

Key Musculoskeletal Pain Risk Factors Among Construction Workers in Wisconsin: A Pilot Study

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Abstract: The construction industry is one of the most physically demanding and dangerous occupations in the United States (Choi, Guo, Kim, & Xiong, 2019). Construction workers also continue to face a high prevalence of musculoskeletal injuries or pains caused by ergonomic-related issues (Wang, Dong, Choi, & Dement, 2017). Individual, biomechanical, psychosocial, and work-related factors have been identified as causal or contributing factors of MSDs (Boschman, van der Molen, Sluiter, & Frings-Dresen, 2012; Silva, Silva, & Gontijo, 2017). We aim to assess the presence of work-related acute and chronic musculoskeletal pain among construction workers in Wisconsin, U.S. and determine individual and work-related factors associated with the occurrence of acute and chronic pain that can be easily assessed by an EHS professional.

A total of 23 construction workers from Wisconsin were enrolled using convenience sampling. Participants completed a survey about the characteristics of their work, the perceived exertion associated with the job, and the presence of musculoskeletal pain (yes/no) in six different body areas during the previous 12 months. For this study, we considered acute pain that lasted from one day to three months. Pain lasting more than three months was categorized as chronic (John Hopkins Medicine, 2022). A modified version of the Nordic questionnaire (Kuorinka et al., 1987) was used to collect information on the presence of musculoskeletal pain, and the Borg ratings of perceived exertion (RPE) scale (Borg, 1998) was used to measure exertion at work for the last 7 work days. Associations between our outcomes of interest (acute and chronic pain) with risk factors (Borg RPE scale, years of work, BMI, and smoking status) were assessed using binary multiple logistic regression models.

More than 90% of the participants were white and male. The participants' trades/occupations were carpenter, laborer, framing, and brick mason. Their median age was 38 years, and they had a median body mass index (BMI) of 28, corresponding to being overweight. The smoking status indicated that 35% of the participants were current smokers. Their median work experience in construction was 10 years, working about 10 hours per day, more than five days per week. The self-reported exertion using the Borg RPE scale corresponded to a median score of 13 (somewhat hard; it is quite an effort - feel tired but can continue). The proportion of participants reporting acute musculoskeletal pain in the last 12 months was 86%. This percentage was higher than those reporting chronic musculoskeletal pain in the same period, who had a proportion of 23%. Among participants with acute pain, the lower back (63%), knee (53%), and shoulder (47%) were the body areas more frequently associated with this type of pain. Likewise, participants with chronic pain reported the lower back (40%), shoulder (40%), and wrist or forearm (20%) as the body areas mainly associated with this type of pain (Table 1).

Table 1. Musculoskeletal pain in the last 12 months (n= 23)

Musculoskeletal symptoms in the previous 12 months	n	%
Musculoskeletal pain		
Reported acute musculoskeletal pain in the last 12 months *	19	86
Body area:		
Lower back	12	63
Knee	10	53
Shoulder	9	47
Neck	6	32
Wrist or forearm	4	21
Ankle or feet	4	21
Reported chronic musculoskeletal pain in the last 12 months *	5	23
Body area:		
Lower back	2	40
Shoulder	2	40
Wrist or forearm	1	20

*Differences in subtotal population sample due to item nonresponse or missing.

The models indicated that for each 1 unit increase in the Borg RPE scale and the BMI, the odds of experiencing musculoskeletal pain also increased. For each additional Borg RPE Scale unit, the odds of experiencing acute and chronic musculoskeletal pain in the last 12 months increased by 3.82 and 3.25, respectively. A one unit increase in the body mass index (BMI) was associated with an increased odds of experiencing acute and chronic musculoskeletal pain in the last 12 months of 1.53 and 1.17, respectively (Table 2).

Table 2. Logistic regression models for acute and chronic pain in the last 12 months and the Borg RPE scale and BMI

Parameter	Est. odds ratio	Standard error	95% confidence limits	P value
Acute musculoskeletal pain*:				
Borg Scale	3.82	4.37	0.41-36.02	0.24
BMI	1.53	0.62	0.69-3.38	0.30
Chronic musculoskeletal pain ^a				
Borg Scale	3.25	1.97	0.99-10.66	0.05
BMI	1.17	0.20	0.84-1.62	0.36

*Hosmer-Lemeshow: 2.37, p: 0.97; Log Likelihood: -5.51, p:0.19

^aHosmer-Lemeshow:14.68, p: 0.07; Log Likelihood: -5.82, p:0.03

Our study's findings confirmed that workers in construction faced a high prevalence of musculoskeletal pain. The logistic regression models indicated that Borg's ratings of perceived exertion (RPE) and BMI were associated with a higher probability of experiencing acute and chronic pain. High occupational physical demands are considered one of the significant contributors to musculoskeletal pain. At the same time obesity pandemic is also impacting construction workers. These two factors should be addressed in order to reduce musculoskeletal pain. Physical demands at work have been intervened using two approaches. The first approach is reducing physical activity at work by implementing safe working techniques and assistive devices (Straker & Mathiassen, 2009). However, current statistics have shown poor results in reducing the prevalence of musculoskeletal pain. The second one is the implementation of workplace exercise programs. Through this, workers perform exercises at work to improve their physical capacity for their job. Several studies have shown its efficacy, but there are some concerns about the sustainability of this type of program. Factors such as the impact on productivity, the fact that it relies only on workers' motivation, and cost-efficiency have been raised as barriers that limit its long-term impact (Holtermann et al., 2010).

For weight control, individually tailored interventions have shown promising results among construction workers (Viester, Verhagen, Bongers, & van der Beek, 2018). Integrated approaches to promote health and improve physical capacity are mandatory for construction workers. Implementing the Goldilocks principle seems to be a new paradigm that can address this challenge (Holtermann, Mathiassen, & Straker, 2019).

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