These measures of age also shed light on how people adapt to context and environment as they get older. According to the life-span work motivation framework (Kanfer & Ackerman, 2004), four developmental patterns can predict work motivation: *loss* is the decrease of intelligence (e.g., attention, working memory) due to age. *Growth* represents the increase in experience-based knowledge and learning capacity that develops with age. *Reorganization* refers to how people's abilities and nonabilities change and are restructured throughout adulthood (e.g., goal structures, priorities). *Exchange* characterizes the strengthening of certain tendencies (e.g., emotional stability, self-esteem) with progressing adulthood. Work motivation is one of many patterns that reflect adaptive processes over time. More specifically, older workers' motivation to work tend to revolve around interacting with others and to transmit knowledge to others (Kanfer, Beier, & Ackerman, 2013). Also according to Kanfer et al., older workers' motivation to retire are less known because research has not done much to distinguish motivation to leave a specific job and motivation to retire from work altogether. Motivation at work (in the context of performing one's job) can change with age, depending on job demands (e.g., physical demands, job complexity) and personal characteristics (e.g., perceptions of time left at work, opportunities). Truxillo et al. (2012) explain, "A lifespan perspective is useful for examining the interplay between age and work characteristics because adults spend a significant part of their lifespan at work, where they have ample opportunity to display these adaptive processes" (p. 7).

The life-span perspective also acknowledges the development of universal and interindividual differences (Baltes et al., 2006; Bengston, Elder, & Putney, 2005). There is a cumulative effect of different factors. For example, a work-related

[1]The authors acknowledge that life-span and life course are sometimes used interchangeably, but that the two terms originate from different disciplines. Life-span, a term from psychology, emphasizes heterogeneity across older individuals and the importance of plasticity and within-individual change. Life course, a sociological term, focuses on events at the macro level, studying the effect of groups, organizations, and institutions on the lives of individuals; principal considerations include social factors such as economic conditions and social networks. In this chapter, productive aging is discussed in relation to the adaptability, plasticity, and change that are inherent to the aging process, which is why this term is used instead of life course.

accident or injury even in early life could result in increasing detriments to physical ability, health, finances, and social relationships. This illustrates the contextual nature of the aging process. The cognitive, social, and biological changes taking place during the life-span do not occur in a vacuum but in important contextual settings: families, friendships, community, workplace, and society. All these dimensions can vary in how they affect the functional decline of individuals that establish different limits for different people in their ability to be productive. The structure and design of one's work, the type of workplace relationships individuals develop, and certain work-related happenings (e.g., disability, career progression, retirement) can all have an impact on a worker's capacity to age productively.

Comprehensive and Integrated Framework Aging is multileveled, contextual, and dynamic. Consequently, policies, programs, and interventions targeted to protect the safety and advance the health and well-being of workers across their life-span should be multidimensional, well-coordinated, and holistic. This implies that any program or intervention that enhances workplace age-friendliness must incorporate several different aspects of safety and health in order to be sustainable. In their review of research addressing older workers' health and safety needs, Crawford, Graveling, Cowie, and Dixon (2010) suggest that interventions needs to account for physical activity, intellectual pursuits, and lifestyle factors when moderating age-related changes.

Frameworks should also be comprehensive in the topics areas they draw upon. For instance, frameworks that address working conditions need to incorporate ergonomics and industrial hygiene. Psychosocial health campaigns should combine information on social support, safety culture, and work design (Ilmarinen, 1999). An integrated approach also means protecting and advancing workers' health as they age and at the same time maximizing the intellectual, physical, and social assets they bring to the job (Leoppke et al., 2013). Finally, integrated strategies should not be limited to certain age groups, but provide benefits to all workers as they age.

Outcomes That Recognize the Priorities of Both Workers and Organizations A productive aging approach underscores the importance of worker- and organization-centered outcomes and how they can mutually influence each other. These outcomes can include improving safety and well-being (worker-centered) to reducing absenteeism, maintaining job performance, and lowering healthcare costs (organization-centered). For example, an organization that can improve its productivity might be able to use additional earned income to invest in worker well-being programs and injury prevention interventions. Similarly, improvements on "worker-centered" outcomes such as trust and well-being can lead to reduced organization-centered outcomes such as, absenteeism, higher productivity, and fewer reported workplace injuries (Harter, Schmidt, & Keyes, 2003). Preferably, any changes directed to make the workplace more age-friendly can and should focus on outcomes that are beneficial to both workers and organizations, such as worker satisfaction, work engagement, and job performance (Truxillo et al., 2012).

The duality of worker and organizational outcomes is represented in Fig. 4.1, which shows their interdependent relationship. The bidirectional arrow between the two types of outcomes illustrates that changes in either workers' or organizations' outcomes can influence the other. For example, installing new flooring to reduce knee strain might be a benefit to employees but might seem too costly for the company. Despite the potential negative outcomes to both parties, the reciprocal nature of the worker-organization relationship suggests that implementing integrated safety and health measures is not only beneficial to workers of all ages, but that it also translates to organizational benefits. If a worker with a chronic disease chooses to remain working, it might be because the health condition is not severe enough, and the desire to leave work could be outweighed by the continued income and health insurance. With strong support and reasonable job

Fig. 4.1 Worker- and organization-centered outcomes. (Source: NIOSH, 2015d)

accommodations, the worker can continue to gain the benefit of employment, and the organization can retain the skill and experience of that employee (Silverstein, 2008). Thus, both categories of outcomes need to be recognized and incorporated into any attempt to encourage safe and healthy workplaces where workers of all ages can thrive.

Productive aging is a useful framework wherein the interrelationship of worker-centered and organization-centered outcomes of aging and work can be better understood. It also suggests a course of action for employers to develop and implement programs and policies that support the changing work capacities of aging workers, minimize work-related safety and health hazards, and ultimately benefit from the gains in competiveness, productivity, and sustainable business practices. For instance, changes to Social Security in the USA imply that retirement benefits will be affected and the age of eligibility will continue to rise (Moody & Sasser, 2015). Therefore, it is important to understand what factors predict early departure of employees from the workforce. McGonagle et al. (2015) argue that research into these factors can help employers improve the work ability of their workers and reduce the reduction of highly skilled and experienced employees due to early departure.

Supportive Multigenerational Work Culture A generation is a cohort of individuals born during the same period of time that share a set of formative life experiences (e.g., economic and political movements, historical events) that shape their attitudes, beliefs, and values (Borman & Hedge, 2012). Given shifting population demographics, multigenerational workplaces are increasingly common and bring unique challenges and opportunities to the workplace (Schill & Chosewood, 2013). The generations in today's workforce can be categorized as World War II (or Silent) Generation, 1925–1945; Baby Boom Generation, 1946–1964; Generation X, 1965–1980; and the Millennial Generation, 1981–2001 (Horovitz, 2012; Howe & Strauss, 1991). Although often subtle, differences between generations can include attitudes toward work and supervision, preferred communication style, training needs, and work habits (Deal, 2007; Joyner, 2000; Jurkiewicz & Brown, 1998; Smola & Sutton, 2002). Learning to manage these differences and build upon the unique strengths of each generation creates an inclusive workplace culture that also contributes to productive aging.

This level of generational diversity raises important considerations related to the well-being of workers immersed in a multigenerational

workplace. For instance, there is a risk in simplifying a single generation down to one characteristic when there can be a great deal of variability. For example, the relationship between retirement and age-related cognitive decline does not occur at the same rate for all workers. Fabrizio and Franco (2017) found the decline was more pronounced for people who had more physically demanding jobs. Another consideration is that it can be difficult to separate the effects of age from other work-related changes that occur over time (e.g., career progression, disability). Because behaviors and training needs can vary across age cohorts, organizations are well-advised to take inter- and intragenerational differences into account when designing or implementing training, motivating workers, or using communication strategies to foster teamwork and knowledge transfer among employees. Such strategies might have to take into consideration age-related stereotypes about co-workers when teamwork and mentoring are utilized.

A supportive age-diverse work culture involves knowledge of the age group makeup of a workforce. Such knowledge can aid in developing programs and policies that are broad enough to address all workers' needs (e.g., family leave policies that appeal to both younger and older workers). A supportive culture also facilitates conversations about generational issues and encourages constructive interactions among employees (e.g., mentoring that leads to knowledge transfer). A key goal of this culture should be to use the diverse skills, knowledge, and perspectives of all workers to create a more unified and productive organization. Broadening the discussion about aging within the workplace will likely encourage stronger collaboration and cross-generational knowledge transfer (Leoppke et al., 2013).

Implications for Advancing Productive Aging

The study of aging and work offers a fertile ground for the advancement and application of varied research and practice related to occupational health and safety. In addition to basic and applied research on the aging workforce, advancement of productive aging has to consider the advancement of best practices, appropriate use of interventions, and the translation of key findings into useful tools and resources. Using the four-pronged mission of NCPAW that was previous discussed, this section outlines recommendations in four areas: (1) research, (2) internal and external collaborations, (3) best practices for age-friendly workplaces, and (4) translating research into products and resources.

Research

One of NCPAW's missions is to develop institute-wide research goals and leadership with regard to workers of all ages, *as they age*. NCPAW has identified three areas of research goals to advance the understanding of workplace factors that contribute to the productive and healthy aging of workers ("Productive aging and work: Research goals." NIOSH, 2015b). These three areas are (1) surveillance, (2) research on the health effects and mechanisms of aging, and (3) research on evidence-based practices and intervention targeted to aging workers.

In terms of surveillance, NCPAW conducts and facilitates the collection, analysis, and interpretation of workplace health and safety data to better understand the life-span health outcomes and harmful workplace risk factors such as physiological, cognitive, and psychosocial that aging workers are exposed to. Surveillance is used to recognize and comprehend salient OSH issues and trends and allows for identifying priorities for research and intervention. For example, changes to Social Security in the USA imply that retirement benefits will be affected and the age of eligibility will continue to rise (Johnson & Steuerle, 2003). Monitoring such trends is important for organizations to understand what factors predict early departure of employees. McGonagle et al. (2015) argue that research into these factors can help employers improve the work ability of their workers and reduce the reduction of

highly skilled and experienced employees due to early departure.

Second, research is being conducted to identify and characterize mechanisms and health effects of workplace risk factors for productive aging in workers across the working life. Observational and laboratory research examining risk and protective factors associated with aging leads to greater knowledge and ways to improve interventions. Despite the positive consequences of prolonged work such as economic and cognitive ability, there are also risks of continued work, including burnout and age discrimination (Fisher, Ryan, & Sonnega, 2015). Other important areas of health effects research include job lock (restricted job mobility), changes in cognitive functioning before and after retirement, job-related physical performance, and effects of chronic conditions like coronary disease among older workers (see "Productive aging and work: Current research." NIOSH, 2015a).

Third, the purpose of evaluation research is to determine the effectiveness of interventions, communication tools, policies, and practices designed to support workers and improve effectiveness at different points across the working life. This goal focuses on developing and then assessing policies and programs intended to improve safety or health outcomes in workers as they age. Some interventions aim to improve workers' functional capacity or job-related skills as they age. Programs that involve training, environmental and organizational changes, and human resources practices that are relevant to various age groups also need to be evaluated. In sum, NCPAW's research goals are to advance and conduct etiologic, surveillance, and intervention research on the most critical issues in workplace safety and health affecting aging workers.

Internal and External Collaboration

Another element of the NCPAW mission is to facilitate both intramural and extramural collaboration when it comes to advancing research pertaining to the aging workforce. NCPAW seeks to build and foster intramural and extramural partnerships with occupational health and safety researchers, policymakers, labor, employers, intermediaries, and other stakeholders interested in the aging workforce. These collaborations enhance the impact and reach of research, translation, and dissemination activities aimed at preventing and reducing work-related injuries and illnesses in the aging workforce. NCPAW's collaboration efforts are consistent with the mission of Total Worker Health, which is to "Motivate transdisciplinary collaboration among investigators focused on preserving and improving the health of people who work" (Schill & Chosewood, 2013, S10).

Intramurally, the center has worked with other NIOSH sector and cross-sector programs to integrate aging and work issues into the NIOSH research agenda. To advance productive aging and work, NCPAW is actively engaged in partnership development and collaborations with international partners who share an interest in healthy aging and work (e.g., EU-OSHA, Finnish Institute of Occupational Health, Canadian Institute for the Relief of Pain and Disability, Institut de recherche Robert-Sauvé en santé et en sécurité du travail). As NCPAW has developed and increased its internal and external visibility, it has raised awareness about the concept of productive aging in occupational safety and health through conference presentations, publications, webinars, and other online communications tools.

One important reason for external collaboration is for stakeholders to have the opportunity to identify the areas of greatest need facing the aging workforce. Collaborative research also is likely to lead to discovering unanticipated or unpredicted factors. For instance, preliminary findings from a needs assessment being conducted by the authors at the time of this writing suggest that both organizational-level issues (e.g., stress management) and macro-level concerns (e.g., changes in departure from the workforce due to Social Security modifications) are important for small businesses, but most owners of small enterprises often lack the resources to address these issues.

Without external collaboration, these issues might be overlooked or less understood.

Best Practices

NCPAW also seeks to further develop knowledge on interventions and best practices for creating "age-friendly" workplaces from the physical, emotional, economic, and labor relations perspectives. Application of productive aging can encourage *age-friendly* workplaces because they help individuals "adapt, learn, and grow together, across demographic divides. The focus [is] on keeping employees healthy by beginning interventional efforts early in their careers aimed at helping them manage their health risks to stay productive over time" (Leoppke et al., 2013, p. 503). To that end, programs and policies can encourage the crafting of jobs that enable workers to adapt their work to their own needs and skills as they age (Truxillo et al., 2012).

As previously discussed, work ability is one of the concepts informing the NCPAW approach to productive aging. Maintaining work ability requires attention to worker health and safety (Ilmarinen, 1999). For workers experiencing reduced work ability, work-related accommodations and interventions that boost psychological resources should be considered (McGonagle et al., 2015). Of concern to all workers, regardless of age, is how organizations can design jobs and tasks to meet workers' needs as they age so they can continue to be productive (Kooij, Van Woerkom, Wilkenloh, & Denissen, 2017; Morgeson, Medsker, & Campion, 2008; Schulte et al., 2017). Unfortunately, according to Truxillo et al. (2012), we are only beginning to learn how to enhance satisfaction, engagement, and productivity for workers across the life-span.

A one-size-fits-all approach to productive aging is not the most efficient strategy, partly because organizations vary in their size and scope. For example, smaller businesses bear a greater burden of occupational illnesses, fatalities, and injuries than larger companies (Okun, Lentz, Schulte, & Stayner, 2001). They also have access to fewer resources, such as money and staff, with which to implement well-being or safety training and programs (Page, 2009). At the time of this chapter's writing, the authors are conducting focus group and in-depth interviews as part of a larger needs assessment to determine the most pressing needs for research and practice in workplace aging. The data collected thus far reveal the ways in which small and large businesses differ in their ability to engage in workplace aging management. Interviews with high-level executives of larger corporations suggest that large companies have specific occupational roles to which certain aspects of health and safety can be delegated. For example, occupational safety issues (e.g., fall prevention, hearing loss) might be taken on by middle-level management whereas employee wellness (e.g., smoking cessation) might have oversight from human resources. Employee health, safety, and well-being are often managed through fragmented departments that operate as silos (Schill & Chosewood, 2013).

In comparison, the authors' needs assessment interviews confirm that owners of small businesses often have to deal with OSH-related issues and problems by themselves unless they get external assistance, and age-related health and safety issues often get low priority. According to Cunningham and Sinclair (2015), small business owners often lack the opportunities to meet in person with intermediaries to obtain important OSH information and build business relationships. For smaller enterprises, facilitating age-friendly workplaces might require interventions that improve the systems used to deliver OSH information and resources. Moreover, this requires that initiating organizations (i.e., initiators), such as public health agencies, identify the needs of small businesses and working intermediaries to diffuse the needed information and resources to the small businesses they serve. Sinclair, Cunningham, and Schulte (2013) provide an extended model for small business OSH intervention diffusion, which takes into account characteristics of the intervention itself, the target audience(s), how information is communicated, and the time it takes to adopt the intervention. The model offers guidance for both initiators and

intermediaries in the diffusion. To put this in the aging context, it is arguable that the success of the system requires the cooperation of intermediaries who have expertise and a commitment to meeting the needs of aging workers and the organizations who employ them.

Translating Research into Products and Resources

Another part of NCPAW's mission is to develop and disseminate a broad range of products and resources that target workers, organizations, and sectors where aging issues are particularly salient. To this end, NCPAW seeks to advance and conduct research translation that engages stakeholders and intermediaries to reduce and prevent work-related injuries and illnesses in the aging workforce. Translation is the process of taking findings from scientific investigation and transforming them into practice (Straus, Graham, & Mazmanian, 2006), taking into account the drivers of and barriers to putting recommendations into practice. Translation involves (1) generating solutions to workplace risks and testing them, (2) using experimental and observational approaches to test new interventions, (3) moving tested recommendations and interventions into the field to identify barriers and to test delivery for broader audiences, and (4) testing the outcomes of the interventions or recommendations when they are adopted in the "real world" (Scholl, Van Bogaert, Forrester, & Cunningham, in press).

The ultimate goal of educational materials, training curricula, and other products is to make an impact on the OSH problems they were created to address. Regarding the aging workforce, such impacts of translational products and resources can yield many benefits in the short and long term:

- For workers and their families: keeping healthy and productive, being treated with fairness and respect, contributing meaningfully to the organization, staying safe regardless of age-related changes
- For employers: a maximally productive and engaged workforce, lower healthcare costs, lower turnover and absenteeism, retention of experienced and skilled workers, knowledge transfer to younger workers
- For the community and society: enhanced national prosperity, a globally competitive economy (Harter et al., 2003; Leoppke et al., 2013; Wilson, Dejoy, Vanderbeg, et al., 2004)

For these impacts to be realized, the best practices and recommendations that are shared through translational products have to reach the intended audiences and resonate with them. Making an impact on the safety and health outcomes of aging workers means taking into account the diversity within the aging workforce. Some of the most significant demographic shifts that intersect with the rise of aging workers are increases in temporary and contingent workers (Cummings & Kreiss, 2008; Hipple & Hammond, 2016), workers employed by small businesses (Choi & Spletzer, 2012; Cunningham, Sinclair, & Schulte, 2014), female workers (Toossi, 2012), and vulnerable worker populations such as young immigrants (NIOSH, ASSE, 2015) and Latinos (Diuguid, 2014).

Older workers make up a significant portion of the contingent workforce in the USA (Bolden-Barrett, 2017). According to the (*Toossi & Torpey*, 2017), at least 40 percent of workers over 55 are looking for work in the *gig economy*, a market that is characterized by the rise of short-term employment and decline of permanent jobs (Friedman, 2014). Workers 65 years and older have the highest percentage (24.1) of self-employment, and those aged 55–64 make up 14.7% of freelancers (Hipple & Hammond, 2016). In addition to the lack of legal protections and workers' compensation and retirement benefits, temporary workers lack the safety training needed to protect them from harm (Zohar & Luria, 2005), which further exposes workers to injuries that present an

increased threat to older workers. The translation-related challenge is to make an impact on a segment of aging workers who may work for companies that "incorrectly behave as if they do not share safety and health responsibilities" (Howard, 2017, p. 4). There is confusion over who bears the responsibility for safeguarding these workers: Is it the temporary agency who supplies the workers? Or is it the company who pays the temporary agency to find people to fill the jobs? This confusion is a significant barrier to knowing the intended audience, which is crucial to effective translation of OSH research findings.

Recommendations

More employers are seeing the value of older workers for the greater knowledge, experience, and emotional intelligence they bring (Anderson & Morgan, 2017). The shift toward an older workforce in the USA and in other countries means adapting workplaces to accommodate not just older workers, but workers of all ages. Organizations that make age-friendly accommodations might do the following:

- Support flexibility in work schedules, work conditions, and work location.
- Use adaptive technology and design work tasks to meet older workers' physical needs (e.g., physical movement, vision).
- Manage hazards (e.g., noise, slips/trips/falls) and conditions that are more challenging to older workers.
- Provide ergo-friendly work environments, such as workstations, tools, floor surfaces, and adjustable seating that reduce musculoskeletal strain.
- Maintain better illumination where needed, such as computer screens and surfaces that have less glare.
- Arrange for health promotion and lifestyle interventions, particularly those that are voluntary and do not appear to penalize workers who do not participate.
- Enable workers to engage in medical self-care in the workplace and provide time away for health visits.
- Invest in training and skills-building at all age levels.
- Administer reasonable accommodations and return-to-work processes after illness or injury absences ("Productive aging and work: Safety and health outcomes." NIOSH, 2015c).

When making organizational changes to encourage productive aging, what might work best is simple guidance that is easy to put it into practice, such as a few simple steps to get started ("Total Worker Health: Simple steps to get started." NIOSH, 2016a). For example, the NIOSH document *Older Drivers in the Workplace: How Employers and Workers Can Prevent Crashes* (NIOSH, 2016b) presents checklists of simple steps that can encourage all workers to implement safe driving practices. From an employer's perspective, some steps might appear more feasible than others, and they can be encouraged to start with the steps that are simpler and can yield results right away.

Supervisors who want to facilitate an age-friendly workplace would benefit from management skills training that focuses on the specific needs of older workers in addition to the needs of all age groups (Leoppke et al., 2013). Because a one-size-fits-all approach is not likely to work with most workplace settings, managers could be trained to use a needs assessment framework to identify the most pressing needs they face, set a goal to address each, and create an action plan to make the necessary changes. Based on the areas of work ability previously discussed including working conditions, employee health, professional skills, and psychosocial factors (Ilmarinen, 1999; Silverstein, 2008), organizations can generate and choose one or more areas needing improvement and generate one or more goals that address those areas (University of Washington,

2009). This integrated approach requires organizations to describe the action steps to be done, who will ensure it gets done, when it will be finished, and what challenges or barriers need to be overcome. Training curricula and other educational materials can incorporate a needs assessment or goal structure to help organizations take the first steps. Furthermore, a breakdown and prioritization of specific steps can make it easier to recognize the outcomes that are worker- and/or organization-centered. Setting goals and addressing the challenges to meeting those goals can shed light on the mutual influence that worker- and organization-centered outcomes can have on each other (Harter et al., 2003).

Future Directions in Practice and Research

There is a need to continue research about the functional, physiological, and cognitive effects of worksite hazards on aging workers (National Research Council and Institute of Medicine, 2004). In addition to the attention devoted to economic implications of an aging worker population, retirement, and pension-related issues, more needs to be directed toward the interaction between the aging process and work.

Gains can be achieved in developing and improving data collection and data systems in order to better understand the workplace safety and health vulnerability of aging workers (Leoppke et al., 2013). The data that are collected might also include those from workers that comprise the entire life-span, which can better track the cumulative effects of aging on work-related outcomes as well as variations within age cohorts (Bengston et al., 2005). The data might contain employment histories and specific demands of workers' jobs. The National Research Council and Institute of Medicine (2004) also recommends that organizations continue to collaborate to identify and use databases that contain data relevant to aging research.

Also, research is needed to identify and evaluate promising practices in job design, training programs, polices, and interventions targeted to aging workers. Questions that could guide the development of intervention and policies should include the following: "How does work need to be remodeled to suit aging workers? What social support is needed for aging workers to maintain working capacity" (National Research Council and the Institute of Medicine, 2004, p. *xii*). Leoppke et al. (2013) recommend more return-on-investment studies of integrated programs to determine the impact of programs and policies that go beyond the reduction of medical and pharmaceutical costs. Interventions also should be evaluated based on the impact of supervisor-based training (Hammer et al., 2015). Other indicators should include increased participation by employees, perceived value of the integrated programs, the reduction of health risks, and potential increases to productivity.

Current economic and market trends require continued surveillance of the impacts of contingency work arrangements and changes to pension provisions, such as Social Security in the USA. McGonagle et al. (2015) argue that research into Society Security changes can encourage employers to improve the work ability of their workers and reduce the reduction of highly skilled and experienced employees due to early departure. As discussed earlier, translation of research on productive aging needs to take into account the needs of workers that occupy nonstandard work arrangements, such as contract work, gig work, and work through temporary agencies (Howard, 2017). Such jobs have been shown to put workers' health at risk in general (National Research Council and the Institute of Medicine, 2004), and more focused attention on older workers in these arrangements is warranted.

In addition, there is the need to explore the intersectionality of age with other factors, such as immigrant or minority status, that might put workers across the life-span at increased risk for occupational injury and illness (NIOSH, ASSE, 2015). The aging populations around the world also include rising numbers of women and ethnic minorities. For example, gender is a significant determinant of health outcomes and experiences of older workers: social roles, types of jobs held, work-related exposures, and other patterns

(National Research Council and the Institute of Medicine, 2004, p. 4). Targeting socioeconomic and demographic variables that are related to age-related safety and health risks at work can go a long way to predicting retirement decisions and employment of older workers among more vulnerable populations (National Research Council and Institute of Medicine, 2004).

Conclusion

A productive aging approach can be used to address the opportunities and challenges that come with an aging workforce. Productive aging involves providing a healthy and safe work environment for all workers as they age through comprehensive strategies that allow workers to function at their best. This approach is not only beneficial for older workers, but for workers of all ages. The four attributes of productive aging outlined by NCPAW, research, collaboration, intervention, and translation, can facilitate the design of age-friendly workplaces. Productive aging implies that young workers can reach later life with little to no injury or illness, and older workers can maximize their changing work ability and continue to work without injury or illness. Such efforts can ensure that younger workers are set up for longer and more productive working lives as they age, which improves the quality of life of workers of all ages on and off the job.

The four attributes also illustrate how productive aging can eventually lead to social, economic, and political policies that benefit workers of all ages (Johnson & Mutchler, 2014). Implementing programs to increase the health of aging workers also helps address the current demographic transition into an older, more age-diverse workforce. To avoid doing so has implications for long-term decreased health and productivity (Fisher et al., 2015). Future exploration of productive aging also needs to move away from viewing the aging workforce as a homogenous entity, but rather, as individuals who occupy various sectors and occupations, as well as represent various demographic characteristics, which present challenges to providing meaningful guidance to make an impact on such a diverse audience.

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