Impact of Musculoskeletal Pains on Productivity and Fall Accidents Among Hispanic Construction Workers in Texas

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BACKGROUND

- Hispanics comprise 61% of the construction workforce in Texas, ranks the highest share of Hispanics in the construction labor force.
- Work-related fatalities due to falls, slips, and trips increased by 5.6 percent in 2021, with high numbers among Hispanic workers (U.S. Bureau of Labor Statistics, 2022)
- Falls from heights are a leading cause of fatalities, resulting in over 310 deaths and over 10,350 serious injuries each year in the US (NIOSH, 2019)
- Construction workers are at high risk of musculoskeletal pain (MSP) due to manual labor, harsh working conditions, and repetitive motions that can lead to difficulty in participating in social or family events and strain relationships (Alwasel et al., 2017)
- Construction workers are at a high risk of experiencing high levels of bodily pain and regularly perform their duties while in pain

RESEARCH GAP:

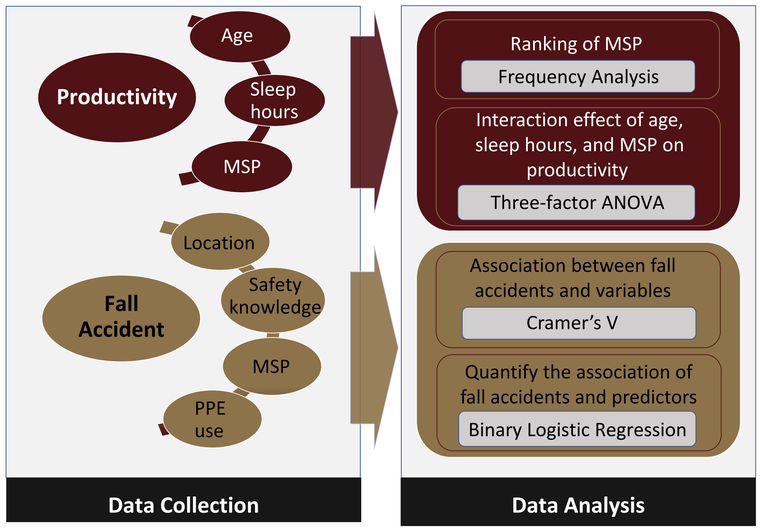
- no study on the relationship between MSPs, sleep hours, and productivity among Hispanic construction workers, making it challenging to develop effective interventions to minimize MSP and improve productivity in this population
- Lack of study on musculoskeletal pains among Hispanic workers and their association to fall accidents

OBJECTIVES

- Rank the most common MSPs among Hispanic construction workers
- Investigate the relationship between MSPs and their impact on worker productivity
- Investigate the association between fall accidents and attributes such as age, MSPs, sleep hours, safety knowledge, and use of personal protective equipment (PPE)

METHOD

- ✓ Approved Texas State IRB # 8550
- ✓ 14 items questionnaire
- ✓ Recruited Hispanic construction workers who participated in free OSHA safety training organized by TXST, supported by the U.S. Department of Labor
- ✓ Analyzed 228 valid responses from 32 different companies
- ✓ Data analyzed using SPSS
- ✓ Used quantitative research method as shown below



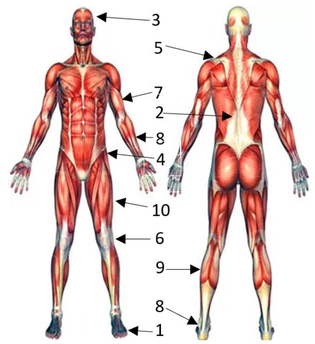
Research Methodology

RESULTS

Impact of Musculoskeletal Pains on Productivity

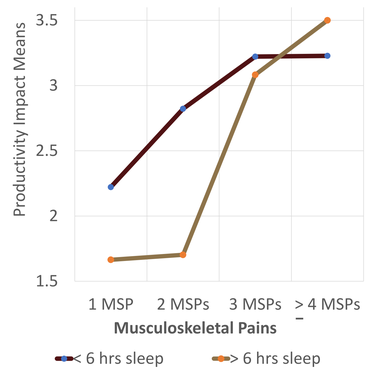
Frequency Analysis

Rank	MSP	% Frequency (N = 228)
1	Foot	21.03%
2	Back	16.52%
3	Head	10.73%
4	Hip	9.01%
5	Shoulder	8.15%
6	Knee	7.08%
7	Arm	6.22%
8	Forearm	6.01%
8	Ankle	6.01%
9	Leg	4.72%
10	Thigh	4.51%

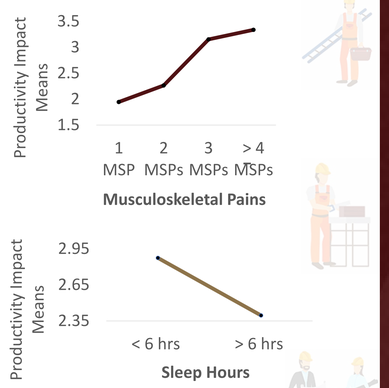


Ranking of Musculoskeletal Pains

Three-factor ANOVA



Interaction Effect



Main Effect

- No significance differences observed in the three-factor interaction.
- A significant simple two-way interaction between MSPs and sleep hours ($F(3, 205) = 6.235$, $p < 0.001$). The main effects of MSP ($F(3, 205) = 29.614$, $p < 0.001$) and sleep hours ($F(1, 205) = 13.425$, $p < 0.001$) were found to be statistically significant.

Impact of Musculoskeletal Pains on Fall Accidents

Cramer's V

- At significance level of 0.05, the strongest association was found between fall accidents and the location of the fall (V = 0.405). A moderate association was found between fall accidents and musculoskeletal pains (V = 0.326) and use of PPE (V = 0.274). A weaker association was found between fall accidents and safety knowledge (V = 0.145) and sleep hours (V = 0.181)

Binary Logistic Regression

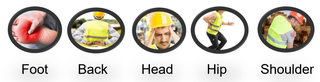
- For the location of fall, the stronger predictor of having a fall accident was "fall from ladder" (OR = 12.216, 95% CI: 4.228 – 35.293), which means that working on a ladder will increase the odds of a fall accident by 12.2 times than working near openings.
- Similarly, having two musculoskeletal pains had an increasing ratio in odds of fall accidents (OR = 3.125, 95% CI: 1.191 – 8.199), and having three or more MSPs had the increasing ratio in odds of fall accidents (OR = 9.417, 95% CI: 3.072 – 28.870) than one MSP.
- For the use of the PPE category, the workers using PPE had the highest decreasing ratio (89.2%) in odds of fall accidents (OR = 0.108, 95% CI: 0.046 – 0.254). It shows that those who don't wear PPEs properly are more likely to have fall accidents.

KEY FINDINGS

- The number of MSPs and sleep hours have a significant impact on productivity
- No dependence of MSPs and sleep hours' effect on productivity on age groups was observed
- Increase in the number of MSPs leads to corresponding increase in the impact on productivity, ranging from mild to severe
- For workers with one or two MSPs, productivity impact is significantly higher for those who slept less than six hours per day than those who slept more than six hours per day
- Location of fall, MSPs, and use of PPE were found to be significant predictors of fall accidents with the strongest predictor being a "fall from a ladder" (OR = 12.216)
- Increased risk of fall accidents for workers with two or more musculoskeletal pains (OR = 3.125 for two pains, OR = 9.417 for three or more pains)

CONCLUSIONS

- The top five common site of pain among Hispanic construction workers are:



- Musculoskeletal pains and sleep hours have a significant impact on worker productivity, but the effects of MSPs and sleep hours on productivity do not depend on the worker's age.
- There is a significant association between fall accidents and location of fall, MSPs, and use of PPE among Hispanic construction workers.
- There is a high importance of targeted interventions to improve musculoskeletal health and productivity in this population

RECOMMENDATIONS

- The study found that there may be unique risk factors or work conditions that contribute to Foot pain among Hispanic construction workers.
- Future research should investigate the specific factors that contribute to the high prevalence of Foot pain among Hispanic construction workers.
- Employers and policymakers should take the specific needs of Hispanic construction workers into account when implementing safety measures and addressing pain management in the workplace.
- Targeted interventions should address musculoskeletal pains and properly use of PPE to reduce fall accidents

FURTHER STUDIES

- Plantar pressure and kinematic gait assessment for individuals with chronic ankle instability (IRB# 8360)
- Gait kinematics and plantar pressure assessment among construction roofers to educate and train best practices (Proposal submitted to National Roofing Alliance)

Laboratory equipment and participant set-up

Intelligent Insole

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