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The Influence of National Culture on Effectiveness of Safety Trainings During Postdisaster Reconstruction

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ABSTRACT

Non-English speaking workers constitute a disproportionately high number of workers involved in postdisaster reconstruction. Additionally, the rate of fatality among these workers is higher than the industry average. Research shows this population is more prone to unsafe behaviors in the working environment, conceivably because many of these workers are sent into the field prior to any formalized training. Recent studies show that the native culture of construction workers can impact risk-taking behavior. While numerous researchers have attempted to develop training materials for Hispanic workers, the number of studies that consider the impact of native culture on safety behavior is minimal. To answer this emerging knowledge gap, this paper develops a framework that will help to discern the influence of native culture, as well as other socioeconomic characteristics, on the effectiveness of safety trainings for non-English speaking workers. The formulation of this framework will pave the way for an enhanced understanding of the impact native culture plays on unsafe behaviors within a diverse workforce. Foreseeably, this understanding will play a significant role in developing culturally sensitive training materials in the future.

1. INTRODUCTION

Natural disasters such as hurricanes and floods cause severe damage and demand infrastructural recovery. However, working in an environment after a natural disaster often exposes workers to dangerous chemical-biological materials, contaminated floodwater, downed energized power lines, confined space entry, or other high-risk situations (Grosskopf, 2007). As a result, workers involved in cleaning and reconstruction operations after a disaster are at a higher risk of severe illness or injury. Thus, the occupational health and safety of workers involved in recovery after disasters should be a part of any disaster management plan.

A disproportionately high number of workers involved in postdisaster reconstruction are non-English speaking—and specifically Hispanic—workers (Gorman, 2010). As a group, recent immigrant construction workers have lower rates of health insurance coverage, unionization, hourly wages, and educational levels (Jorgensen, Sokas, Nickels, Gao, & Gittleman, 2007). They have fewer years of construction experience and are concentrated in lower-skilled and more hazardous occupations, such as helpers, laborers, and roofers (Jorgensen et al., 2007). As a result of this reality, the rate of fatality among these workers is higher than the industry average. For example, after examining Bureau of Labor Statistics reports, Richardson (2004) found that while Hispanic workers made up 34% of construction workers employed, they accounted for 41% of fatalities. When such fatalities were examined at a diagnostic level, it became evident that this population of workers often exhibit unsafe behaviors characteristic of being uninformed of potential hazards. Upon further examination, it became apparent that many of these workers are sent into the field prior to any formalized training (Grosskopf, 2007; O'Connor, Loomis, Runyan, dal Santo, & Schulman, 2005).

While it is important to provide safety training for Hispanic workers, there are several communication and cultural barriers. For example, Evia (2011) found that the general translation of English-language materials is not enough for teaching workplace safety to Hispanic construction workers and that the safety course content should address the audience's cultural and professional needs and preferences. Currently, training materials are developed without considering the effect of cultural diversity on their effectiveness.

To address this knowledge gap, the current study develops a framework to measure the impact of native culture on the effectiveness of safety trainings. Since raising awareness of hazards and the ways to identify them is a valuable consideration for all workers, particularly targeting this underinformed population—specifically, recently immigrated workers—can help raise the general responsiveness towards hazards for the entire postdisaster construction team. It is expected that the results of the study will lay the foundation for developing culturally responsive training materials that will enhance Hispanic workers'

preparedness to react to a hazard and function safely in postdisaster recovery operations.

2. BACKGROUND

A thorough literature review was conducted on the topics of hazards in postdisaster recovery and Hispanic workers safety to identify potential variables that may impact the effectiveness of safety trainings. The literature that provides context for the present study and served as the basis for developing the framework is summarized below.

2.1. Common Hazards in Postdisaster Recovery

After any disaster (e.g., flood), various pieces of equipment for cleaning and reconstruction activities will be brought in for recovery (Esworthy, Schierow, Copeland, Luther, & Ramseur, 2005). These pieces of equipment can be a source of hazard to workers, especially those who have not received proper training. For example, workers on aerial lifts can fall or get caught in/between overhead objects; boomed vehicles can contact overhead power lines; rigging failures in lifting operations can cause struck-by accidents; portable generators can cause electrocution due to improper use or lack of round-fault circuit interrupters (GFCIs), cause fires from improperly refuelling or storing fuel, and cause suffocation due to carbon monoxide from engine exhaust (Esworthy et al., 2005; Institute of Inspection Cleaning and Restoration Certification, 2006; Grosskopf, 2007; U.S. Centers for Disease Control and Prevention [CDC], 2009b; U.S. Environmental Protection Agency [EPA], 2009). To avoid these accidents, workers should receive proper training that prepares them to identify hazards in their surrounding environment and take precautionary measures (Grosskopf, 2007).

One of the major differences between safety challenges in postdisaster recovery and ordinary construction projects is related to the unknown chemical-biological hazards (Esworthy et al., 2005). For example, floodwaters can be contaminated by sewage, agriculture or industrial chemicals, hazardous agents from waste sites, infectious organisms, and intestinal bacteria, such as E. coli, salmonella, shigella, hepatitis A, or typhoid. In addition, there is a high risk of entering confined or poorly ventilated areas that may have been exposed to hydrogen sulfide (Federal Emergency Management Agency [FEMA], 2005; U.S. National Institute for Occupational Safety and Health [NIOSH], 2008; CDC, 2009; EPA 2009). This gas is colorless, flammable, and extremely hazardous. Another colorless, odourless, and toxic gas that can cause serious episodes in recovery-after-disaster operations is carbon monoxide. Many workers die because of using gasoline-powered equipment in spaces without adequate ventilation. Furthermore, repair, renovation, and demolition operations of hurricane- or flood-damaged buildings can expose workers to hazardous materials, such as asbestos and lead (Esworthy et al., 2005).

To avoid incidents and infections related to chemical-biological hazards, workers should have good personal hygiene and wear proper protective equipment, such as gloves, goggles, chemical-resistant outer clothing, boots, or other protective clothing. In addition, they should avoid entering confined or poorly ventilated areas without permission and should never use gasoline-powered equipment indoors (FEMA, 2005; Grosskopf, 2007; NIOSH 2008).

2.2. Hispanic Workers Safety

Immigrants compose an increasing percentage of the U.S. construction labor force. As of March 2006, almost 24% of all construction workers in the country were foreign born (U.S. Census Bureau, 2006). Most immigrant construction workers are Hispanic, and many U.S.-born Hispanics also work in construction. While the increase in Hispanic workers helped the construction industry to meet its workforce demand, safety performance suffered in certain occupations (Goodrum & Dai, 2005). Of the 3,609 Hispanic workers who died between 2004 and 2006, 34% worked in the construction industry (CDC, 2009a) and full-time Hispanic workers experienced consistently higher rates of fatality than the full-time non-Hispanic workers (Center for Construction Research and Training [CPWR], 2008).

One of the factors that contribute to a higher number of injuries among Hispanic workers is communication. According to the Center for Construction Research and Training, 42% of foreign-born Hispanic workers cannot speak English very well (CPWR, 2008; Gonzales, 2008), making spoken-English trainings ineffective. Another problem is the literacy levels of recently arrived foreign-born Hispanic workers: a significant portion of these workers are illiterate even in their own language—rendering written manuals less successful. There is ample evidence that the typical training in a host country may not be effective in training workers from another country and culture (Albert, 1996; Grieshop, Stiles, & Villanueva, 1996; Nixon & Dawson, 2002; Taylor, Serrano, Anderson, & Kendall, 2000). Furthermore, there are multiple variations in Spanish-language patterns across Hispanic/Latino construction workers' varied ethnic and cultural backgrounds. Therefore, developing training materials that can effectively communicate safety requirements to Hispanic workers is rewarding.

3. FRAMEWORK

The objective of this study is to develop a framework to measure the impact of national culture on the

effectiveness of safety trainings. The framework includes dependent variables, which are metrics used to measure safety performance, and independent variables, which are the inherent characteristics of a group of workers who are going to be trained, such as demographic information and cultural background. A schematic view of the framework is shown in Figure 1.

The framework involves five major tasks. First, one should measure demographic information and the native-culture dimensions of the workers who are going to participate in the training session. In the second task, workers' hazard-identification skills, risk perception, safety climate, and situation awareness should be measured. These dependent variables are indicators of the safety performance of workers before they receive any safety training. Third, workers should participate in a safety training program designed to bridge the communication and cultural barriers. Fourth, after each safety training session, safety performance should be measured. Finally, new safety performance indicators should be compared with the values obtained from the second task. These values will determine the most effective safety training programs for workers with similar demographic and native culture dimensions.

4. INDEPENDENT VARIABLES

It is important to determine whether a safety training program is effective for a group of workers with diverse cultural backgrounds. To achieve this goal, one needs to document demographic information and measure cultural dimensions of workers. These factors, which are considered independent variables, are explained in more detail in the following subsections.

4.1. Demographic Information

One of the factors that may affect attitudes towards safety and risk-taking behavior is the demographic background of construction workers, such as age, gender, ethnicity, years of experience, education level, safety training received, potential language barriers, and marital status. Safety training materials should be designed in a way that considers these differences.

4.2. National Culture

One of the factors that may affect the effectiveness of safety training programs is the native national culture of construction workers. According to Hofstede (1986), national culture has four dimensions: (1) power distance, (2) individualism versus collectivism, (3) uncertainty avoidance, and (4) masculinity versus femininity. Hofstede measured the value of cultural dimensions for different nations. Several studies found a relationship between Hofstede's cultural dimensions and different aspects of life and business (Horii, Jin, & Levitt, 2005). In the construction-safety domain in particular, native national culture can influence safety work behaviors of construction workers (Mohamed, Ali, & Tanm, 2009). To establish the national cultural trends of workers, different statements can be made to ask

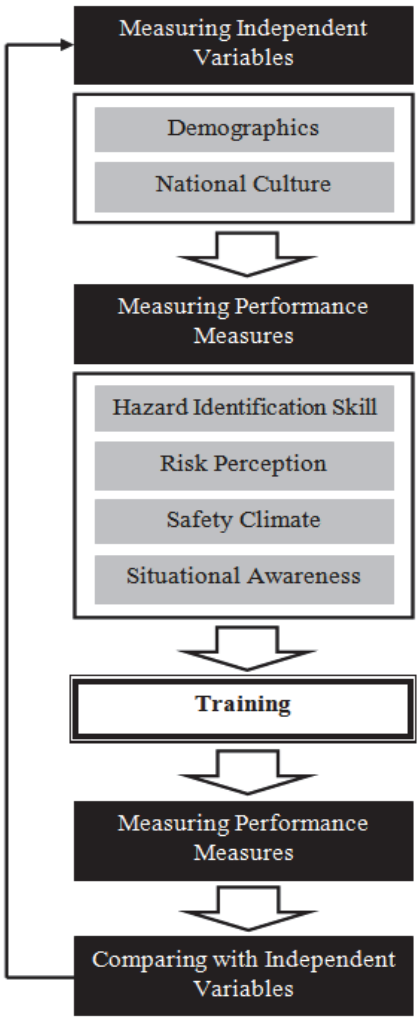

Figure 1. Process of measuring effectiveness of safety training

workers to express their level of agreement on a five-point Likert scale. For example, the following statement may be an indicator of power distance: "I am always willing to raise any safety concerns with my supervisor."

5. DEPENDENT VARIABLES (PERFORMANCE MEASURES)

Four variables should be used to measure impact of a safety training program: (1) hazard-identification skills, (2) risk perception, (3) safety climate, and (4) situation awareness. These variables are described in more detail in the following paragraphs.

5.1. Hazard Identification Skills

One of the main causes of accidents is poor hazard identification by supervisors and employees (Holt &

Lampl, 2006). Working in an environment with latent hazards drastically increases the risk of an incident (Laurence, 2005); 42% of accidents are attributed to inadequate hazard identification (Haslam et al., 2005). Such poor safety performance stems from the fact that most of the established hazard-identification techniques rely on human judgment. Since the construction job site is a complex environment with a large number of activities, workers often fail to identify a nearby hazardous situation or assess its significance. For this reason, training workers and supervisors to be able to identify hazards has the potential to be exceptionally valuable in postdisaster recovery operations. Enhancing hazard identification skills should be the primary mission of any safety-training program.

5.2. Risk Perception

Risk perception is the process by which humans perceive and react to hazards (Mearns & Flin, 1995). There is a strong relationship between risk perception and the unsafe behaviors of construction workers (Fischhoff, Bostrom, & Quadrel, 1993). For example, a worker may be aware of a hazard around him, but behave unsafely because of an inaccurate perception of risk. An effective safety-training program should increase the safety perception of workers towards potential hazards after a disaster. Risk perception can be measured using various measures; for example, the following statement may be an indicator of risk perception towards fall risk: "I find that working with scaffolds that are not totally boarded is hazardous."

5.3. Safety Climate

Some researchers have attempted to relate safety outcomes (e.g., injury rates) to the factors that affect safe performance (e.g., safety practices). A common independent variable used to forecast safety performance or safe behavior during construction is safety climate. Safety climate is considered as a subset of organizational climate and can be defined as the "moral perceptions" that workers share about the importance of safety (Zohar, 1980). Researchers have attempted to find empirical evidence of relationships between safety climate and safety performance, such as frequency and severity of accidents. In a seminal study, Zohar (1980) successfully predicted a safety program's effectiveness as judged by safety inspectors in industrial organizations by using safety climate dimensions. Well-designed safety training should establish a strong safety climate among workers. There are several questionnaires to measure safety climate.

5.4. Situation Awareness

While one of the main causes of construction accidents is workers' unsafe behaviors, the majority of accidents involving human error can be attributed to situation awareness. Situation awareness is the appreciation of proximate activities and risks, especially in terms of assessing location, responding to expectations, and identifying threats to one's health and safety (Endsley, 1995). In fact, by evaluating situation awareness, one can assess an employee's capacity to respond to a hazard and function safely at work. An effective training program should enhance situation awareness of workers in postdisaster recovery.

6. CONCLUSIONS

Disasters are becoming a major threat to the whole world (Department for International Development [DFID], 2006), so developing a resilient community capable of recovering from disasters is a rising priority in many societies. Toward this end, the training of postdisaster recovery teams becomes an increasingly important consideration within reconstruction preparedness.

Immigrants compose an increasing percentage of the recovery-after-disaster labor force. Most immigrant construction workers in the United States are Hispanic, and many U.S.-born Hispanics also work in construction. Hispanic construction workers are typically young, lack English-speaking abilities, are not highly educated, and work in low-skill and high-risk occupations (CPWR, 2008; Jorgensen et al., 2007; Dong & Platner, 2004; Kouyoumdijan, Zamboanga, & Hansen, 2003; Anderson, Hunting, & Welch, 2000). These factors have made Hispanic workers more vulnerable when they are employed in postdisaster recovery operations.

Reviewing lessons learned about managing the safety and health of workers who were involved in the disaster response, recovery, and cleanup after the 2001 World Trade Center collapse indicated that pre-event and "just-in-time" disaster-worker training can dramatically enhance the health and safety of workers involved in these operations (Reissman & Howard, 2008). While it has been shown that developing training materials can enhance safety performance, there are several cultural and language barriers that need to be bridged to reach immigrant construction workers.

We propose that the developed framework can be used to measure the effectiveness of various training materials against the considerations of cultural background in the future. The framework has several practical implications to enhance the safety and health of workers after a disaster. First, based on the variables incorporated into the framework, theories

could be developed to explain the impact of native culture and organizational factors on acceptance of different safety-training programs. This information could lead to creating more effective injury-prevention strategies for a multicultural workforce. Second, the results of this framework could shed light on the importance of creating active-learning experiences that embrace state-of-the-art technologies. For example, virtual reality environments and 3-D models informed by the data garnered in this research could provide a more effective training experience for non-English speaking workers involved in postdisaster activities. In fact, these new technologies could foreseeably bridge the cultural and language barriers between workers in a hazardous environment. Furthermore, understanding the impact of cultural differences on workers' safety performance can play a significant role in reducing the number of injuries and fatalities in postdisaster reconstruction projects because this knowledge may help managers formulate culturally sensitive training programs that will reach a diverse workforce.

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