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A Survey Study of Ergonomic Risks Associated with Older Workers in the Road Construction Industry

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Abstract: An aging workforce is a growing concern in the construction industry and should be addressed further within certain construction industries such as road construction. This study intends to gather perceptions on an aging workforce and ergonomic risks of road construction workers. The methodology used in this study consists of a questionnaire survey distributed to the employees of a road construction company. The results of the survey were then analyzed to determine the conclusive perceptions of the road construction workers. This study included workers of all ages, to gather a full spectrum of perceptions, in the road construction industry, and 42 percent of the participants were 45 years or older. The results illustrated that the ergonomic program was not well perceived by the road construction workers. Less than one third of the participants have received proper ergonomic training. More than one third of the participants had body discomfort during typical work duties. More experienced workers with 20 years or more in the construction industry reported body discomfort more than less experienced workers with less than 20 years in the construction industry (50% vs. 24%). "Older" workers were considered to have more construction knowledge, be more safety conscious, be more ergonomically safety conscious, and have more valuable construction skills than younger workers.

Keywords: aging workforce, construction, risk perceptions, work-related musculoskeletal disorders

1. Introduction

The construction workforce demographic has changed over the past 50 years and now has more "older" workers than previous years (Bureau of Labor Statistics, 2015). In 2004, ages 55 and older made up nearly 16 percent of the construction workforce. In 2014, it was nearly 22 percent. The projected percent increase in 2024 will be nearly 25 percent (Bureau of Labor Statistics, 2015). People are working longer or past their retirement because supporting their lifestyle has become more difficult due to inflation, particularly for the Baby Boomer generation. Workers 55 and older are extending their work life to ensure retirement security at the expense of mental and physical health risks associated with ergonomic risks in the road construction industry (Fox, Brogmus, & Maynard, 2015).

Due to demographic changes in the construction industry, risks have changed the concepts of ergonomics to take special precautions with "older" workers. Employers should be focused on the occupational risks associated with aging workers, their overall physical health, and how well they recover from injuries. As we age, our bodies begin to deteriorate, and physical health conditions become more prominent. Physical changes appear as spine and joints begin to shrink and as cartilage

begins to wear. As physical conditions worsen, the impact directly affects people's mobility, dexterity, flexibility, and healing (Fox, Brogmus, & Maynard, 2015; Choi, 2008). This becomes a greater concern with an aging workforce because "older" workers have already lost cognitive function and perceptual vision (Fox, Brogmus, & Maynard, 2015). Due to the changes to the workers' bodily functions, the workers themselves and their coworkers have high probability of occupational health risks by increasing the potential health hazard.

The construction industry is a physically demanding trade that often requires employees to work in awkward body positions, high/excessive force, repetitive motions, and extended exposure time (Choi, Yuan, & Borchardt, 2016). Awkward body positions include flexing, stooping, extending, sitting/standing for long periods, twisting, reaching overhead, and carrying heavy loads. These awkward positions are hazardous concerns for employees, especially now that the construction workforce is becoming "older." Work-related musculoskeletal disorders (WMSDs) have become one of the largest areas of injuries and illnesses with loss and/or restricted time in the construction industry. According to OSHA, WMSDs account for approximately 33 percent of injury and illness cases (Choi, Yuan, & Borchardt, 2016).

Ergonomics has been a key factor in the reduction of construction work-related musculoskeletal disorders. As the construction workforce ages, ergonomics should be further developed to protect a wider range of ages. Ergonomic programs should address strength capabilities, physical changes to the spine, aerobic capacity, perceptual vision, flexibility, dexterity, range of motion, cognitive processing, chronic health conditions, and self-reported health conditions of older workers (55+ years) (Fox, Brogmus, & Maynard, 2015). Ergonomic programs may include, but are not limited to, site-specific training, lifting techniques, posture, stretch and flex, everyday health, weight-handling limits, engineer through design, tool selection, task rotations, material handling, safety culture/climate, and slips, trips and falls (Choi, Yuan, & Borchardt, 2016; Fox, Brogmus, & Maynard, 2015).

The objectives of this study are to identify the roles of ergonomics and the significance of an aging workforce in the road construction industry and to provide better understanding of how to improve ergonomic issues associated with aging workers in the road construction industry through perceptions of management and union field workers.

2. Methods

A survey questionnaire was developed to discover the ergonomic risks associated with the aging workforce in the road construction industry. The survey study conducted with the employees from a heavy highway road construction company, employing approximately 120 employees, 82 of whom were field employees, and provided services on public and private projects in South Central Wisconsin and North Central Illinois, from large interstate highways to small commercial site development. The construction employees, included a variation of management, supervisors/foreman, operators, and laborers. Management included project managers, supervisors, foremen, and safety managers. Operators were workers who maneuver heavy machinery consisting of loaders, skid-steers, rollers, asphalt pavers, graders, excavators, and dozers. Labor duties consisted of working with hand and power tools, raking, shoveling, material handling, vehicle/equipment maintenance, etc.

A pilot survey was conducted to ensure that the questionnaire was comprehensible to the common construction worker and that the workers understood the significance of the questions being asked. From the pilot study, the questionnaire was adjusted accordingly to reflect the responses and comments provided. A comprehensive definition was established at the beginning of the survey to convey the meaning of ergonomics and what it may entail. The same workers read the definition provided, and they believed they understood what ergonomics means while believing they could provide a more accurate answer to the questions. This survey included background information, safety and ergonomics, injury and health issue, and aging construction workers. These surveys were analyzed utilizing answers with the perceptions that were provided by the road construction workers.

3. Results and Discussions

3.1 Demographic Characteristics of Participants

Out of 82 distributed surveys to the road construction employees, 56 participants completed all or partially finished sections of the survey. Table 1 shows the demographic characteristics of the 56 participants. The majority of the respondents were white, male (90.7%, 89.3%, respectively). 78% of the participants held non-management positions such as laborers, operators, and other technicians, while 22% were foremen or supervisors/managers. The participants' age range was 25-62 and the average age was 42.8 years. The largest age group was the 35-44 year group (38.2%), followed by the 45-54 year group (23.6%), the 25-34 year group (20.0%), and the 55-62 year group (18.2%). 42 percent of the participants were 45 years or older.

The mean time in the construction industry was 18.9 years. Approximately 80 percent of the workers have worked 11 or more years in the road construction industry and 45 percent have worked 20 or more years in the construction industry.

Table 1. Demographic Characteristics of Participants

	Variable	Frequency (%)
Gender	Male	50 (89.3%)
	Female	6 (10.7%)
Race	American Indian	1 (1.9%)
	Black	3 (5.6%)
	Hispanic	1 (1.9%)
	White	49 (90.7%)
Job Position	Management	12 (22.2%)
	Non-management	42 (77.8%)
Age (years, mean ± SD)		42.8 ± 9.7
Years in Construction Industry (years, mean ± SD)		42.8 ± 9.7

3.2 Safety and Ergonomics Programs

Table 2 presents survey questions that are related to the safety and ergonomics programs of the road construction company, and the results of the participants' responses. The results illustrated that the ergonomic program was not a major player in the road construction industry. Only 33 percent knew that the company had an ergonomic program, and 77 percent reported that their previous employers did not have an ergonomic program. Less than one third of the participants have ever received any ergonomic training specific to a task throughout the entire career (31.5%) or any ergonomic training through the union safety trainings (22.2%). Only 9.3% of them reported that an ergonomic evaluation had been completed on a task that they performed, and only 26% has had mandatory stretch and/or flex exercise program.

It appears that more experienced workers with 20 years or more in the construction industry knew the existence of the ergonomic program better than less experienced workers with less than 20 years in the construction industry (19% vs. 42%). The same trends were found in receiving any ergonomic training specific to a task throughout the entire career (17% 42%) and in receiving any ergonomic training through the union safety training (13% vs. 29%). These results imply that more experienced workers may not pay enough attention to the ergonomic program and training.

On the other hand, data shows that employees were aware of various ergonomic hazards. 40% of the participants responded that they report unsafe "ergonomic hazard" conditions (e.g., heavy lifting, high repetition, vibrations, awkward positions, etc.). 62% reported that their bodies were subjected to awkward positions daily (e.g., reaching overhead, stooping, sitting or standing for long periods, etc.) and 22% found it difficult to work on uneven surfaces (e.g. elevated structures or sloped or rough terrain). OSHA claims that WMSDs account for approximately 33 percent of injury and illnesses (Bureau of Labor Statistics, 2015). These survey results suggest that there might be a lack of effective ergonomic programs and education in the road construction industry. Even though the majority (95%) of the participants wear personal protective equipment that is provided to them, it might not be enough to reduce the hazard risks associated with WMSDs without effective ergonomic programs.

Table 2. Safety and Ergonomics Programs

Survey Question	Response	Frequency (%)
Does the company have an ergonomic safety program?	Yes	17 (32.7%)
	No	20 (38.5%)
	Maybe	15 (28.9%)
Was an ergonomic program implemented in your previous job?	Yes	8 (14.3%)
	No	43 (76.8%)
	Maybe	5 (8.9%)
Have you received any ergonomic training specific to a task throughout your entire career?	Yes	17 (31.5%)
	No	33 (61.1%)

	Maybe	4 (7.4%)
Have you received any ergonomic training through the union safety trainings?	Yes	12 (22.2%)
	No	36 (66.7%)
	Maybe	6 (11.1%)
Has an ergonomic evaluation been completed on a task that you performed?	Yes	5 (9.3%)
	No	40 (74.1%)
	Maybe	9 (16.7%)
Have you been with a company that has had mandatory stretch and/or flex exercise programs?	Yes	14 (26.4%)
	No	36 (67.9%)
	Maybe	3 (5.7%)
Do you report unsafe “ergonomic hazard” conditions (e.g., heavy lifting, high repetition, vibrations, awkward positions, etc.)?	Yes	21 (40.4%)
	No	21 (40.4%)
	Sometimes	10 (19.2%)
Is your body subjected to awkward positions daily (e.g., reaching overhead, stooping, sitting or standing for long periods, etc.)?	Yes	33 (62.3%)
	No	12 (22.6%)
	Sometimes	8 (15.1%)
Do you find it difficult to work on uneven surfaces (e.g. elevated structures or sloped or rough terrain)?	Yes	12 (22.2%)
	No	26 (48.2%)
	Sometimes	16 (29.6%)
Do you wear personal protective equipment that is provided to you?	Yes	52 (94.6%)
	No	1 (1.8%)
	Sometimes	2 (3.6%)

3.3 Injury, Health, and Aging Issues

Table 3 shows survey questions that are related to the injury and health issues and the results of the participants’ responses. More than one third of the participants had body discomfort during typical work duties. The back was the most frequently reported (10) body part, followed by shoulders (3), knees (3), feet (2), and hands (2). More experienced workers with 20 years or more in the construction industry reported body discomfort more than less experienced workers with less than 20 years in the construction industry (50% vs. 24%). 29% of the workers have had a work related injury involving a muscle, tendon, nerve, cartilage, or spinal disc. 14% have had minor injuries (cuts, bruises, pinched fingers, etc.), but did not report it to safety management. Workers reported in the survey that cuts, bruises, sprains, and pinched ligaments were not significant means for reporting to safety management. These types of injuries should be reported. Even though they may seem small and insignificant, they are oftentimes common signs for the development of more serious injuries as the worker ages (Johnson, 2013). The results here fall in line with another survey study that had similar findings on non-reported injuries. Approximately 27 percent would not report injuries because they were small acute injuries that they believed would heal quickly (Johnson, 2013). No participants reported that they had any health issues that affect their jobs. This does not necessarily mean that the health issues of the workers do not affect their jobs. Workers who have health issues that affect their job may have left the work.

Table 3. Health and Safety Issues

Survey Question	Response	Frequency (%)
Do you have body discomfort during typical work duties?	Yes	18 (35.3%)
	No	33 (64.7%)
Have you had a work related injury involving a muscle, tendon, nerve, cartilage, or spinal disc?	Yes	14 (28.6%)
	No	35 (71.4%)
Have you been injured and not reported it to safety management?	Yes	7 (14.0%)
	No	43 (86.0%)
Do you have any health issues that affect your job?	Yes	0 (0%)
	No	47 (100%)

Figure 1 and Figure 2 illustrates the participants’ perceptions when they believe physical and mental limitations begin, respectively. As you can see in these figures the perceptions of the employees are spread out. For high blood pressure, high

cholesterol, arthritis, and carpal tunnel, more participants perceived the 35-44 years group as the beginning of the physical limitations. For lung disease, more workers perceived the beginning of the limitation at 45-54 years old. For asthma, they perceived it happens at earlier ages, more at 20-24 years old. On the other hand, more participants perceived the 45-54 years-group as the beginning of mental limitations in decreased balance control, decreased light perception, and decreased cerebral function. For reduced reaction time, more participants perceived 35-44 years-group as the beginning of the limitation. According to sources in the literature, the 35-44 year-age group, on average, is the start of deteriorating physical and mental functions (Fox, Brogmus, & Maynard, 2015; Haight & Belwal, 2006). These limitation functions increase dramatically during this age group and exponentially after age 64, as age progresses. Road construction workers must be informed on these matters, at all ages, especially the "older" workers as they are at the highest risk for loss time injuries and fatalities.

The median age that they considered an "older" worker was 50 with a range of 35-70 years. 21% of them considered a worker aged 45 or above as an "older" worker, 58% aged 50 and above, and 73% aged 55 and above. Figure 3 shows participants' perceptions about "older" workers and safety issues. In general, older workers were not considered to put themselves or others in unsafe positions, nor to be injured more often than younger workers. They were considered to have more construction knowledge, be more safety conscious, be more ergonomically safety conscious, and have more valuable construction skills than younger workers. 64% of the participants either strongly agreed or agreed that older workers have more construction knowledge, and 64% either strongly agreed or agreed that older workers have more valuable construction skills than younger workers. More experienced workers (with 20 years or more experience) and older worker (aged 45 and above) more strongly agree that older workers are more safety conscious than younger workers. More experience workers (with 20 years or more experience) more strongly agree that older workers are more ergonomically safety conscious than younger workers.

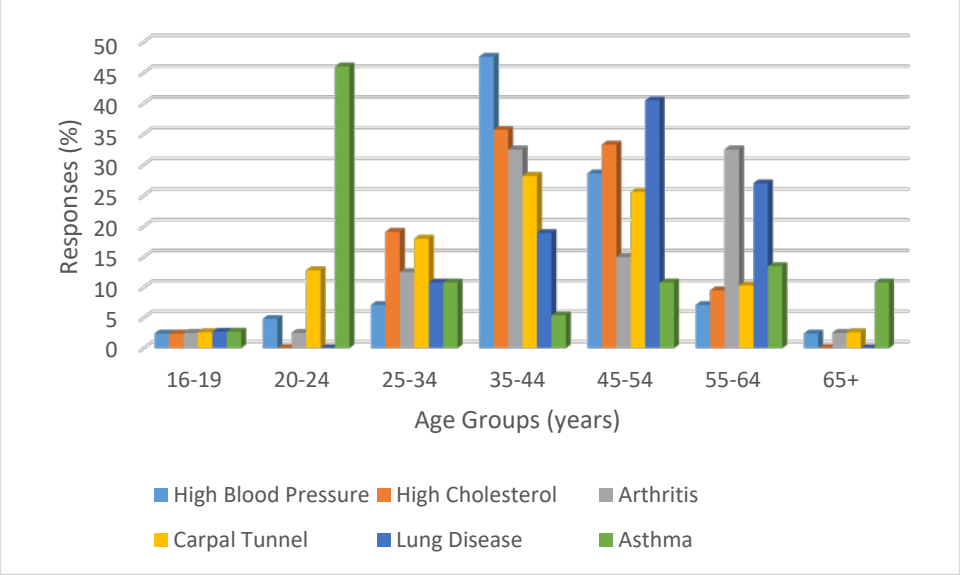

Figure 1. Perceptions of Physical Limitations

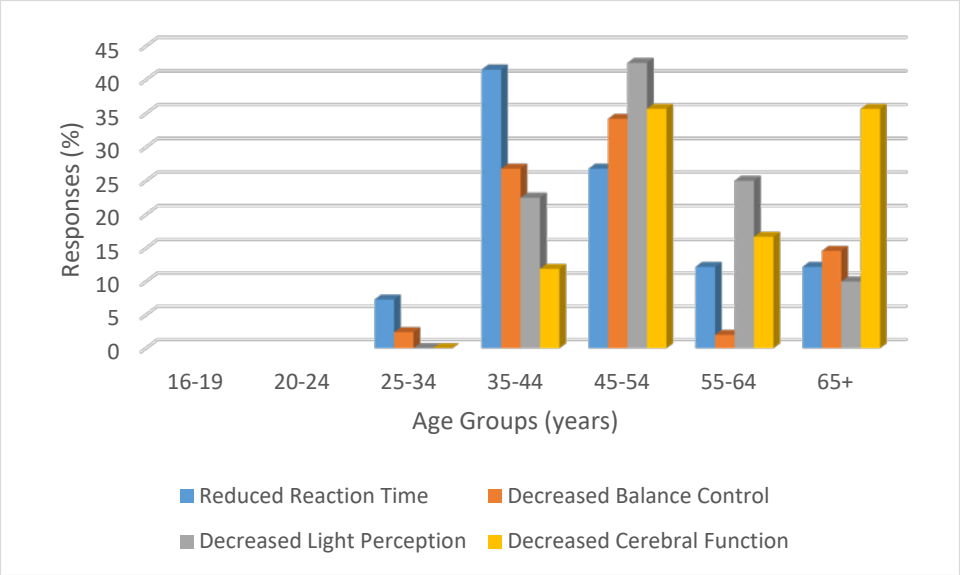

Figure 2. Perceptions of Mental Limitations

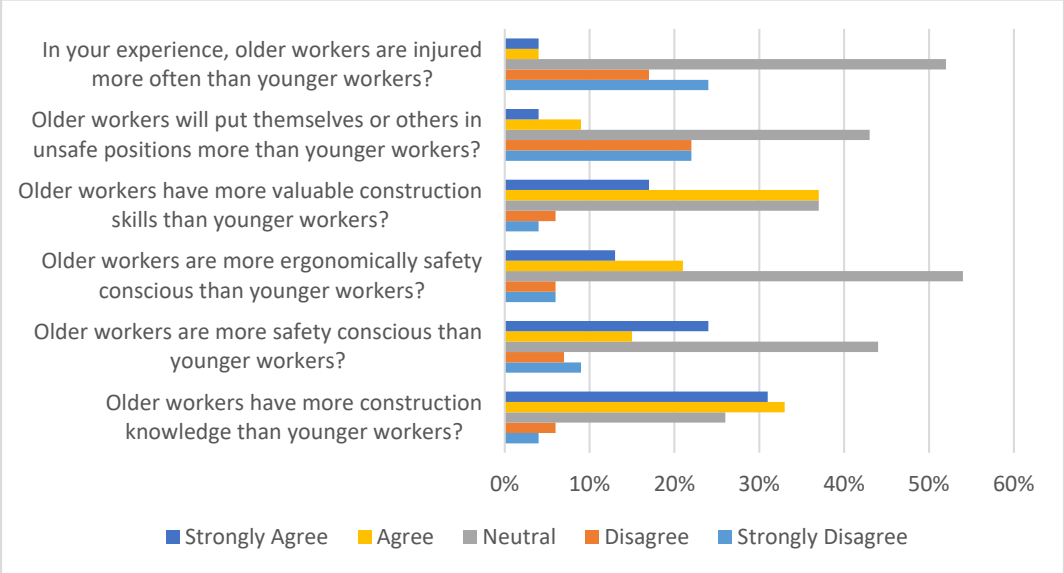

Figure 3. Perceptions of Old Workers and Safety Issues

4. Conclusion

An aging workforce has been a growing concern for the road construction industry as the potential for long term WMSD injuries continues as the workers age (Bureau of Labor Statistics, 2015). The findings from this study continue to show that “older” workers, and even workers in their late 30s and 40s, show signs of daily bodily discomfort in their normal working duties. “Older” workers continue to provide knowledge and experience with construction skills and safety knowledge to workers who are younger and less experienced. Having a well-designed ergonomic program that addresses the task(s) of the company could prove viable, especially if “older” workers have bought into the safety side of construction to pass on safety knowledge to younger generations. Providing the knowledge and training on WMSDs and how ergonomic risks are associated with aging workers could help reduce the risk of injury or at least reduce the amount of injury rehabilitation.

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