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An Exploratory Study to Investigate Safety Climate among Latino Construction Workers

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Abstract

The construction industry continues to be plagued by high injury and fatality rates compared to other sectors. The occurrence of occupational injuries and fatalities are greatly influenced by worker risk-taking, unsafe work behaviors, and work environment. This exploratory study analyzed a total of 315 responses collected in Colorado (n = 218) and Puerto Rico (n = 97) using the safety culture and risk perception survey instrument. Responses were graded using a Likert scale 1 to 5 where, 1 = highly disagree and 5 = highly agree. The Puerto Rico group scored higher overall for a positive safety climate with a total score of 118 versus 115 for Latino construction workers in Colorado. Nearly half the workers were 30 years of age or younger. Findings revealed that Colorado Latino construction workers reported a higher level of concern for job related risks with a mean score of 3.9 compared to the Puerto Rico construction workers with a mean score of 3.5., p-value 0.05. The workers in Puerto Rico also reported that their supervisors were better informed about safety issues compared to the Colorado cohort with a mean scores of 4.7 and 4.5 respectively, p-value 0.04. The Colorado Latino workers indicated that management places most of the blame for accidents on the injured employee with a mean score of 3.2 compared to the Puerto Rico workers with a mean score of 2.8, p-value 0.01. This study contributes to the body of knowledge by increasing the understanding of perceptions that may contribute to factors influencing decision making, unsafe work behaviors, and resulting work related injuries or fatalities.

Introduction and background

Despite the downward trends in occupational injury seen over the past three years in the U.S., the construction industry continues to be plagued by high injury and fatality rates compared to many other sectors (Bureau of Labor and Statistics (BLS), 2016a). The BLS 2015 data on non-fatal occupational injuries revealed the highest injury rates 3.5/100 were experienced in smaller companies with 11 - 49 employees. The larger companies with over 250 employees had much lower injury rates, 2.5/100 and 1.3/100 respectively for those firms with more than 1000 employees. The downward trend seen in non-fatal injuries was not matched in those severe events that took the lives of workers. The BLS reported a total of 4,836 fatal workplace injuries in 2015. Hispanic or Latino workers suffered 903 or 18.8% of all fatal injuries. Falls

accounted for nearly 40 percent of fatal work injuries in the private construction industry. The number of fatally-injured workers born in Mexico increased to 22% or 415 cases in 2015. Fatal injuries involving foreign-born workers were at the highest level since 2007 (BLS, 2016b). Several construction occupations recorded their highest fatality totals in recent years, including construction laborers, carpenters, electricians, plumbers, pipefitters, and steamfitters. The Census for Fatal Occupational Injuries for Puerto Rico reported that 25% of 20 fatalities in 2013 were in the construction sector dropping to 18.85% of 32 deaths by 2015 (BLS, 2015).

The occurrence of occupational injury and fatality are greatly influenced by worker risk taking, safe work behaviors and environmental conditions. Greater effort needs to be taken to foster a positive and supportive workplace culture, safe work practices and healthy conditions (Gilkey, Lopez del Puerto, Keefe, Bigelow, Herron, Rosecrance and Chen, 2012). Zohar (2010) reported that over 200 articles had been written about safety climate and culture and that overwhelming data supported the inverse relationship to positive culture and lower injury and illness experience. Schwatka, Hecker and Goldenhar (2016) asserted that safety climate measures have been useful practice activities to prevent work related ill health and injury on construction sites. The authors reviewed 56 articles related to construction safety climate and culture and concluded that consistency existed in eight climate domains of performance (Zohar, 1980) that could drive down the occurrence of occupational injury: 1) general management commitment to safety, 2) safety policies, resources, and training, 3) supervisor commitment to safety, 4) general organizational commitment to safety, 5) co-workers commitment to safety, 6) safety communication, 7) worker involvement in safety, and 8) risk appraisal and risk taking. In contrast, Zohar (2010) and Choudhry, Fang and Mohamed (2007) identified slightly different characterization of the eight domains: 1) management commitment, 2) and 3) organizational status of safety officer and safety committee, 4) successful safety training, 5) level of risk in the workplace, 6 and 7) effect of safe conduct on social status and promotion within the company, and 8) effects of safe work practices on work pace and productivity deadlines.

While climate and culture co-exist (Gilkey, Lopez del Puerto, Keefe, Bigelow, Herron, Rosecrance and Chen, 2012), the domains of safety climate are measured to understand the safety culture of the company. It is the predominant belief that work culture influences the assumptions and beliefs that workers make about the genuine priority for safety held by the company and thus greatly influences risk taking and safe work behaviors. Zohar (1980) would ask; what if the company adheres to safe work practices and misses the productivity deadline, suffers penalties and lose profits? An organizational culture that prioritizes worker safety and wellbeing would sacrifice the economic gains to protect the health of workers; whereas, a company with a low safety climate and poor culture, focused only on productivity and profits, might shortcut the use of safe work practices to complete the project on time for economic gains at the expense of worker health, safety and wellbeing.

Gilkey, Lopez del Puerto, Rosecrance and Chen (2013) examined differences between Latino and non-Latino workers in Colorado employed in residential, commercial and civil construction. The investigators found that ethnicity was an important factor that may explain some differences in safe work behaviors and

susceptibility to risk taking, hazard exposure and resulting injury. Their research revealed that Latino workers were more concerned about the risk of injury but had more difficulty understanding safety rules and procedures than their non-Latino counterparts. Investigators also found that construction sectors deferred somewhat from each other in that residential construction workers reported the highest risk perception scores compared to those in the commercial and heavy civil sectors (Gilkey, Lopez del Puerto, Rosecrance and Chen, 2013).

The effect of language and culture on risk of injury or fatality in construction has not been fully explained. Do workers from different language and cultural backgrounds behave differently, are they at greater risk? We know that immigrants experience higher injury and fatality rates in the construction industry compared to their non-immigrant and Caucasian coworkers (BLS, 2016b). Do Latino immigrants take greater risks than their native born or resident counterparts? To help answer this question, this project was designed to investigate differences in safety climate scores from Colorado construction workers to those obtained from Puerto Rican construction workers. Investigators had data from 341 respondents that completed the Safety Climate and Risk Perception Survey obtained in prior research (Gilkey, Lopez del Puerto, Rosecrance and Chen, 2013). The Colorado data included 218 Latinos that were compared to 97 respondents working in Puerto Rico using the same survey instrument to evaluate differences and similarities between the two groups.

Study methods

The present study was uniquely designed by combining and comparing data obtained in Colorado and Puerto Rico using the Safety Culture and Risk Perception Survey. That safety climate assessment tool was developed by researchers for the HomeSafe Pilot Study in Colorado (Bigelow, Gilkey, Greenstein, and Kirsch, 1998a; Gilkey, Bigelow, Herron, Greenstein, Chadwick and Fowler, 1998). The instrument was developed as the primary tool for measuring safety climate, culture and risk perception among residential construction workers (Gilkey, et al., 2012; Gilkey, Lopez del Puerto, Rosecrance and Chen, 2013). The survey was originally adapted from the 130 item Safety Culture Survey developed by Safety Performance Solutions, Inc. (Geller, 1990). The English version was translated into Spanish by a bilingual physician and then translated back into English by a bilingual academic faculty member to ensure accuracy of language, content and meaning (Gilkey, et al., 2012). The Safety Culture and Risk Perception Survey has been used for two decades in numerous workplaces and environments, including construction. Details about the Safety Culture and Risk Perception survey are described in prior studies (Gilkey, Bigelow, Herron, Greenstein, Chadwick and Fowler, 1998b; Gilkey, et al., 2012; Gilkey, Lopez del Puerto, Rosecrance and Chen, 2013). Surveys were administered by a graduate student in both locations. Study subjects were recruited through companies associated with the construction management programs at both universities. Subjects were not selected randomly but rather by convenience based upon availability and access granted by the partner company. Approval for the studies was obtained from the institutional review boards (IRB/HRB) at both universities. Surveys were collected, coded and analyzed using IBM TMS SPSS

Statistics, Version 24. The analysis included univariate, descriptive and frequencies to characterize the sample. Data were evaluated for normality using Kolmogorov–Smirnov goodness of fit test for normality. Data were also graphed using the frequency distribution feature in SPSS and reviewed visually for distribution patterns of normality. Comparisons were made using One-Way Analysis of Variance (ANOVA) to evaluate mean scores obtained with the Safety Culture and Risk Perception Survey between Colorado and Puerto Rican construction workers. Investigators selected the more powerful parametric tests to use on Likert-scale derived data and treated results as interval values for the analysis. A number of investigators have concluded that the more powerful tool is appropriate and preferred to the nonparametric counterpart (Carifio and Perla, 2008; Jamieson, 2004; Pell, 2004).

Two hundred and eighteen Latino cases were extracted from the Colorado dataset to make a direct comparison to those Latino scores obtained in Puerto Rico to evaluate differences in safety climate domains, perceptions and opinions about risk and safe work practices between Colorado construction workers to those employed in Puerto Rico.

Results

The combined data set of Colorado and Puerto Rico workers included 315 identified as Latino. The Latino subset was extracted for characterization and evaluation as shown in Table 1. The population identified as 100% Latino included 70% from Colorado and 30% from Puerto Rico. The study population was fairly balanced between construction sectors with the commercial group comprising slightly more than one-third and with less than 10% working in multiple areas. The age distribution of Latino workers was fairly homogenous with 87% less than 40 years of age and 95% less than 50 years of age. The largest group were those under 30 years of age which comprised 47% of the total. Approximately 1/5 of workers had been on the job for less than five years while only 14% had accrued more than 15 years of experience. The education level also varied among the group with more than 1/3 not having completed high school and nearly 14% reporting that they had completed college. Workers were surveyed for the number of hours of safety training received in the past 12 months. Over 1/3 reported that they had received at least five hours of training while 12 did not respond to the question. A total of 58% received less than five hours or did not respond to the question but nearly 90% had received some training in the past 12 months.

Table 1. Distribution of Latino Construction Workers

Area of Employment in Construction Work	Number	Percent of Total
Residential	99	31%
Commercial	108	34%
Heavy Civil	83	27%
Multiple Areas	25	8%
Totals	315	100%
Age Group	Number	Percent

Age Not reported	27	8%
Less than 30 years	148	47%
31 – 40 years	101	32%
41 – 50 years	25	8%
50 years and older	14	4%
Totals	315	100%
Years of School	Number	Percent
Elementary School or less (6th grade)	27	9%
Started High School (did not graduate)	68	22%
Graduated from High School	89	28%
Part of College	79	25%
College Graduate	43	14%
Technical School	6	2%
Total	312	100%
Hours of Training	Number	Percent
Did not Answer	37	12%
1 – Hour	16	5%
2 – Hours	38	12%
3 – Hours	53	17%
4 – Hours	37	12%
5 – Hours	115	37%
More than 5 Hours	16	5%
Totals	312	100%

The Safety Culture and Risk Perception Survey was administered to Latino construction workers from both groups, n=315, 218 in Colorado and 97 in Puerto Rico. Similarities and differences were observed within the group when evaluated by location. Mean scores including those differences identified as statistically significant*, p-value 0.05 or lower, are presented in Table 2. The evaluation revealed a higher overall safety climate score of 118 for the Puerto Rican construction worker with a mean of 3.9 compared to the Colorado group with an overall score of 115 and mean score of 3.8. The Puerto Rican workers had lower or equal mean scores for 18 out of 30 items on the Safety Culture and Risk Perception Survey.

The Latino construction workers from Colorado reported higher concern for job related risks with a mean score of 3.9 compared to the Puerto Rican construction workers with a mean score of 3.5. The Puerto Rican workers felt that their supervisor was better informed about safety issues as shown by a mean scores of 4.7 compared to the Colorado Latino workers with a mean score of 4.5. The Puerto Rican construction workers were more willing to correct safety hazards when identified with a mean score of 4.3 compared to 4.2 for the Colorado Latino workers. The Colorado Latino workers felt that management places most of the blame for accidents on the injured employee with a mean score of 3.2 compared to the Puerto Rican workers with a mean score of 2.8. The Colorado Latino workers were less willing to warn coworkers about working unsafely with a mean score of 4.5 compared to the Puerto Rican workers with a higher mean score of 4.8. The Colorado Latino construction workers were less willing to be observed and recorded by a coworker

with a mean score of 3.7 compared to the Puerto Rican workers with a mean score of 3.1. Puerto Rican construction workers believed that immigrant workers were more likely to suffer an accident than American workers with a mean scores of 3.9 compared to the Colorado Latino workers with a mean score of 2.8. The Puerto Rican construction workers were much more likely to believe that immigrants made the worksite unsafe for all workers with a mean scores of 4.4 compared to Colorado Latino workers with a much lower mean score of 2.2

Table 2 Safety Culture and Risk Perception Mean Scores

Safety Culture Survey Question	CO - Latino (#) Mean	PR-Latino (#) Mean	ANOVA P-Value
The risk level of my job concerns me quite a bit	(212) 3.9	(91) 3.5	0.05*
When told about safety hazards, supervisors are appreciative and try to correct them quickly	(212) 4.3	(92) 4.6	0.40
My immediate supervisor is well informed about relevant safety issues	(211) 4.5	(93) 4.7	0.04*
It is the responsibility of each employee to seek out opportunities to prevent injury	(211) 4.5	(87) 4.6	0.43
At my company, work productivity and quality usually have a higher priority than work safety	(211) 3.1	(91) 2.7	0.07
The managers in my company really care about safety and try to reduce risk levels as much as possible	(211) 4.3	(91) 4.5	0.23
When I see a potential safety hazard (e.g., oil spill), I am willing to correct it myself if possible	(211) 4.2	(92) 4.3	0.04*
Management places most of the blame for an accident on the injured employee	(211) 3.2	(91) 2.8	0.01*
“Near misses” are consistently reported and investigated at our company	(211) 3.7	(90) 3.9	0.23
I am willing to warn my coworkers about working unsafely	(211) 4.5	(92) 4.8	0.04*
Employees seen behaving unsafely in my company are usually given corrective feedback by their coworkers	(211) 4.1	(92) 4.1	0.80
Compared to other companies, I think mine is rather risky	(211) 2.6	(91) 2.3	0.13
Working safely is the Number One priority in my company	(211) 4.3	(90) 4.4	0.66
I have received adequate job safety training	(211) 4.3	(89) 4.5	0.17
Many first-aid cases in my company go unreported	(211) 2.8	(89) 2.7	0.57
Information needed to work safely is made available to all employees	(206) 4.5	(89) 4.5	.084
Management here seems genuinely	(206) 4.3	(92) 4.1	0.15

interested in reducing injury rates			
Safety audits are conducted regularly in my company to check the use of personal protective equipment	(204) 4.3	(92) 4.5	0.08
I know how to do my job safely	(204) 4.4	(92) 4.7	0.17
Most employees in my company would not feel comfortable if their work practices were observed and recorded by a coworker	(204) 3.7	(92) 3.1	<0.01*
Team work and collaboration are encouraged to reduce safety hazards	(204) 4.5	(90) 4.5	0.95
I always follow the safety rules and procedures when doing my job	(204) 4.4	(90) 4.6	0.18
I have the personal protective equipment that I need to do my job safely	(204) 4.6	(91) 4.6	0.87
Some safety rules and procedures are difficult to understand	(204) 3.1	(92) 3.1	0.86
Immigrant workers are more likely to suffer accidents than American workers	(204) 2.8	(92) 3.9	<0.01*
Immigrant workers make the worksite unsafe for all workers	(204) 2.2	(90) 4.4	<0.01*
Accidents can happen to anyone	(204) 4.7	(89) 4.5	0.12
I am willing to take more risks than my coworkers	(183) 2.4	(91) 2.4	0.46
The dangers present on construction sites can not cause my death or the death of others	(183) 2.9	(91) 2.8	0.63
I have control over the dangers that I encounter on construction sites	(180) 4.1	(90) 4.0	0.84

Discussion

The study results from this investigation support the notion that differences exist between Latino groups of construction workers from different locations and cultures. This study was designed to investigate a large Latino population of construction workers that were primary Spanish speakers but living in Colorado and Puerto Rico and to compare safety climate and risk perception scores within the group by location. Both groups are classified as minorities in the U.S. and considered Latino, but are unique to different cultures and locations. Of the 30 measures of safety climate assessed in this study, 27% were significantly different and 20% were identical within the all Latino populations. The Puerto Rican group scored higher overall for a positive safety climate with a total score of 118 vs. 115 for Latino construction workers in Colorado.

The differences seen in the current study were in the domains of risk taking, management, supervisor and worker commitment to safety and perception about immigrants. The Latino workers from Colorado had a higher perceived risk level about their workplaces estimated at 3.9 (p-value 0.05). This may suggest that a culture of lower risk perception exists in the U.S. The concept of risk in construction is complex, especially in the multi-cultural worksite. Increased risk for injury among Latinos has been linked to many variables including limited economic and political

resources, language and cultural barriers, hazardous jobs and conditions, and even discrimination (Roelofs, Sprague-Martinez, Burnette and Azaroff, 2011).

The Puerto Rican workers felt that their supervisors were well informed about safety with a mean score of 4.7 compared to the Colorado group of 4.5 (p-value 0.04). Puerto Rican workers appear to have greater faith in the safety competency and commitment of their supervisor. There was significant difference seen between the total population of workers and their willingness to correct identified hazards. The Puerto Rico Latino workers were more willing to correct jobsite hazards than the Colorado Latino workers. The perception that blame may be directed at the worker was much higher for the Colorado Latino group with a mean score of 3.2 compared to the Puerto Rico group with 2.8 (p-value 0.01) suggesting that U.S. companies may place more blame on Latino workers for accidents. Placing blame on workers for their injury consequence is not acceptable and a signal of a poor safety culture (Gilkey, Lopez del Puerto, Rosecrance and Chen, 2013; Oakley, 2012). It has been reported that fear of being blamed for an accident was a persistent barrier for Latino workers (Roelofs, Sprague-Martinez, Brunette and Azaroff, 2011). If language and cultural barriers exist, effectiveness of communication degrades and accurate assessment of hazards is reduced. Understanding the complex nature of the highly dynamic construction worksite is essential to ensure safety. Experts have reported that a series of 10 to 14 cause-and-effect relationships queue up for the event to occur (Latino & Latino, 2006). Blaming workers for their injury is shortsighted and counterproductive to the development of a positive safety culture and a lost opportunity to identify the real underlying causes for human error and adverse outcomes (Latino & Latino, 2006).

When asked about reporting of near misses, no significant differences were seen between Latino populations. The willingness to warn coworkers of hazards was consistently higher among Puerto Rico Latinos in both data sets (p-values 0.02 and 0.04). Latino workers from Puerto Rico were less concerned about being observed by coworkers and having work practices recorded, mean score 3.1 (p-value 0.01), compared to the Colorado group 3.7. When asked about following the safety rules there was no significant difference seen between the Colorado Latino and Puerto Rico groups, 4.3 vs. 4.3 (p-value 0.18). Analysis of both data sets revealed that Puerto Rican construction workers have great concern about immigrant workers. Their mean scores were significantly higher when asked if immigrant workers are more likely to be hurt and pose a risk to all workers, mean scores 3.9 and 4.4 respectively; whereas, the Latino Colorado construction workers had a mean score of 2.8 and 2.2 (p-values <0.01 and <0.01) respectively. These study results may suggest that culturally similar groups hold some level of support for each other and concern about outsiders but less so in the U.S. than in Puerto Rico.

Flynn (2014) reported that language differences between coworkers and supervisors was an impediment to effective safety training and communication that jeopardizes safe work practices on the jobsites and was a common challenge reported among increasingly frequent multi-cultural workplaces. He went on to say that the ability to speak a language does not mean that individuals have effective interpersonal and social interaction skills or technical knowledge to maintain safety in the workplace (Flynn, 2014). Our study reduced the effect of language differences

because of the primary Spanish fluency in both groups and leads us to believe that cultural differences are real and significant factors.

The influence of culture is not well understood yet recognized by prior investigators (Center For Construction Research and Training (CPWR), 2014; Flynn, 2014; Gilkey, Lopez del Puerto, Rosecrance and Chen, 2013; Lavy, Aggarwal and Porwal, 2010; Schwatka, Hecker and Goldenhar, 2016). We do not clearly understand the effect of culture on immigrant worker adaption to US construction worksites, regulations, standards, and best practices. Differing cultural backgrounds may impair hazard perception, risk estimation and judgement through lack of familiarity with new expectations for safe work practices compared to prior experience in their native country, lower education attainment, misunderstanding of safety rules, altered relationships with coworkers and supervisors that impair effective communication and overall misfit between the individual's culture and the organizational culture (Flynn, 2014; Schwatka, Hecker and Goldenhar, 2016).

Conclusion and Limitations

The study results support the notion that differences exist between cultures and groups from different locations. This study was designed to investigate a large Latino population of construction workers in Colorado and compare safety climate and risk perception scores with those of Latino workers in Puerto Rico. Both groups are classified as minorities and Latino but come from different cultures and locations. Both groups may have different base-level expectations and thus be less homogeneous and explain some of the differences.

There are several factors that may contribute to the observed differences. Among those are the relationship between the United States and Puerto Rico. As a U.S. territory, Puerto Rico is covered by the same federal laws as the mainland, including labor laws. This means that the labor force in Puerto Rico is very familiar with Occupational Safety and Health Administration regulations and related standards for the construction industry. Another factor is the exposure that the Puerto Rican labor force has to the English language which may result in a better understanding of applicable OSHA standards. Expectations and conditions may also vary between groups and explain part of the difference.

This study may have selection bias, the study subjects were not selected randomly but rather by convenience through companies with relationships to their respective university. This may have a differential bias toward the null in that they may represent a better company with higher climate and culture toward safety compared to the broader industry. The surveys were self-reported responses and may not have been completed with integrity or accuracy of memory. Investigators selected the more powerful parametric tests to use on Likert-scale derived data and treated results as interval values for the analysis. A number of investigators have concluded that the more powerful tool is appropriate and preferred to the nonparametric counterpart (Carifio and Perla, 2008; Jamieson, 2004; Pell, 2004).

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