THE EFFECTS OF PERCEIVED ORGANIZATIONAL SUPPORT ON TRAINING AND SAFETY IN LATINO AND NON-LATINO CONSTRUCTION WORKERS

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ABSTRACT

Workplace safety, if not managed appropriately, can result in human and economic tolls. The need to establish and maintain a safe working environment has probably never been more important. Despite a mounting emphasis on safe work practices, the Bureau of Labor Statistics (BLS) reported a total of 5,702 fatalities in the United States in 2005. Among these fatalities, Latino workers, defined as both foreign-born and native-born (U.S.-born) workers of Latino ethnicity (BLS, 2006; Dong and Platner, 2004), accounted for 16% of those fatalities (BLS, 2006).

Researchers are increasingly acknowledging that organizational factors are important in workplace safety (Hofmann, Jacobs, and Landy, 1995; Hurst, Bellamy, Geyer, and Ashley, 1991). However, there is a lack of cross-cultural comparison in this area. With the continuing increase in Latino construction workers and the level of injuries and fatalities, little attention has focused on the comparison of employment relationships between Latino and non-Latino construction workers and their supervisors and work environment. Therefore, this research endeavor used social exchange theory to examine the role of organizational factors in small construction firms to help explain why Latino workers have a disproportionate number of construction casualties compared to their non-Latino counterparts and to design a safety training program to help reduce the number of injuries, accidents, and fatalities in the workplace.

The results of this is research endeavor demonstrated that both Latino and non-Latino and Latino groups had relatively equal perceptions of organizational support and distributive justice implying that Latinos and Latinos have identical support needs or that the construction firms' practices meet the support the workers need regardless of ethnicity. In addition, the study found ethnic group differences for safety climate, safety behavior, and cultural dimensions, which may contribute to the disproportionate number of fatalities for Latino workers.

After uncovering group differences, this study tested the affect of training on perceived organizational support, distributive justice, safety climate, and safety behavior. This research demonstrated that providing training, of any type, as a source of perceived organizational support increases workers' perception of organizational support. Additionally, the study concluded that embedded sources of perceived organizational support in the training program increase workers' perceptions of distributive justice and safety climate. As a result, guidelines to improve workers' perception of organizational support and safety climate were created. Since high perceptions of safety climate are linked to less risky safety behaviors, embedding perceived organizational support into training programs can have an indirect affect on the workers' safety behavior. For that reason, improving the safety behavior of workers and the workers' perception of a safe work environment can lead to reduced accidents, injuries, and fatalities in the construction industry.

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DEDICATION

I would like to dedicate this dissertation to my parents, the family members I have loss during my journey to completing my Ph.D., and to those who lost their lives on April, 16, 2007 on Virginia Tech's campus.

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CHAPTER 1. INTRODUCTION

1.1. Workplace Safety

Workplace safety, if not managed appropriately, can result in human and economic tolls. The issue of workplace safety has become extremely important in an era of escalating health care costs and an increasingly litigious response to on-the-job accidents and fatalities. The need to establish and maintain a safe working environment has probably never been more important. Despite a mounting emphasis on safe work practices, the Bureau of Labor Statistics (BLS) reported a total of 5,702 fatalities in the United States in 2005. Among these fatalities, Latino workers, defined as both foreign-born and native-born (U.S.-born) workers of Latino ethnicity (BLS, 2006; Dong and Platner, 2004), accounted for 16% of those fatalities (BLS, 2006). Latino workers accounted for the highest number of workplace fatalities among all racial and ethnic groups. Among Latino workers, foreign-born Latinos account for a higher proportion of workplace fatalities than native-born Latinos. As shown in figure 1, in 2005, 917 Latino workers had fatal work injuries, and 625 of the Latino workers were foreign-born Latino workers (BLS, 2007).

In the construction industry, Latinos accounted for a disproportionate number of workplace fatalities compared to their overall representation in the industry—13.8% of the fatalities compared to 10.7% of the employment workforce (Henshaw, 2002). As shown in Figure 2, for year 2001 the rate of work-related deaths for Latinos from construction-related injuries was 19.5 deaths per 100,000 full-time workers, 62.5% higher than their non-Latino counterparts (12 deaths per 100,000 full-time workers)(BLS 2002; Dong et al., 2004).

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Number of fatal work injuries involving Hispanic or Latino workers, 1992-2005

Number of fatalities

Year	Foreign-born	Native-born	Total
1992	275	258	533
1993	320	314	634
1994	336	288	624
1995	342	277	619
1996	371	267	638
1997	379	279	658
1998	405	302	707
1999	468	262	730
2000	494	321	815
2001	572	323	895
2002	578	263	841
2003	519	275	794
2004	596	306	902
2005	625	292	917

☐ Foreign-born   ■ Native-born

Fatal work injuries involving Hispanic or Latino workers were at a series high in 2005. The majority of fatally-injured Hispanic or Latino workers were born outside of the United States.

Figure 1. Number of fatal work injuries involving Latino workers, 1992-2005 (adapted from BLS, 2007, with permission).

This relatively high percentage of fatalities for Latino workers is largely due to the fact that Latino workers are typically employed in more dangerous industries such as construction (BLS, 2005; Mosisa, 2002). In fact, Latinos involved in construction accounted for 20% (or 2.1 million) of the total employed population working in the U. S. construction industry (approximately 10.1 million) in 2003. The alarming number of fatalities among Latino construction workers has focused attention on the need to reduce the number of accidents, injuries, and fatalities incurred by this population and bring attention to how safety is managed in the workplace.
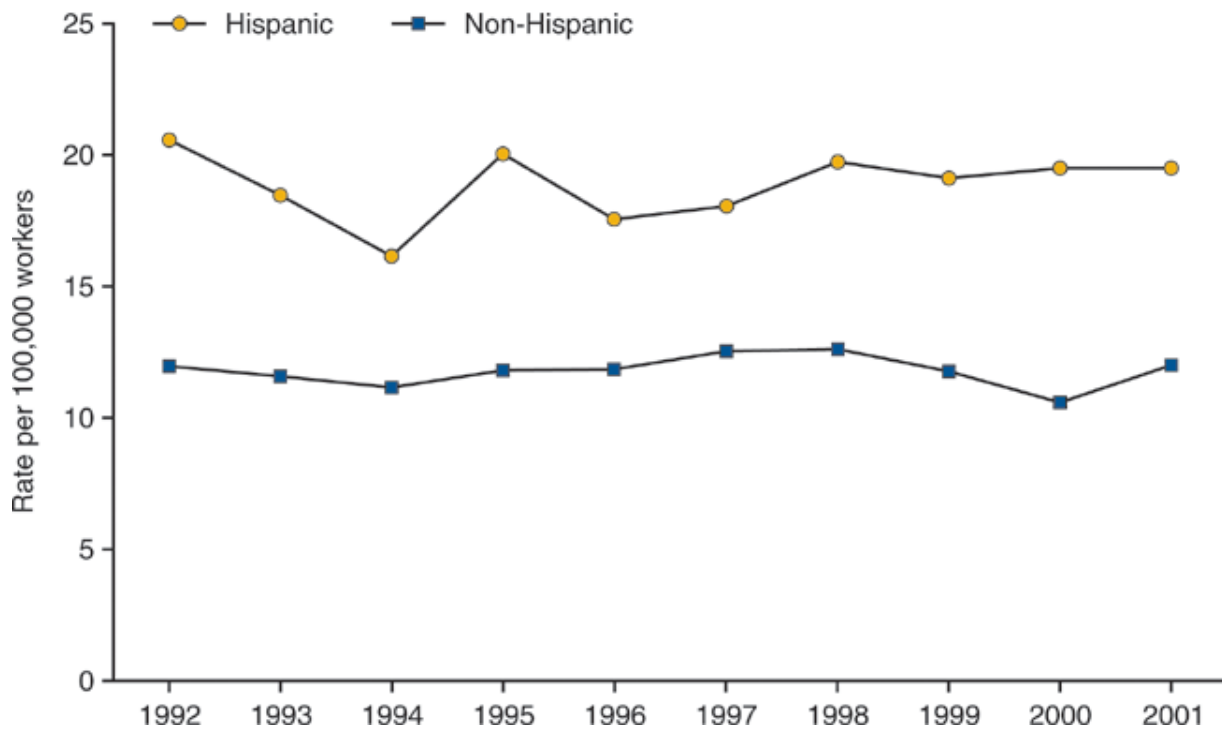
Figure 2. Fatal occupational injury rates among Hispanic and non-Hispanic workers in the construction industry from 1992–2001 (adapted from BLS, 2002, with permission).

1.1.1. Safety Management in the Construction Industry

The increase in accidents, injuries, and fatalities in the construction industry has brought more attention to conditions of workplace safety (Mohamed, 2000). The mission of Occupational Safety and Health Administration (OSHA) is to prevent work-related injuries, illnesses and deaths. Occupational Safety and Health Administration sets and enforces occupational health and safety regulations. Failure to comply with OSHA regulations can result in fines and penalties for organizations. Since OSHA was created in 1971, occupational deaths in the United States have declined by 50% and injuries by 40%. However, there are still a large number of occupational deaths

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annually. In 2005, a total of 5,702 fatalities were recorded in the United States (BLS, 2006).

With attention being focused on improving workplace safety conditions, some organizations have shifted from a reactive approach to being proactive (Crawley, 1999). Many construction firms are showing an increase in the concept of safety management as a proactive approach to reduce the number of accidents, injuries, and fatalities in the workplace (Weiek, Sutcliffe, and Obstfeld, 1999). Safety management assists managers in better performing their responsibilities for operational system design and implementation through predicting management systems deficiencies before errors occur or identifying and correcting management system deficiencies. Safety management also connects actual practices, roles, and functions associated with remaining safe (Kirwan, 1998). Therefore, the focus on accidents has been driven by the awareness that organizational, managerial, and culture, rather than technical failures alone, are primary causes of accidents (Weiek et al., 1999).

To further investigate the impact of organizational factors on reducing accidents in the workplace, social exchange theory was utilized as a framework to examine organizational factors impacting the safety of Latino and non-Latino construction workers. Given the multifaceted concerns (e.g., economic deprivation and scarcity, fairness in job assignment and salary, language barrier, higher rates for fatalities) of Latino construction, social exchange theory was selected because of its interdisciplinary roots in economics, psychology, and sociology (Blau, 1964).   In addition, this theory was used as a conceptual model for this study because researchers (e.g., Hofmann and Morgeson, 1999; Hofmann, Morgeson, and Gerras, 2003; Hofmann and Stetzer, 1996)

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have used social exchange theory to link organizational factors (e.g., perceived organizational support, distributive justice) to safety-related outcomes (e.g., safety communication, safety commitment, accidents).

Similar to past studies (Cooper and Phillip, 2004; Hofmann and Morgeson, 1999; Hofmann, Morgeson, and Gerras, 2003; Hofmann and Stetzer, 1996; Wayne, Boomer, and Tetrick, 2002) employing social exchange theory, this study examined the effect of social exchange, a general principle that states that in all social relationships the partners give and expect something in return, on safety. Social exchange theory suggests that when one party acts in a way that benefits another party, obligation for future reciprocity is created, resulting in behaviors designed to benefit the initiating party (Goulder, 1960; Settoon, Bennett, and Liden, 1996). For this study, safety training was used as a medium of "exchange" between the supervisors and workers in small construction firms. Zohar (1980) argued that management actions (e.g., safety training, safety meetings, considering safety in job design) influence employee perceptions regarding the safety climate of the organization. For this study, safety climate was defined as the workers' perception of safety in their work setting (Dedobbeleer and Beland, 1991). From a social exchange perspective, these safety-related actions signal an implied obligation for workers to act in a safe manner (Hofmann, 1996; Hofmann and Morgerson, 1999). Several authors (Cooper and Phillip, 2004; Hofmann, Morgeson, and Gerras, 2003; Wayne, Boomer, and Tetrick, 2002) concluded that social exchange in the workplace can improve a worker's perceived organizational support and distributive justice, which can lead to increased safety climate and improved safety behavior in the workplace. It is plausible that this study used social exchange theory to

examine the role of perceived organizational support in small construction firms to help explain why Latino workers have a disproportionate number of construction casualties compared to their non-Latino counterparts. Social exchange theory was also used to design a training program embedded with sources of perceived organizational support to improve the safety climate and safety behavior of Latino and non-Latino workers in small construction firms. Sequentially, understanding safety-related differences between Latino and non-Latino workers and increasing their perception of safety climate and improving their safety behavior will lead to fewer accidents, injuries, and fatalities in the workplace.

1.1.2. Overview of the Construction Industry

In 2005, construction was considered the largest industry in the United States (BLS, 2006). This diverse industry is associated with the fabrication of houses, apartments, factories, offices, schools, roads, and bridges. In addition to the manufacture of new structures, this industry also addresses alterations and repairs to existing structures. Because of the diverse types of construction projects and the expertise needed complete these projects; this industry is divided into three major areas: building construction contractors, heavy and civil engineering construction, and specialty trade contractors (BLS, 2006). Building construction contractors, also called general contractors, build residential, industrial, and commercial buildings. Heavy and civil engineering contractors, also called highway contractors, build sewers, roads, highways, bridges, and tunnels. Finally, the specialty trade contractors, upon which this study was focused, work in specialized areas such as carpentry, electrical work, masonry, painting, and plumbing.

1.1.3. Specialty Trade Contractors

In 2005, the construction industry was comprised of 7.0 million wage and salary workers and 1.9 million self-employed or unpaid family nongovernmental workers (BLS, 2006). Two-thirds of the wage and salary jobs were specialty trade contractors and self-employed or unpaid family nongovernmental workers in the following occupations: carpet layers, painters, managers, carpenters, bricklayers, and masons. At that time, the construction industry listed approximately 818,000 construction companies, of which 247,000 were general contractors; 57,000 were highway contractors; and 514,000 were specialty trade contractors. Most of these businesses tended to be small, with the majority employing fewer than 20 workers (Figure 3).

In general, over 60% of the workers in the U.S. construction industry are specialty trade contractors, most of whom are self-employed (BLS, 2006). Generally, these specialty trade contractors are skilled craft workers who started in the industry as unskilled laborers. Specialty trade contractors typically focus on only one trade, such as painting, masonry, carpentry, or electrical work, or on two or more closely related trades, such as plumbing and heating.

Chart 1. **Nine-tenths of establishments in construction employ fewer than 20 workers.**

Figure 3. Construction firms employing fewer than 20 workers (adapted from BLS, 2006, with permission).

Specialty trade contractors are typically hired by general contractors to complete specific jobs related to their area of expertise. Their construction projects are usually coordinated by the general contractor who specializes in either residential or commercial. Because these specialty trade contractors are subcontractors on projects, general contractors are responsible for the project as a whole. Typically, the general contractor is responsible for the completion of the project, although they routinely subcontract some of the work to other contractors, such as specialty trade contractors. The specialty trade contractors are only responsible for the trade work they complete (BLS, 2006).

1.1.4. Laborers

The majority of specialty trade contractors hire laborers to help complete jobs. Laborers are a subset of construction workers who are typically less skilled construction workers because they do not require a substantial knowledge of construction for hiring; these individuals can enter the industry without a high school diploma or any formal classroom education after high school (BLS, 2006). They develop their skills while they work by apprenticing with an experienced craft worker to acquire the basic skills of a particular craft. As a result of the lack of an education requirement for hiring laborers in the construction industry, many Latino individuals find work in these trades. Latino construction workers enter the construction field by being hired as laborers. Twenty-one percent of Latino construction workers are employed as laborers, whereas 14% and 13% are employed as carpenters and 13% as painters, respectively (Brunette, 2005; Center to Protect Workers' Rights, 2002b).

1.2. Problem Statement

According to the U.S. Census Bureau (2005), it is projected that by the year 2050, one in four workers in the American workforce will be Latino, making the Latino population the fastest growing group in the American workforce. This growth has already been observed in the construction industry, which follows agriculture as the industry with the second highest proportion of Latino workers (Vázquez and Stalnaker, 2004). In the United States, about 21% of the construction industry is represented by Latino "foreign workers" (BLS, 2005), whereas, researchers define "foreign workers" as workers who have no permanent residential status in the host country and who seek employment in another country without sponsorship from any firm in their home nations

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(Alarcon, 1999; West and Bogumil, 2000). Due to the ease of entry, relatively high

wages, a limited need for English literacy for hiring, and the availability of construction

jobs, many of the smaller construction firms in this country attract a great number of

Latino workers (Brunette, 2005; Vázquez and Stalnaker, 2004). However, as the

number of Latinos working in construction has increased, the fatality rate has escalated

disproportionately. Latinos account for the highest number of workplace fatalities among

all racial and ethnic groups.

To reduce the number of accidents, injuries, and fatalities in the workplace,

safety should be a top priority. Although the issue of workplace safety has historically

been viewed as more of an engineering problem, several researchers (Hofmann,

Jacobs, and Landy, 1995; Hurst, Bellamy, Geyer, and Ashley, 1991) have increasingly

acknowledged that organizational factors have also played an important role in

workplace safety. Studies have been conducted that examine factors such as group

processes, communication, organizational structure, decision making, leadership, and

degree to which management values workers (Hofmann and Morgeson, 1999).

However, little attention has been centered on either safety or the influence of group

processes and intergroup relation theories, including social exchange theory.

1.3. Purpose

To successfully reduce the number of accidents and injuries in construction,

research has suggested that organizational factors are positively correlated with safety

in the workplace. Therefore, the primary purposes of this research were to: 1) utilize the

social exchange theory to examine the role of perceived organizational support and

distributive justice in small construction firms to help explain why Latino workers have a

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disproportionate number of construction casualties compared to their non-Latino counterparts and, 2) design a training program embedded with sources of perceived organizational support to improve the perception of safety climate and safety behavior of Latino and non-Latino workers in small construction firms.

For the purposes of this study, the term "social exchange" refers to a general principle underlying most human behavior, namely that in all social relationships the partners give and expect something – either concrete or abstract – in return for what each has given (Gouldner, 1960). For example, in the workplace, managers provide workers safety-related actions such as safety meetings and safety training to convey an implied obligation for workers to act in a safe manner (Hofmann, 1996; Hofmann and Morgerson, 1999). For this study, safety training was used as a medium of "exchange" between the supervisors and workers in small construction firms. In the workplace setting, social exchange has been associated with (1) perceived organizational support (a worker's beliefs concerning the extent to which the organization values his or her contributions and well-being) (Eisenberger, Huntington, Hutchison, and Sowa, 1986) and (2) distributive justice (a worker's assessment of fairness of rewards received in exchange for contributions at work) (Greenberg, 1990). The concept of social exchange is described in greater detail in Section 2.5. Also, it should be noted that for the purpose of this study, "Latino" workers refers to both foreign born and U.S. born workers of Latino ethnicity (BLS, 2005; Dong and Platner, 2004).

Given the unique environment and culture of small construction firms, the culture and background of Latino construction workers could be factors that impact the safety of construction environment. Indeed, a richer understanding of the interactions between

culture and the work environment could ultimately lead to a more secure and efficient workplace. Therefore, a macroergonomic approach was applied to the research and engineering design recommendations. The macroergonomic approach made certain the internal environment (technology, organizational factors, physical environment, and individual factors), the external environment (social, economic, and cultural background), and the interactions of the two environments were examined throughout this research endeavor. Specifically, utilizing a macroergonomic approach ensured that the research was conducted to better understand the interaction of the entire sociotechnical system, personnel, technology, and work system, while the results of the research were considered in the context of the entire sociotechnical system.

There were four specific objectives associated with this study:

1) To examine the relationship between social exchange variables (perceived organizational support and distributive justice) and perceived safety climate of Latino and non-Latino workers;

2) To examine the relationship between perceived safety climate and safety behavior of Latino and non-Latino workers;

3) To explore the differences in perceived organizational support, distributive justice, perceived safety climate, and safety behavior between Latino and non-Latino workers;

4) To examine the effect of safety training programs with embedded sources of organizational support on safety behavior in the workplace.

To accomplish these objectives, the study used safety training as a type of "exchange" between supervisors and workers to determine if training workers made

them feel as if they had been given something in return for their work—thereby improving the workers' perceived organizational support and distributive justice, which was expected to result in increased perceived safety climate and safety behavior. This is the first known study to investigate the affect of training as an "exchange" in the workplace as it relates to social exchange constructs (perceived organizational support and distributive justice), safety climate, and safety behavior. However, several authors (Cooper and Phillip, 2004; Hofmann, 1996; Hofmann and Morgerson, 1999; Hofmann, Morgeson, and Gerras, 2003; Wayne, Boomer, and Tetrick, 2002; Wayne, Shore, and Liden, 1997) have cited training as a type of "exchange" between supervisors and workers.

1.4. Research Questions and Hypotheses

The research model (Figure 4) created by the researcher depicts the broad hypothesis that safety behavior is a consequence of existing safety climate, which can be enhanced through perceived organizational support and distributive justice (Lingard and Rowlison, 1998; Mohamed, 2000; Rowlinson, 1997; Sawacha, Naoum, Fong, 1999). This model included four components: constructs of social exchange, perceived safety climate, safety behavior, and safety training program. A description of each component is shown below:

1. Constructs of social exchange

    a. Perceived organizational support: a worker's belief concerning the extent to which the organization values his or her contributions and well being (Eisenberger et al., 1986).

b. Distributive justice: a worker's belief of the fairness of rewards received in exchange for contributions at work (Greenberg, 1990).

2. Perceived safety climate: a worker's belief about safety in their work setting (Dedobbeleer and Beland, 1991).

3. Safety behavior: a worker's rating of potential hazards in the workplace (Mearns, Whitaker, and Flin, 2003).

4. Safety training program: Medium of "exchange" (Cooper and Phillip, 2004; Hofmann, 1996; Hofmann and Morgerson, 1999; Hofmann et al., 2003; Wayne et al., 2002; Wayne et al., 1997) between the supervisors and workers in small construction firms.

The model in Figure 4 also displays the hypothesized effect of implementing safety training, namely, that a worker's perception of organizational support and distributive justice would increase perceptions of safety climate and reduce risky safety behaviors, which can result in less accidents, injuries, and fatalities in the workplace.

An organization's commitment to promoting safety is a central element of the safety climate in an organization (Zohar, 1980). As documented by Langford, Rowlison, and Sawacha (2000), employees believe that when management cares about their personal safety, they are more willing to cooperate to improve their safety behaviors. With this in mind, this dissertation utilized social exchange theory to explore factors influencing the safety of construction workers, especially the workplace safety of Latino workers. Specifically, this study explored the differences between Latino and non-Latino construction workers' perception of organizational support, distributive justice, safety climate, and safety behavior in small construction firms, and also examined if

safety training had an impact on the aforementioned variables. This research effort was designed to answer the following questions:

1. How do perceived organizational support, distributive justice, safety climate, and safety behavior differ between Latino and non-Latino workers?

2. What are the relationships between perceptions of organizational support, distributive justice, and safety climate for Latino and non-Latino construction workers?

3. What is the relationship between perceived safety climate and safety behavior for Latino and non-Latino construction workers?

4. How does safety training affect the perceptions of organizational support, distributive justice, safety climate, and safety behavior of Latino and non-Latino workers in small construction firms?
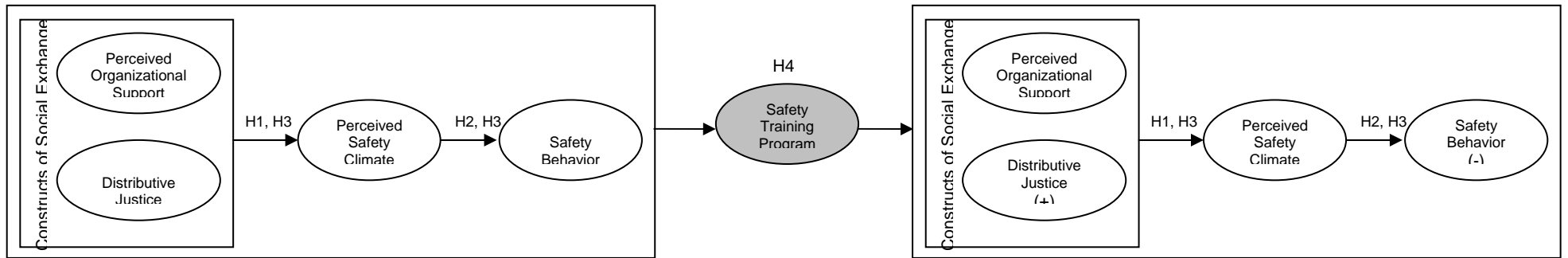
Figure 4. Research Model and Hypotheses.

To address Research Question One (*How do the perceived organizational support, distributive justice, safety climate, and safety behavior differ between Latino and non-Latino workers?*), four hypotheses were tested—one pertaining to each variable in the study: perceived organizational support, distributive justice, perceived safety climate, and safety behavior. For the variables associated with social exchange, it was hypothesized that the Latino workers would report lower scores for perceived organizational support and distributive justice compared to non-Latino workers. This hypothesis was based on the results of a study examining reciprocity differences between local and foreign workers in construction (Ang, Dyne, and Begley, 2003). This hypothesis was tested by collecting perceived organizational support and distributive justice data from the participants. It was expected that Latino workers would perceive less organizational support and distributive justice in the workplace.

For perceived safety climate, it was hypothesized that perceived safety climate would be rated lower by Latino workers compared to non-Latino workers. This hypothesis was tested by measuring the participants' perception about their workplace safety climate. It was expected that Latino workers would more likely have lower safety climate perceptions.

For safety behavior, it was hypothesized that the Latino workers would report higher scores compared to non-Latino workers. This hypothesis was tested by collecting safety behavior data from the participants. It was expected that Latino workers would be more likely to have riskier safety behaviors ratings than their non-Latino counterparts.

To address Research Question Two (*What are the relationships between the perceptions of organizational support, distributive justice, and safety climate for Latino and non-Latino construction workers?*), it was hypothesized that the two variables associated with social exchange (perceived organizational support and distributive justice) would be positively related to safety climate. This hypothesis was tested by collecting data from the participants about their perceptions of the stated social exchange variables and safety climate. Comparable to research findings examining social exchange and safety climate (Langford et al., 2000; Zohar, 1980), it was expected that individuals who indicated higher perceived organizational support and distributive justice judgments would be more likely to hold higher safety climate perceptions.

To address Research Question Three (*What is the relationship between the perceived safety climate and safety behavior for Latino and non-Latino construction workers?*), it was hypothesized that perceived safety climate would be negatively related to safety behavior. This hypothesis was tested by collecting data from the participants about their perceived safety climate and their safety behavior. It was expected that individuals who indicated higher perceived safety climate would be more likely to exhibit less risky behavior.

To address Research Question Four (*How does safety training affect the perceptions of organizational support, distributive justice, safety climate, and safety behavior of Latino and non-Latino workers in small construction firms?*), it was hypothesized that the perceptions of the study's experimental group (the group that received safety training with embedded sources of organizational support) with regard

to social exchange, safety climate, and safety behavior would improve as a result of training. This hypothesis was tested using a pretest-posttest control group design. This hypothesis was derived from the social exchange theory suggesting that when one party acts in a way that benefits another party, obligation for future reciprocity is created, resulting in behaviors designed to benefit the initiating party (Goulder, 1960; Settoon, Bennett, and Liden, 1996). From pretest to posttest, the experimental group's beliefs about social exchange, perceived safety climate, and safety behavior were expected to increase. As a corollary hypothesis, it was suggested that the perceptions of the control group (the group that received the control safety training) with regard to the stated social exchange variables, perceived safety climate, and safety behavior would not change from pretest to posttest. It was expected that implementing safety training with embedded sources of organizational support in the workplace would improve the Latino and non-Latino workers' perceptions of organizational support, distributive justice, and safety climate and improve their safety behavior.

1.5. Research Justification

This research focused on the Latino population because it is the largest minority group in the United States, and the Latino population has a disproportional high job accident and fatality rate when compared with other ethnic groups. Moreover, this population is expected to increase, primarily because of the number of undocumented Latino immigrants (U.S. Census Bureau, 2005) who enter this country in search of employment and better living conditions (Hanson, 2006). With the growth of the Latino population, it is likely that more Latinos will be seeking employment in the construction industry, resulting in a disproportionate rise in the number of accidents, injuries, and

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fatalities. As shown earlier in Figure 2, the expected increase in the number of injuries and fatalities among the Latino workforce provided ample justification for further research on ways to avert this undesirable trend.

Several factors (legal, cultural, and economic pressures) are likely associated with the higher fatality risk for Latino construction workers (Brunette, 2005). It is believed that one of the main reasons that this ethnic cohort is at higher risk is because Latino construction workers are typically hired to do the most dangerous jobs (BLS, 2006; Mosisa, 2002). Latino workers have not generally been informed about their rights to a safe workplace. Even if legally working in the U.S., Latino construction workers, depending on their country of birth, may not be comfortable demanding a safe jobsite as guaranteed by labor laws in this country. More importantly, undocumented workers would be extremely reluctant or even afraid to complain because of their illegal immigration status and strong economic and familial pressures to stay employed (Brunette, 2005). Undocumented workers tend to fear the threat of being fired or even worse, being deported back to their home countries.

Another factor that has negatively impacted the higher rate of accidental deaths among Latino workers is that Latino workers tend to receive little or no safety training. Even when safety training or safety information is provided, it is often delivered in English, not Spanish, so many of the Latino construction workers cannot understand the safety training (Goodrum and Dai, 2005; Nash, 2004; Vázquez and Stalnaker, 2004). When designing training programs for the Latino population, it is essential that they are culturally sensitive to the Latino population (Brunette, 2005). Understanding the cultural backgrounds of the Latino work force can contribute to the effective training programs

for Latino workers. Latino workers come from countries where there are few occupational safety and health regulations and limited enforcement by the government. These workers have little or no trust in governmental agencies' intentions to protect their rights. In addition, the general working conditions in Latin American countries have negatively influenced the safety awareness of Latino workers. Latino workers are accustomed to unsafe physical environments, little or no safety training, exposure to dangerous tools, equipment, and machines, and lack protective equipment (Brunette, 2005). Moreover, they may be unaware that safe working conditions are regulated by OSHA.

Although some progress has been achieved in making the construction industry a safer employment choice for all workers, specific attention should be given to the disproportional injury and fatality rate among Latino construction workers – especially given the expected rise in the number of Latino construction workers in this country, which as previously discussed puts them at greater risk for injury and death. Therefore, as a human factors engineering researcher, it is vital to develop strategies that will make the construction jobsite as safe as possible to reduce the high number of work-related accidents among this population.

Based on Alphonse Chapanis' (1917-2002) definition of human factors, the human factors discipline focuses on human beings and their interactions with the equipment, procedures, and environments of the workplace. More specifically, human factors engineering uses information about human behavior, abilities, capabilities, limitations, and other characteristics and applies that to the design of tools, machines,

systems, jobs, and environments for productive, safe, comfortable, and effective use (Sanders and McCormick 1993).

Macroergonomics, a sub-discipline of human factors, was chosen as the framework for this study because this research focused on how to improve the overall work environment in small construction firms. More specifically, the sociotechnical subsystems approach was employed because of the cultural diversity, socioeconomic status, and educational level of construction workers in small construction businesses, as well as the unique structure of these smaller firms.

In addition to the macroergonomic framework, this multidisciplinary research endeavor also incorporated social exchange theory, which is a critical theory of social psychology. Social exchange theory was selected because of its constructs of reciprocity and distributive justice and its relationships with safety climate. In construction, there exists a discrepancy—or lack of fair exchange—between Latino and non-Latino construction workers with respect to training, pay, and job responsibilities (Ang et al., 2003; March and Simon, 1958). For example, Ang et al. (2003) conducted a quantitative study in Singapore to examine the employment relationships of foreign workers versus local employees for organizational justice, job satisfaction, and performance. Their study determined that a lack of exchange in the workplace led to suboptimal performance among the foreign workers. Following the example of Ang et al. (2003), social exchange theory was used to develop a better understanding of the role of organizational factors, perceived organizational support, distributive justice beliefs, and perceived safety climate for both Latino and non-Latino construction workers. This theory was also used to predict differences between Latino and non-

Latino construction workers, helping to explain why Latinos tend to have a

disproportionate number of accidents, injuries, and fatalities in the construction

workplace.

1.6. Document Overview

The remainder of this dissertation includes a review of the literature (Chapter 2)

and the methodology, results, and discussion sections for three phases of this research

study (Chapters 3, 4, and 5). Phase 1 consists of a needs analysis (Chapter 3); Phase

2 describes the development of the experimental safety training program (Chapter 4);

and Phase 3 reviews the pretest-posttest control group design to determine

effectiveness of the training program (Chapter 5). Chapter 6 features the conclusion

section of this study.

Chapter 2, the literature review, examines the current literature relevant to this

research and provides an overview of macroergonomics and sociotechnical system

(STS) theory. This overview is followed by an examination of how social exchange

theory can be integrated with the different subsystems of STS.

Phase One, the needs analysis, consists of a field study, which included a

combination of a classical empirical study model and a needs analysis study. Chapter 3

is divided into two sections: (1) methodology and (2) results and discussion. The

methodology section describes the experimental design and discusses the associated

variables and measurements, participants, and lists all of the materials and equipment

used for Phase One. Chapter 3 concludes with the results of Phase One and a

discussion of limitations, recommendations, and future research associated with Phase

One.

During Phase Two, the experimental training program was developed and evaluated. Chapter 4 discusses the development of the training program and the formative evaluation approach used to evaluate the training program.

Phase Three, which reviews the pretest-posttest control group design to determine effectiveness of the training program, consists of a similar empirical study conducted in the Phase One. Chapter 5 is divided into two sections: (1) methodology and (2) results and discussion. The methodology section describes the experimental design and discusses the associated variables and measurements, participants, and lists all of the materials and equipment used for Phase Three. Chapter 5 concludes with the results of Phase Three and a discussion of limitations, recommendations, and future research associated with Phase Three.

Chapter 6, the conclusion section, discusses the study's contribution to research in construction and presents recommendations to help recruit and collect data from Latino construction workers.

CHAPTER 2. LITERATURE REVIEW

2.1. Overview

This literature review will discuss topics related to macroergonomics, sociotechnical systems, and social exchange theory. First, the macroergonomic approach will be discussed in relation to the sociotechnical subsystems of small construction firms. Second, social exchange theory will be integrated with the sociotechnical systems to substantiate the hypothesis that Latino workers have lower perceived organizational support and distributive justice. Finally, the use of training as a tangible outcome related to social exchange will be discussed, especially to validate whether or not implementing training in small construction firms increases a worker's perceived organizational support, distributive justice, and safety climate.

2.2. Macroergonomics

Macroergonomics is a sociotechnical systems approach to work system design (Hendrick and Kleiner, 2001) that addresses the design of organizational and work systems taking into account relevant sociotechnical variables (e.g., organizational environments, culture, history, and work goals) and the interactions between these variables (Hendrick, 1986). Conceptually, macroergonomics is a top-down sociotechnical systems approach concerned with the optimization of organizational and work system design through the interactions of personnel, technological, and environmental subsystems (Hendrick and Kleiner, 2001; Kleiner, 1997). This sub-discipline of human factors engineering has become especially important in investigating and optimizing the relationship between humans and work systems using

ergonomic interventions to improve work systems design. Macroergonomics provides a

framework that attempts to integrate the changing work environment, the workers, and

available technology to meet the goals and objectives of the work system. A

macroergonomic approach strives to fulfill the following criteria for the effective design

of a sociotechnical work system (Hendrick and Kleiner, 2001, p.12):

1. *Joint design.* The approach should be human-centered. Rather than designing a

   technological subsystem and then requiring the personnel subsystem to conform

   to it, the approach should require the design of the subsystems concurrently.

2. *Humanized task approach.* The function and task allocation process should first

   consider whether there is a need for a human to perform a given function or task

   before allocating functions to either humans or machines.

3. *Consider the organization's sociotechnical characteristics.* The approach should

   systematically evaluate the organization's sociotechnical system characteristics,

   and then integrate them into the work system's design.

These criteria will be integrated in the analysis and design phases of the ADDIE model,

which is further discussed in Section 2.12, to systematically design a human-centered

safety training program that considers the different sociotechnical subsystems

(personnel, technological, organizational design, and environment) of small construction

firms.

2.3. Sociotechnical System Theory

Sociotechnical systems (STS) theory has been used for decades as a framework

to design and understand organizations and to facilitate organizational changes

(Hendrick, 1991). The concept of STS defines organizations as open systems engaged

in transforming inputs into desired outputs. As seen in Figure 5, the STS framework

divides an organization into four interdependent subsystems: personnel, technological,

organizational design, and environment (Hendrick, 1991; Hendrick and Kleiner, 2001;

Hendrick and Kleiner, 2002). The next sections will discuss the different subsystems of

small construction firms in detail.
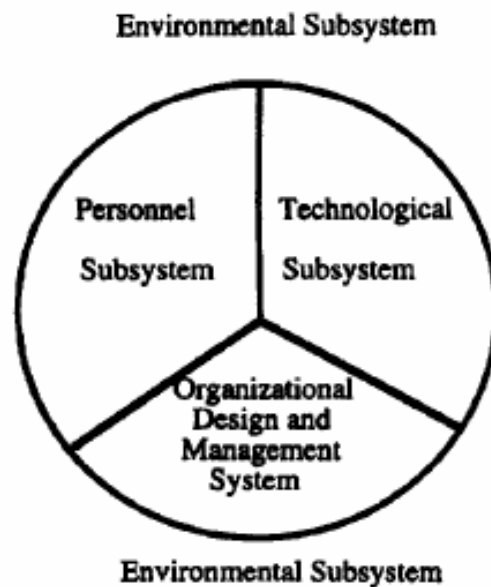
Figure 5. Sociotechnical subsystems (adapted from Hendrick, 1986).

2.4. Overview of the Personnel Subsystem

2.4.1. Characteristics of the Personnel Subsystem

The personnel subsystem corresponds to the human beings within a given

organization. There are three important characteristics of the personnel subsystem that

are sensitive to the design of a work system structure: 1) demographic characteristics,

2) degree of professionalism, and 3) psychosocial aspects of the workforce (Hendrick

and Kleiner, 2002). Examples of demographic characteristics include the age of the workforce, how culturally diversified the workforce is, and the gender breakdown of the workforce. The degree of professionalism refers to the extent to which a person has learned and accepted the values, norms, and expected behaviors of the job before accepting a position within an organization. The psychosocial aspects of the workforce include the personality of the organization's workforce, especially in terms of how receptive the workers are to new ideas and concepts. According to Taylor and Felten (1993), the personnel subsystem functions to: 1) attain the system's primary goals, 2) adapt to the external environment for survival, 3) integrate internal environment for conflict management, and 4) provide for the development and maintenance of the system's long-term needs. Ideally, the workers should be intrinsically motivated to perform these functions on behalf of the organization. In reality, however, this motivation does not always exist within every worker, which causes the work system to perform at a suboptimal level. Different organizational factors such as social exchange and safety climate can impact a worker's level of motivation, thus causing him or her to work at a suboptimal level of performance (Langford et al., 2000; Zohar, 1980).

2.5. Social Exchange Theory

Social exchange theory encompasses social, psychological, and sociological viewpoints. This theory is centrally based on the premise that the exchange of social and material resources is a fundamental form of human interaction (Michener, 2004). This theory stemmed from Gouldner's (1960) norm of reciprocity, which simply states that people should return benefits given to them in a relationship. Social exchange theory posits that when one party acts in a way that benefits another party, implicit

obligation for future reciprocity is created, resulting in behavior(s) designed to benefit the initiating party. Thus, the term "social exchange" has often been used to describe the group processes and intergroup relations that develop between individuals in an organization (Settoon et al., 1996). For the present research involving small construction firms, social exchange theory was used to help explain the role of organizational factors such as perceived organizational support, distributive justice, and safety climate in small construction firms and the differences in these variables for Latino and non-Latino workers in the personnel subsystem.

2.5.1. *Latinos in Construction*

Historically, the construction industry in the United States has attracted a large proportion of the immigrant labor force due to a ready supply of jobs that don't require highly skilled or educated workers. Up from 8.5% in 1990, Latinos now represent 15% of the total construction workforce (Dong and Platner, 2004). In 2000, it was estimated that there were 1.4 million Latino construction workers in the U.S., with 70% of them born outside of the U.S. Twenty-one percent were employed as laborers and nearly one third spoke only Spanish (Center to Protect Workers' Rights, 2002b).

As noted earlier, many studies have concluded that Latino immigrants may be at greater risk for workplace injuries than their non-Latino counterparts (Anderson, Huntington, and Welch, 2000; Dong and Planter, 2004; Loh and Richardson, 2004). A recent BLS (2005) study found that while the fatal injury rate for non-Latino Whites and Blacks has steadily declined, the fatal injury rate for Latinos has increased. Loh and Richardson (2004) examined BLS data from 1996 through 2001 to identify current trends in fatal work injuries among foreign-born workers. Their study concluded that

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Mexican immigrants in particular are at higher risk for non-fatal workplace injuries or illnesses than any other gender, race, or ethnicity group.

A number of factors have been associated with the higher injury rates among Latinos. One important dynamic that has been routinely cited is the disproportionate representation of this ethnic group in higher risk construction jobs (Anderson et al., 2000; Jackson and Loomis, 2002; Loh and Richardson, 2004). For example, from 1997 to 1999, the Texas Workers' Compensation Commission records indicated that 45.5% of the fatalities involved Latino workers. These workers shared similar characteristics, such as low skill levels, being fairly young, working in hazardous and physically demanding occupations, and being foreign-born (Fabrego and Starkey, 2001). Another analysis of occupational fatalities among Latino workers looked specifically at the construction workforce. Dong and Platner (2004) suggested that as a group, Latinos consistently had a higher relative risk for fatal injuries than non-Latinos, as documented by the fact that although Latinos made up less than 16% of the construction workforce in 2002, they incurred 23.5% of the fatal injuries. To help explain why Latinos are assigned more hazardous jobs than their non-Latino counterparts, social exchange constructs, perceived organizational support and distributive justice were explored to examine differences between Latino and non-Latino construction workers.

2.5.2. Differences in Social Exchange Perceptions

Researchers have defined "foreign workers" as workers who have no permanent residential status in the host country and who seek employment in another country without sponsorship from any firm in their home nations (Alarcon, 1999; West and Bogumil, 2000). In the construction industry, approximately 15% of the foreign workers

are from Latin American countries (Dong and Platner, 2004). Social exchange theory

(Blau, 1964) and reciprocity norms (Gouldner, 1960) have suggested that foreign

workers have less positive exchange relationships than local workers because foreign

workers receive different incentives involving pay, benefits, access to career

development, and opportunities for advancement (Ang et al., 2003; March and Simon,

1958). In the construction industry, workers that are U.S. citizens are more likely to be

promoted and receive training and career development opportunities, more paid

vacation and overtime, medical benefits, and contributions to retirement than their

foreign born coworkers. It is especially disadvantageous for foreign workers, such as

Latinos, who are hired for limited periods of employment. These workers typically do

not receive promotions, training and career development benefits, overtime, or medical

benefits. As a result, the social exchange relationships of foreign workers contain fewer

benefits because their employment relationships are more restricted. These social

exchange relationships will be explored in greater depth with regard to perceived

organizational support and distributive justice.

Perceived Organizational Support

Perceived organizational support, a construct of social exchange, is defined as a

worker's beliefs concerning the extent to which the organization values his or her

contributions and well-being (Eisenberger et al., 1986). When high perceived

organizational support exists, workers believe that their organization values their works

and is committed to them as employees. When high perceived organizational support

exists, workers generally feel more obligated to develop reciprocity that benefits the

organization (e.g. perform better) (Hofmann and Morgeson, 1999).

<u>Distributive Justice</u>

Distributive justice, a construct of social exchange, refers to a worker's assessment of the fairness of rewards received in exchange for contributions at work (Greenberg, 1990). Prior research on distributive justice suggest that when a worker receives incentives that are rationally associated with his or her knowledge, skills, and abilities, he or she is more likely to believe that "outcomes" such as pay, benefits, and terms of work are fair and just. On the contrary, if a worker feels that outcomes such as pay and benefits do not adequately reflect that individual's skills, knowledge or worth, he or she is more likely to make lower distributive judgments. This latter association is particularly true in the construction arena, where Latino workers are assigned more hazardous and physically demanding jobs (Fabrego and Starkey, 2001), but are compensated less than their non-Latino counterparts (BLS, 2006).

2.6. Cultural Differences in the Personnel Subsystem

Given the diverse population of workers in the construction industry, culture is a particularly important component of the personnel subsystem. Although researchers have formulated a number of salient definitions for the term "culture," Hofstede's (1997) definition was utilized for this study. Hofstede defined culture as the *collective programming of the mind which distinguishes the members of one group or category of people from another.* In this definition of culture, groups or categories of people refer to individuals who have something in common (e.g. gender, religion, ethnicity, occupation) (Hofstede, 1997, p. 5). In 1980, Hofstede administered a survey to IBM workers from over 50 different countries to explore how cultures that have the same basic problems differ in how they approach those problems. The problems Hofstede used on the

survey were later termed "dimensions of culture" and could be measured relative to each culture. Different nations were compared according to four distinct dimensions of culture: power distance, uncertainty avoidance, individualism versus collectivism, and masculinity versus femininity. Hofstede's (2001) four dimensions of culture are defined as follow:

1. Masculinity versus femininity—the degree to which gender roles are defined;

2. Uncertainty avoidance—the degree to which a member of a culture feels anxious towards unpredictable situations;

3. Power distance—the way members of a culture handle power differences;

4. Individualism versus collectivism—the extent to which individuals primarily look out for themselves or are loyal to a group.

Hofstede (1997) observed differences in each of these four cultural dimensions between Latin American countries and the United States. Other researchers have also described differences in cultural values between Latinos and American-born residents (Sasao and Sue, 1993).

2.6.1. Culture of the Latino Population

Researchers generally agree that individuals belonging to a specific ethnic group tend to share a common understanding of their own ethnicity or culture (Sasao and Sue, 1993). Table 1 displays some prevalent values shared throughout the Latino culture. It should be noted, however, that Latinos do exhibit some group differences in a number of areas, including acculturation, language skills, generational status, immigration status, socio-economic status, educational background, and political views (Marín,

Marín, Padilla, and de la Rocha, 1983; Padilla, 2002; Starrett, Wright, Minden, and Van

Tran, 1989).

Table 1. Shared values characterizing the Latino culture.

Shared value	Shared value exhibited in the construction environment
Exceptional respect for authority figures (Latino Ministry in the Southeast, 2005).	Worksite supervisors or classroom trainers are respected and Latino workers rarely disagree with persons in positions of authority even when individuals are wrong (NC Health Education Centers, 2005).
Belief in a "do as you are told" way of thinking (Latino Ministry in the Southeast, 2005).	Latino workers usually say yes, regardless of whether or not they understand (Vázquez and Stalnaker, 2004).
Eagerness is not considered appropriate (Pajewski and Enriquez, 1996).	Latino workers will not follow the clock or fill the day with a long list of things to do (Vázquez and Stalnaker, 2004).
Respect job and fear employer punishment for any reason (NC Health Education Centers, 2005).	Latino workers do not like to cause conflict or arguments and tend not to report workplace incidents or injuries, unsafe acts or conditions, potential hazards, and harassment. Most Latino workers would prefer to remain silent and keep their jobs rather than report problems that could cause them to be viewed negatively by their employer. Illegal immigrants fear deportation, which also reduces their likelihood to report safety and health problems (Vázquez and Stalnaker, 2004).

Table 1, con't. Shared values characterizing the Latino culture.

Shared value	Shared value exhibited in the construction environment
Place high value on family. The typical Latino family is characterized as having strong and close bonds and the "family unit" is not limited to parents and the immediate family members. The "family unit" also includes non-family members who are treated as extended family (Latino Ministry in the Southeast, 2005).	Latino workers often view other Latino workers as extended family and are likely to talk about issues that they are unwilling to discuss with supervisors and non-Latino workers (Vázquez and Stalnaker, 2004).
Developing trust requires time and depends on the development of personal relationships (Vázquez and Stalnaker, 2004).	Latino workers are often working at different construction sites with different supervisors. With this instability in the workplace, Latino workers are unlikely to develop trust in an employer (Vázquez and Stalnaker, 2004).

These values, which are shared among many Latino individuals, can impact how Latino workers interact and communicate with their non-Latino counterparts and non-Latino supervisors (Eisenburg, 1999; Hofstede, 1991; Hofstede, 1997; Triandis, 2001). Therefore, it is essential to recognize culture as an important component when training workers in a diverse work environment.

2.6.2. Cultural Differences in Training

Among Hofstede's four cultural dimensions (masculinity vs. femininity, uncertainty avoidance, power distance, and individualism versus collectivism), the

degree of collectivism has been shown to demonstrate the most conspicuous

differences between Latino countries and the U.S. (Eisenburg, 1999; Triandis, 2001).

Therefore, it was particularly important to examine this dimension because of the vast

differences that appear between individualist and collectivist cultures, not to mention

how these differences can influence training in the workplace (Eisenburg, 1999,

Triandis, 2001). Table 2 lists key differences between collectivistic and individualistic

societies as defined by Hofstede (1997), and Table 3 lists key differences between

collectivism and individualism for teacher/student and student/student interactions.

Unlike collectivism, which emphasizes the social context of learning and knowledge,

individualism emphasizes information disengaged from its social context (Hofstede,

1980).

Table 2. Differences between collectivists and individualists (adapted from Hofstede,

1997).

Collectivists	Individualists
People are born into extended families or other in-groups which continue to protect them in exchange for loyalty	Everyone grows up to look after him/herself and his/her immediate (nuclear) family only
Identity is based in the social network to which one belongs	Identity is based in the individual
Children learn to think in terms of 'we'	Children learn to think in terms of 'I'
Harmony should always be maintained and direct confrontations avoided	Speaking one's mind is a characteristic of an honest person
High-context communication	Low-context communication
Purpose of education is learning how to do	Purpose of education is learning how to learn
Helpfulness and interdependence	Independence

Table 3. Differences between collectivism and individualism related to teacher/student and student/student interactions (adapted from Hofstede, 1986).

	Collectivists	**Individualists**
Teacher/Student Interaction	Positive association in society with whatever is rooted in tradition	Positive association in society with whatever is "new"
	Students expect to learn how to do	Students expect to learn how to learn
	Individual students will only speak up in class when called upon personally by the teacher	Individual students will speak up in class in response to a general invitation by the teacher
Student/Student Interaction	Individuals will only speak up in small groups	Individuals will speak up in large groups
	Neither the teacher nor any student should ever be made to lose face	Face-consciousness is weak
	Education is a way of gaining prestige in one's social environment or joining a higher status group	Education is a way of improving one's economic worth and self-respect based on ability and competence

If one were to apply Hofstede's (1983) findings to the Latino culture, the following associations can be made: Latinos, who perceive themselves as subordinates in the workplace, would expect to be told what to do, would see hierarchy as an existential inequality, and would consider their boss as a benevolent autocrat. And indeed, although this characterization tends to be the norm, it can be beneficially used to help trainers better understand the impact of cultural differences in the workplace. Table 4 displays some of the inherent cultural values among Latin American and U.S. cultures that can be included for training workers in small construction businesses.

Table 4. Comparison of management styles between Latin American and U.S. cultures (Kras, 1995).

Characteristic	Latin America	U.S.
Work/leisure	• Works to live • Leisure is considered essential for full life • Money is for enjoying life	• Lives to work • Leisure is seen as a reward for hard work • Money is often considered an end in itself
Direction/delegation	• Traditional managers • Autocratic • Younger mangers starting to delegate responsibilities • Subordinates accustomed to being assigned tasks, not authority	• Managers delegate responsibilities and authority • Executives seek responsibility and accept accountability
Theory vs. practice	• Basically theoretical mind • Practical implementation often difficult	• Basically pragmatic mind • Action-oriented: a problem solving approach
Control	• Not fully accepted, sensitive to being checked on	• Universally accepted and practiced
Staffing	• Family and friends favored because of trustworthiness • Promotions based on loyalty to superior	• Relatives usually barred • Favoritism not acceptable • Promotion based on performance
Loyalty	• Mostly loyal to superior	• Mainly self-loyal • Performance motivated by ambition
Competition	• Avoids personal competition • Favors harmony at work	• Enjoys placing oneself in competitive situations
Time	• Deadlines flexible	• Deadlines and commitments are firm
Planning	• Short-term due to uncertain environments	• Long-term due to stable environments

2.7. Overview of Organizational Design Subsystem

An organization is a unit consisting of two or more people functioning on a relatively continuous basis and through a division of labor and an understood hierarchy of authority to achieve a common goal (Hendrick and Kleiner, 2001). Organizational design encompasses the design of an organization's work system, structure, and related processes, all of which work in tandem to achieve the goals of the organization (Hendrick and Kleiner). In the construction industry, smaller construction firms typically function as subcontractors. The vast majority of U.S. construction firms are small businesses, meaning that 80% of general construction businesses employ 10 or fewer individuals (BLS, 2006). Typically, the organizational characteristics of small businesses differ from larger construction firms. Unlike larger construction firms, small construction businesses are less likely to implement safety training programs (Fielding and Piserchia, 1989; Eakins, 1992; Hollander and Lengermann, 1988; Holmes, 1995; Mayhew, 1995), and are also less likely to routinely and thoroughly communicate OSHA regulations to their workers (Williams, 1991; Rundmo, 1994). This latter deficit may be due in part to the fact that small businesses with 10 or fewer workers receive a partial exemption to OSHA regulations and thus may not be fully aware of their OSHA-related responsibilities. Moreover, these smaller firms operate in extremely competitive business environments and lack the resources of larger construction firms (Peyton, 1996), which could also impact their ability to implement safety training programs. As mentioned in the personnel subsystem, workers receive training as an organizational reward (Eisenberger, Cummings, Armeli, and Lynch, 1997; Eisenberger et al., 1986). The lack of resources to implement training in small construction firms, however, might

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be considered an explanation for low social exchange levels among foreign workers (Ang et al., 2003; March and Simon, 1958).

2.8. Overview of Technological Subsystem

For this study, training falls under the technological subsystem, which refers to the process of how work gets done. This subsystem is comprised of the tools, knowledge base, and technology required to transform inputs to outputs, and to deliver the outputs to the customers in the most efficient way (Pasmore, 1988; Hendrick, 1991). Technology is defined as the sequence of actions performed on an object to change (Perrow, 1967). When implementing new technology, its possible effects on the social subsystem should be carefully considered before any changes are put into practice (Pasmore, 1988) because new technology invariably impacts both the organization and the individuals within it. The technological subsystem affects the social subsystem through the technical demands that help create the roles workers assume. Perrow suggested that a knowledge base could be classified along two dimensions: problem analyzability and task variability. Table 5 displays the different classes of the two dimensions.

Table 5. Perrow's knowledge-base technology classes (adapted from Hendrick and Kleiner, 1991).

		Task Variability	
		Routine with few exceptions	High variety with many exceptions
Problem Analyzability	Well defined and analyzable	Routine	Engineering
	Ill-defined and analyzable	Craft	Non-routine

Small construction firms fit into the "craft" category. These firms specialize in a specific trade, thus producing routine work with limited task variability. Exceptions to routine work in this organization include modifications to job tasks because of weather conditions, time pressures, and the expertise of the workers. The problem analyzability is ill-defined and not analyzable because the construction industry requires workers to have expertise in the trade to make decisions based on experience, judgment, and knowledge. Because of the required level of expertise in the workers' trade, training is essential to the performance of construction workers.

2.8.1. Training as a Component of the Technological Subsystem

Although only a few research studies have investigated the problem of the disproportionately high injury and fatality rates among Latino construction workers, a number of reports have cited language barriers and the lack of training as contributing factors (Brunette, 2004; Brunette, 2005; Dong, Entzel, Men, Chowdhury, and Schneider, 2004; Goodrum and Dai, 2005; Nash, 2004; Pransky et al., 2002; Vasquez and Stalnaker, 2004). A community-based survey of Latino immigrant workers revealed

both elevated rates of injury and lower rates of training compared to the non-Latino population (Pransky et al., 2002). Furthermore, the survey found that among the Latino immigrant workers that did receive training, only 25% received training in Spanish. A study conducted by Castillo, Davis, and Wegman (1999) concluded that Latinos were particularly susceptible to workplace hazards because of their lack of experience and training in the construction industry. The workers' limited on-the-job experience and training deficiencies made it difficult for them to recognize hazards and make proper judgments about risk-taking on the job (Castillo et al., 1999; NRCIM, 1998; O'Connor, Loomis, Runyan, dal Santo, and Schulman, 2005). Additionally, most Latino immigrants tend to be unaware of their legal rights as workers and lack the necessary confidence to speak up to supervisors about hazards in the workplace (NIOSH, 1999). This lack of safety training for Latino workers supports the social exchange theory that foreign workers receive fewer tangible and intangible outcomes from their employers (Ang et al., 2003; March and Simon, 1958). Based on this research, it was postulated that training non-Latino workers on safety would provide a sense of reciprocity, resulting in a safer workplace and higher perceived organizational support and distributive justice. The next section will discuss how safety training can be viewed as an exchange between a supervisor and a worker in a small construction firm.

2.8.2. Social Exchange Theory and the Technological Subsystem

Social exchange theory (Blau, 1964) maintains that when one party acts in ways that benefit another party, an implicit obligation for future reciprocity is created (Gouldner, 1960). Over time, this inherent obligation results in certain behaviors designed to benefit the initiating party. In the safety arena, Zohar (1980) noted that a

company's commitment to safety was a major factor affecting the success of safety programs in industry and that this commitment can manifest itself through job training programs, participation of management in safety committees, and taking safety into consideration in job design. Zohar (1980) argued that these management actions positively influenced worker perceptions regarding the safety climate of an organization. Safety-related actions such as safety training programs and implementing safety measures into the job design can be viewed from a social exchange perspective—namely, that they engender a voluntary compliance among workers to act in a safe manner.

Few studies have investigated the relationship between social exchange and safety climate in the workplace. Hofmann and Stetzer (1996) investigated various organizational factors (e.g., safety climate, group process) influencing unsafe behaviors. The study concluded that management actions can influence a worker's perceptions of the safety climate of an organization. It was found that a positive safety climate was related to safety-related behavior (Hofmann and Stetzer). Zohar (1980) reported that a company's commitment to safety was a major factor affecting the success of safety programs in the industry. This commitment was evident through training programs and taking safety into consideration in job design (Zohar). Hofmann, Morgeson, and Gerras (2003) suggested that social exchange is evident when managers indicate an implied obligation for workers to act in a safe manner. Consistent with the social exchange theory, safety training serves as a tangible benefit for workers (Ang et al., 2003; March and Simon, 1958,).

2.9. Research Contributions

This research endeavor represents one of the first known studies to examine the effect of training in small construction companies. Research examining the reasons behind the disproportionate number of injuries, accidents, and fatalities among all Latino construction workers and ways to reduce their prevalence is a new and developing area. While empirical studies on this topic have been limited, they have agreed on the lack of adequate training among Latino workers (Brunette, 2004; Brunette, 2005; Dong et al., 2004; Goodrum and Dai, 2005; Nash, 2004; Vasquez and Stalnaker, 2004). Despite the general agreement on the relevance of training as a contributing factor, reasons behind the lower level of safety training for Latino workers have remained largely uncharted. Therefore, this study was designed to further explore social exchange constructs, perceived organizational support and distributive justice as a possible explanation for the lack of training. It was also designed to demonstrate that implementing adequate safety training in a small construction firm can improve internal measures of social exchange, resulting in an improved safety climate and less risky safety behaviors among construction workers.

To date, only two known empirical studies exploring interventions to improve the construction workplace for Latinos have been published. Both studies in question investigated the training needs of selected construction companies in the state of Iowa that employed Latino workers, and then evaluated the training courses they developed for their Latino workers and American supervisors (Arbelaez, 2003 and Canales, 2005). Neither study evaluated the impact of the training courses. To augment that research, this study was designed to evaluate the impact of a training intervention to reduce the

number of accidents, injuries, and fatalities among Latino construction workers in small

construction firms. Because of the lack of guidelines for training the Latino population,

this study has also suggested new recommendations or guidelines for training

supervisors in work environments with Latino and non-Latino workers. As policies

develop to protect Latino workers, the results of this study can serve as a model for

training programs that will reduce fatalities among this at-risk population.

CHAPTER 3. PHASE ONE: NEEDS ANALYSIS

This research study consisted of three phases: (1) a needs analysis, (2) the development of a training program, and (3) a pretest-posttest control group design to determine the training program's effect on social exchange and safety. Table 6 displays a summary of the three phases of the study. This chapter discusses the methods and the results of Phase One.

3.1. Phase One – Needs Analysis

Phase One consisted of a field study employing both an empirical study and needs analysis. The empirical study was used to investigate the relationships between social exchange and safety climate, while the needs analysis was used to elicit insight about perceived organizational support to design the experimental training program in Phase Three. The empirical study and the needs analysis are discussed separately in Sections 3.2. and 3.11., respectively.

3.2. Method

3.2.1. Empirical Study

The purpose of the empirical study was to form a better understanding of the effects of perceived organizational support on training and safety in small construction businesses by examining the model proposed in Figure 4. To understand this model, perceived organizational support, distributive justice, safety climate, and safety behavior were investigated. This information was analyzed to: a) provide a better understanding

Table 6. Summary of study.

Phase of Study	Activity	Participants	Type of Data Collection	Instruments/Methods Used	Data Obtained	Data Analysis Method
1	Needs Analysis Empirical study Construction workers complete demographics, social exchange, safety climate questionnaires	• 30 Latino construction workers • 30 non-Latino construction workers	Quantitative	• Demographics questionnaire • Social exchange questionnaire • Safety climate questionnaire	• Demographic information • Perceived organizational support • Distributive justice • Safety climate • Safety behavior	• **Pearson correlation** • **Independent t-test**
	Needs analysis *(Safety Training Program)* Supervisors and bilingual workers participate in semi-structured interviews	10 interviews with 2 construction supervisors, 4 non-Latino workers, and 4 bilingual link workers	Qualitative	Demographics questionnaire	Interviews audio taped	**Content analysis**
2	Development of Training Program Construction workers complete web-based safety training program	2 subject matter experts 2 users (1 Latino and 1 non-Latino construction workers)	Quantitative	Formative evaluation questionnaire	• Perceived organizational support for training program • Training evaluation • Reaction	**Mean and standard deviation**
			Qualitative	Open-ended questions	Strengths and weaknesses of training program	**Content analysis**
3	Pretest-Posttest Control Group Design Empirical study Construction workers complete demographics, social exchange, and safety climate questionnaires	• 19 Latino construction workers • 27 non-Latino construction workers *(*Same participants from Phase 1)*	Quantitative	• Training effectiveness questionnaires • Social exchange questionnaire • Safety questionnaire	• Reaction of participants Knowledge retention • Perceived organizational support and distributive justice • Safety climate and safety behavior	• **Repeated measures ANOVA** • **Paired t-tests**

*From Phase One to Phase Three, 14 participants dropped out of the study for various reasons.

of the connection between perceived organizational support, safety climate, and safety behavior, and b) form hypotheses about perceived organizational support, safety climate, and safety behavior differences between Latino and non-Latino construction workers. A Pearson correlation was performed to determine the relationships among the dependent variables (perceived organizational support, safety climate, and safety behavior), and t-tests were conducted to investigate any Latino and non-Latino group differences among the dependent variables. The subsequent sections will discuss the empirical study's independent and dependent variables, participants, equipment and apparatus, procedures, and data analysis in further detail.

3.2.2. Independent Variable

Ethnic group was the independent variable for this study. Ethnic group was a between-subject factor with two levels, Latino and non-Latino. Latino and non-Latino ethnic groups were selected to remain consistent with two data sources, BLS and the Census of Fatal Occupational Injuries (CFOI) (BLS, 2005; Dong and Platner, 2004; Goodrum and Dai, 2005). Ethnicity was operationalized as self-report data on the demographics questionnaire (Appendix A). Participants were questioned about their ethnicity according to the following set of choices:

Ethnicity: (check one) _____African American   _____American Indian

_____Asian   _____Caucasian _____Latino/Hispanic _____Other, if so,

what ethnicity? _____

The Latino level consisted of workers of Latino ethnicity. This Latino population included individuals of all races and foreign-born and U.S.-born individuals (BLS, 2005; Dong and Platner, 2004). The non-Latino level consisted of construction workers that

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were not of Latino ethnicity (African-American, American Indian, Asian, Caucasian, or other non-Latino ethnicities identified by the participant).

3.2.3. Dependent Variable

The dependent variables measured in Phase One were social exchange, safety climate, and safety behavior. Two measures of social exchange were collected: perceived organizational support and distributive justice.

Perceived Organizational Support

Perceived organizational support is a construct of social exchange, which is defined as a worker's beliefs concerning the extent to which the organization values his or her contributions and cares about his or her well-being (Eisenberger et al., 1986). Perceived organizational support was measured with nine modified items from the Eisenberger, Huntington, Hutchison, Sowa (1986) scale (Appendix B). The Cronbach's alpha for internal consistency = .92. The researcher consulted with subject matter experts in construction to slightly modify the wording of the instrument to accommodate the terminology and education level of workers in small construction firms. The modified scale's Cronbach's alpha for internal consistency = .90. These items assessed the workers' beliefs of the orientation of the organization with regard to their goals and values and well being, satisfaction with their performance, and satisfaction with them as contributing members of the organization. A five-point Likert-type scale was used with 1 = not at all and 5 = all the time. The item responses were scored by taking the sum of the Likert-type scale responses to the nine items on the questionnaire. The total score

ranged from 9-45, where a higher score indicates the workers perceived their workplace and supervisors as more supportive.

Distributive Justice

Distributive justice involves worker assessments of fairness of rewards received in exchange for contributions at work (Greenberg, 1990). Distributive justice was measured via five modified items from Price and Mueller's (1986) Distributive Justice Index (Appendix B). The Cronbach's alpha for internal consistency = .90. The researcher consulted with subject matter experts in construction to slightly modify the wording of the instrument to accommodate the terminology and education level of workers in small construction firms. The modified scale's Cronbach's alpha for internal consistency = .95. These items assessed the extent to which workers believed they were fairly rewarded for their performance, job responsibilities, effort, education, training, and stresses and strains of the job. A five-point Likert-type scale was used with 1 = very unfair and 5 = very fair. The item responses were scored by taking the sum of the Likert-type scale responses to the five items on the questionnaire. The total score ranged from 5-15, where a higher score indicates the perception of a fairer work environment.

Perceived Safety Climate

The safety climate questionnaire (Appendix C) included nine items adapted from the Dedobbeleer and Beland's (1991) Safety Climate Measure for Construction Sites. The Cronbach's alpha for internal consistency = .78. This instrument was based on work by Brown and Holmes (1986) who adapted and revised an eight-factor safety climate developed by Zohar (1980). The questionnaire measured the workers'

perceptions of management's commitment to safety (items 1-5) and workers'

involvement in safety (items 6 – 9) (Dedobbeleer and Beland, 1991; Gillen, Baltz,

Gassel, Kirsch, Vaccaro, 2002). The researcher consulted with subject matter experts

in construction to slightly modify the wording of the instrument to accommodate the

terminology and education level of workers in small construction firms. The modified

scale's Cronbach's alpha for internal consistency = .81. A five-point Likert scale was

used with 1 = strongly disagree and 5 = strongly agree. The item responses were

scored by taking the sum of the Likert-type scale responses to the nine items on the

questionnaire. The total score ranged from 9-45, where a higher score indicates a

perception of a safer work environment.

Safety Behavior

Measuring safety performance was somewhat challenging because measures

such as accident rates and compensation costs are reactive, arise after the event, and

generally occur on an erratic basis (Cohen, 1988; Cooper and Phillips, 2004). Several

approaches have been used to proactively measure surrogates of safety behavior

(safety climate, hazard identification and/or observed percent safe behavior). For this

study, safety behavior was measured by rating potential hazards in the workplace

(Appendix C). Ten items adapted from Mearns, Whitaker, and Flin's (2003) Offshore

Safety Climate questionnaire were rated on a five-point Likert scale was used with 1 =

strongly disagree and 5 = strongly agree. The Cronbach's alpha for internal consistency

= .70. This questionnaire measured the ratings of potential hazards related to three

factors: general unsafe behavior (Items 10 – 12), unsafe behavior under incentives

(Items 13 – 15), and unsafe behavior under work pressure (Items 16-18) (Mearns et al.,

2003). The researcher consulted with subject matter experts in construction to slightly

modify the wording of the instrument to accommodate the terminology and education

level of workers in small construction firms. The modified scale's Cronbach's alpha for

internal consistency = .83. The item responses were scored by taking the sum of the

Likert-type scale responses to the ten items on the questionnaire. The total score

ranged from 10-50, where a lower score indicates less risky safety.

3.2.4. Participants

The participants for this research endeavor were selected using a criterion

sampling strategy to develop a purposeful sample (Patton, 1990). In other words, a

criterion sampling strategy that results in a purposeful sample selects cases that meet

the predetermined criteria. Moreover, the purpose of using criterion sampling was to

identify the cases that were potentially information-rich and study these cases in depth

(Patton, 1990).

The following criterion set was used for the participants in this study:

- At least 18 years of age

- Of Latino ethnicity or non-Latino ethnicity and born in the U.S.

- Had worked in construction for at least 30 days

- Had worked in a crew with at least one Latino construction worker and one
  non-Latino construction worker

- Had worked for a self-owned/managed construction business employing
  between three and 20 people

- Had not received training, defined as a planned learning experience designed
  to bring about change in an individual's knowledge, attitude, or skill

(Goldstein and Ford, 2002), from supervisor or current place of employment

about topics related to OSHA regulations, statistics on injuries, accidents,

and fatalities in the workplace, safety attitude, and safety behavior

These criteria were strategically selected to examine the perceived organizational

support and safety behaviors of construction workers employed by small businesses

and the effectiveness of safety training in these small businesses. As noted earlier,

since construction businesses employing less than 20 employees generally account for

about 20% of the accidents and fatalities in construction (BLS, 2006), scrutiny of

construction workers in small businesses was highly relevant. In addition, this research

focused on small businesses because most small businesses do not provide their

employees with safety training due to time constraints and a lack of financial resources

(Ang et al., 2003; Peyton, 1996). Therefore, the specific criteria established for the

participants in this study provided an opportunity to further examine the impact of safety

training on small businesses with Latino and non-Latino construction workers.

For the empirical study in Phase One, 60 participants (30 Latino construction

workers and 30 non-Latino construction workers) were recruited from the

Commonwealth of Virginia. This number was selected based on a power test using the

criteria for the Values Survey Module (Hofstede and Bond, 1994) that was adapted for

use in this study. To compare cultural values of people from two or more countries,

Hofstede and Bond (1994) stated that while a minimum of 20 participants per country or

region could be used to obtain meaningful results, the ideal number of participants

would be at least 50. For this study, 30 participants per ethnic group were recruited.

Although 50 was the ideal number, 20 as a minimum was selected because of the

difficulties associated with recruiting participants from small construction firms. When

recruiting from small construction firms, researchers are challenged with the

management of small construction firms being suspicious about researchers reporting

violations of existing laws or rules, and/or concerned about researchers distracting their

employees thereby reducing productivity (Kidd, Parshall, Wojcik and Struttmann, 2004).

Oversampling of 10 participants for each group (Latino and non-Latino) enabled the

researcher to exceed the suggested minimum of 20 participants and compensate for

possible attrition from Phase One to Phase Three (Denzin and Lincoln, 2000).

Participation in the study was limited to individuals who met the following criteria:

<u>Latino construction workers</u>

- At least 18 years of age

- Of Latino ethnicity (foreign-born or U.S.-born)

- Had worked in construction for at least 30 days

- Had worked in a crew with at least one non-Latino construction worker

- Had worked for a self-owned/managed construction business employing
  between three and 20 people

<u>Non-Latino construction workers</u>

- At least 18 years of age

- Not of Latino ethnicity (U.S.-born)

- Had worked in construction for at least 30 days

- Had worked in a crew with at least one Latino construction worker

- Had worked for a self-owned/managed construction business employing between three and 20 people

Participation in Phase One lasted for approximately one to two hours for each participant, and all participants were compensated $10/hour at the completion of Phase One.

3.2.5. Equipment and Apparatus

<u>Questionnaires</u>

All participants completed the demographic (Appendix A), social exchange (Appendix B), and safety climate (Appendix C) questionnaires. The non-Latino participants completed questionnaires in English and the Latino participants completed questionnaires in Spanish. The questionnaires were written in both English and Spanish at a sixth-grade level to ensure the instruments were suitable for individuals with a lower level of literacy. Prior to translating the questionnaires from English to Spanish, the level of readability for the English questionnaires were measured using the Flesch Reading Ease test in Microsoft® Word^{TM}. The formula used to calculate the Flesch Reading Ease score was: 206.835 – 1.015 (total words/total sentences) – 84.6 (total syllables/total words). Instruments with higher scores (90-100) were considered easily understandable by an average fifth-grader and lower scores (0-30) were

considered best understood by college graduates. All of the English questionnaires were tested and had a score between 80-90 to ensure it was written on a sixth-grade level.   After verifying the level of readability for the English questionnaires, the instruments were translated to Spanish.

For the questionnaires in Spanish, a bilingual (Spanish and English) individual translated the English versions of the questionnaires into Spanish and then a second bilingual individual translated it back to English to assure comparable meaning (Ang et al., 2003; Brislin, 1980; Triandis, 1976). Additionally, the Spanish questionnaires were administered orally to account for reading and writing illiteracy and to accommodate for different variations of Spanish. To accommodate the different variations of Spanish, the researcher had a list of words that had different meanings for different dialects of Spanish.

The demographics questionnaire (Appendix A) sought information about a participant's age, years of experience in construction, level of education, language preference, training experience, gender, and culture. The social exchange questionnaire (Appendix B) included items assessing perceived organizational support and distributive justice, while the safety climate questionnaire (Appendix C) included items assessing safety communication, safety attitude, safety in the workplace, and safety behavior.

3.2.6. Procedures

The empirical study was conducted at nine different construction sites located throughout the Commonwealth of Virginia by the researcher and the bilingual undergraduate researcher. The researcher conducted the study with the non-Latino

participants, and the undergraduate researcher conducted the study with the Latino participants. Participants read and signed the informed consent form (Appendix D) while the researcher read the informed consent form orally. After completing the informed consent, the participants completed the three questionnaires (Appendix A, B, and C) to elicit information related to their demographics, construction experience, social exchange, and safety beliefs.

3.3. Results and Discussion

This section presents the results and discussion of the empirical study conducted in Phase One of this research study. The first section provides a brief overview of the study sample demographics. Next, correlations among the dependent variables (perceived organizational support, distributive justice, safety climate, and safety behavior) and Latino and non-Latino group differences for the abovementioned dependent variables are discussed. In the third section, several explanations for the results attained in the empirical study are suggested. This section concludes with several proposed engineering design recommendations generated by this study, as well as suggested future research needs based on the limitations of this study and gaps in the literature.

3.4. Demographics

3.4.1. Age

The study sample for Phase One consisted of 60 male construction workers (30 Latino, 30 non-Latinos). Participants' ages ranged from 19-63 ($M = 34.44$, $SD = 13.25$).

The Latino participants' ages ranged from 19-42 ($M = 24.59$, $SD = 5.75$), and the non-Latino participants' ages ranged from 21-63 ($M = 42.75$, $SD = 10.13$).

3.4.2. Ethnicity

Figure 6 illustrates the ethnic distribution of the study sample. Ethnicity was based on the participants' response to the following question: *Ethnicity: (check one) African American, American Indian, Asian, Caucasian, Latino/Hispanic, Other, if so, what ethnicity?* To ensure the participants understood the term *ethnicity,* the researcher used common terms used by the federal government to classify ethnicity (Office of Management and Budget, 2003). Participants responded as follows: 30% (18) indicated African American, 20% (12) indicated Caucasian, and 50% (30) indicated Latino/Hispanic.

Ethnicity Breakdown of Study Sample
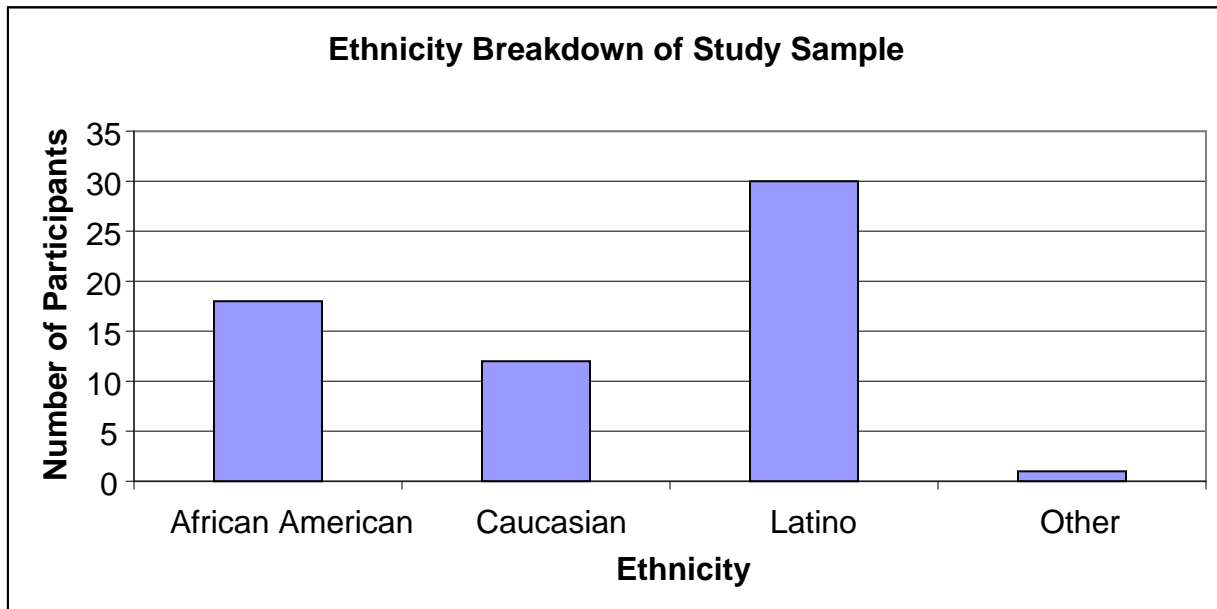
Figure 6. Ethnicity of study sample.

3.4.3. Construction Experience

The number of years in construction as indicated by the participants on the demographics questionnaire (Appendix A) was broken down into four groups, as follows: 0-1 year, 2-5 years, 6-10 years, and more than 10 years. Figure 7 displays the distribution of construction experience. Thirteen (22%) participants indicated that they had been in construction for 0-1 year, 20 participants indicated that they had been in construction for 2-5 years, 9 participants indicated that they had been in construction for 6-10 years, and 19 participants indicated that they had been in construction for more than 10 years.
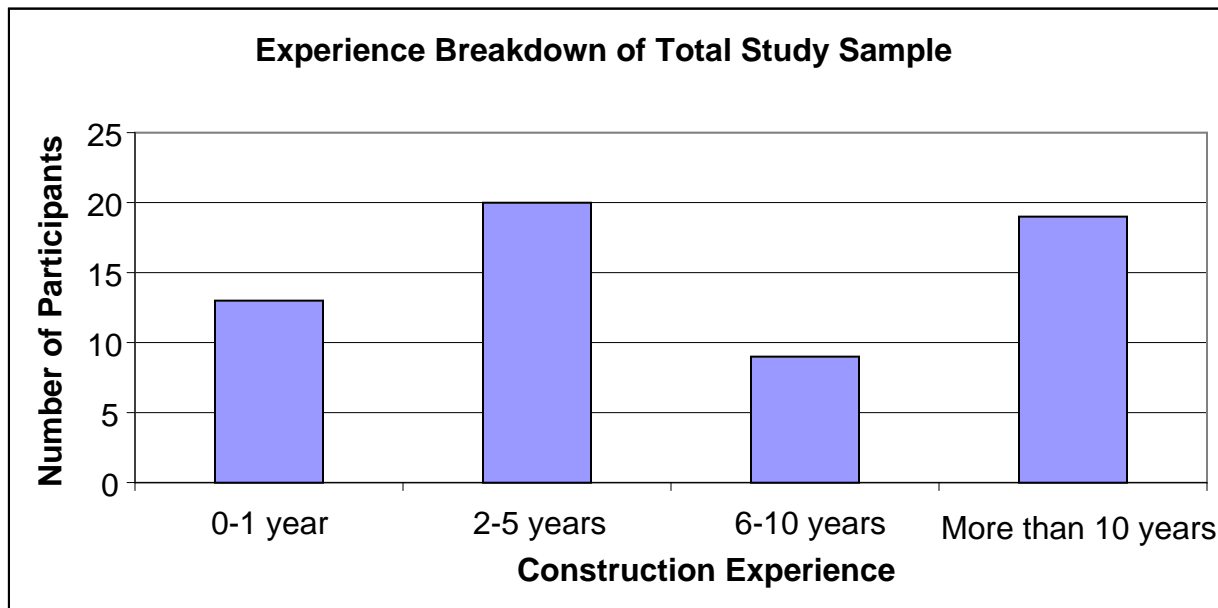
Figure 7. Construction experience for study sample.

Figure 8 displays the distribution of years of construction experience in the Latino and non-Latino samples. For the Latino sample, 9 participants indicated that they had been in construction for 0-1 year, 15 for 2-5 years, 3 for 6-10 years, and 33 for more

than 10 years. For the non-Latino sample, 2 participants indicated that they had been in

construction for 0-1 year, 4 for 2-5 years, 7 for 6-10 years, and 16 for more than 10

years. The non-Latino sample had more experience in construction than their Latino

counterparts, which was anticipated because the non-Latino sample was older in age

than the Latino group.
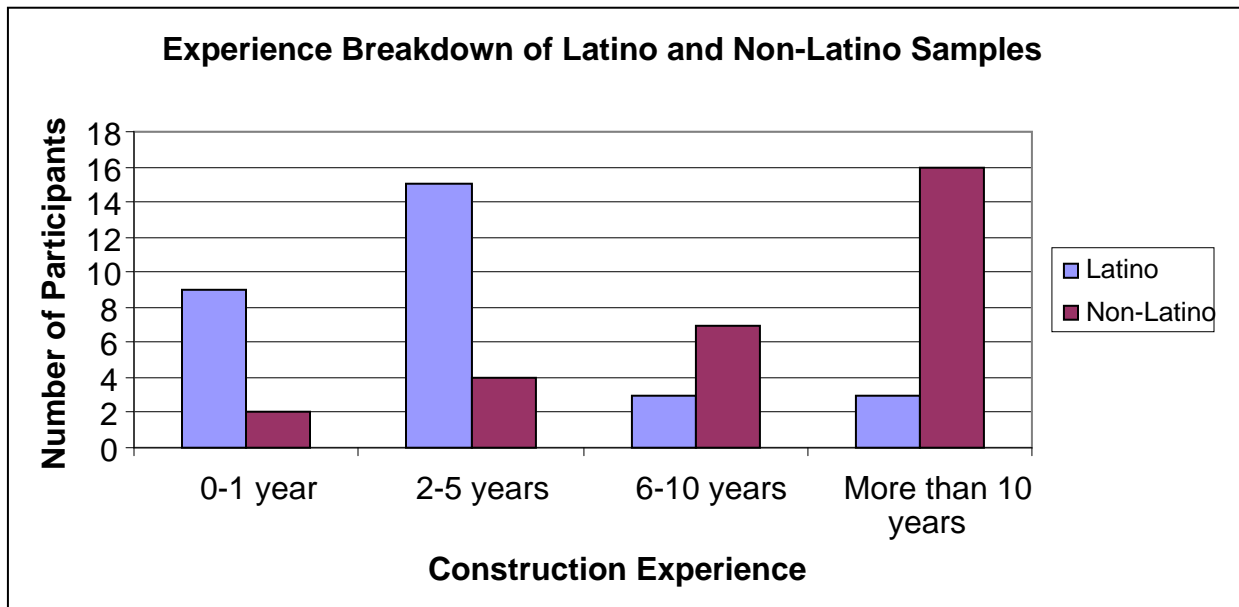
Figure 8. Construction experience for Latino and non-Latino Samples.

3.4.4. Relationship Status

Table 7 displays the relationship status of the participants in the study. Among

the construction workers, a larger percentage, 67% (20), of the Latino workers were

single, whereas the opposite was found for the non-Latino workers. Forty-seven

percent (14) of the non-Latino construction workers were married and 20% (6) of the

non-Latino construction workers were single. Again, this difference can be attributed to

the age difference between the Latino and non-Latino samples. The Latino workers

were younger—63% (19) of them were 25 years old or younger—and therefore many of

the Latino workers had not yet married.

Table 7. Relationship status of participants.

Relationship Status	Total Sample	Latino sample	Non-Latino sample
Single and never married	28	20	6
Single and divorced	8	1	7
Married	22	8	14
Married, but separated	3	1	2

3.4.5. Education Level

Figure 9 displays the highest level of education completed for the participants in

the study. The breakdown of the participants' highest levels of education was: 18% (11)

elementary school, 13% (8) middle school, 21% (13) some high school, 30% (18) high

school diploma, 15% (9) some college, and 3% (2) college degree. Figure 10 compares

the highest level of education completed for the Latino and non-Latino sample. Eighty

percent of the non-Latino workers had at least a high school diploma, compared to 81%

of the Latino workers with less than a high school diploma. These demographics are

consistent with findings reported by Mosisa (2002), in which it stated that (1) BLS

reports indicating that a high level of education is not required to find work in the

construction industry and (2) Latinos immigrating to the United States for work generally

have less than an eighth-grade level of education.
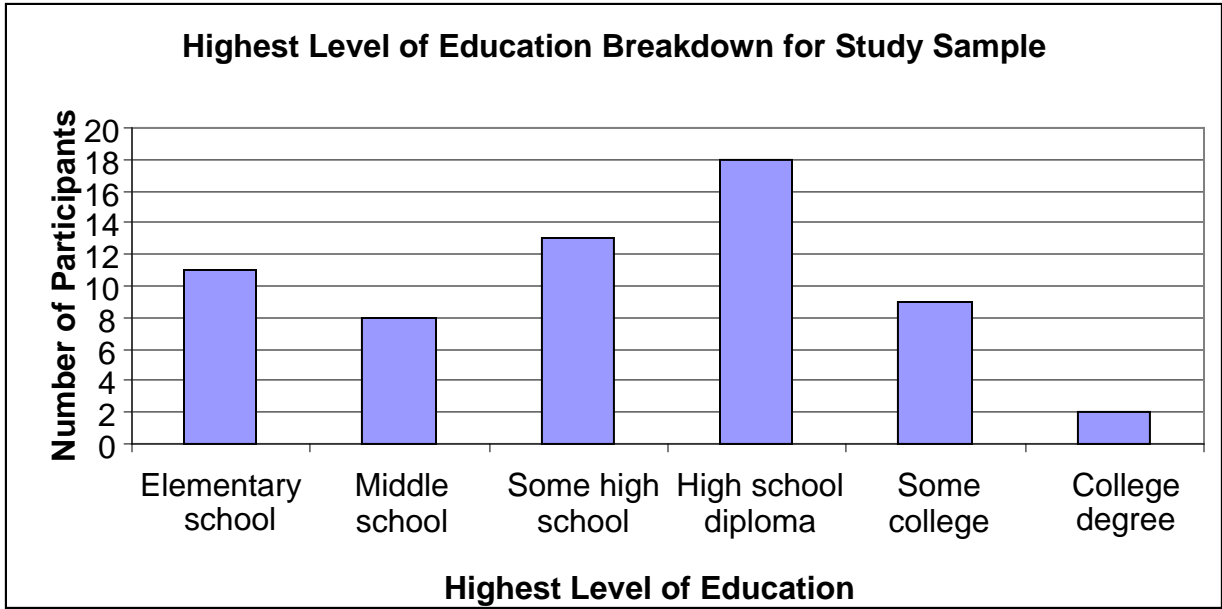
Figure 9. Highest education completed for study sample.
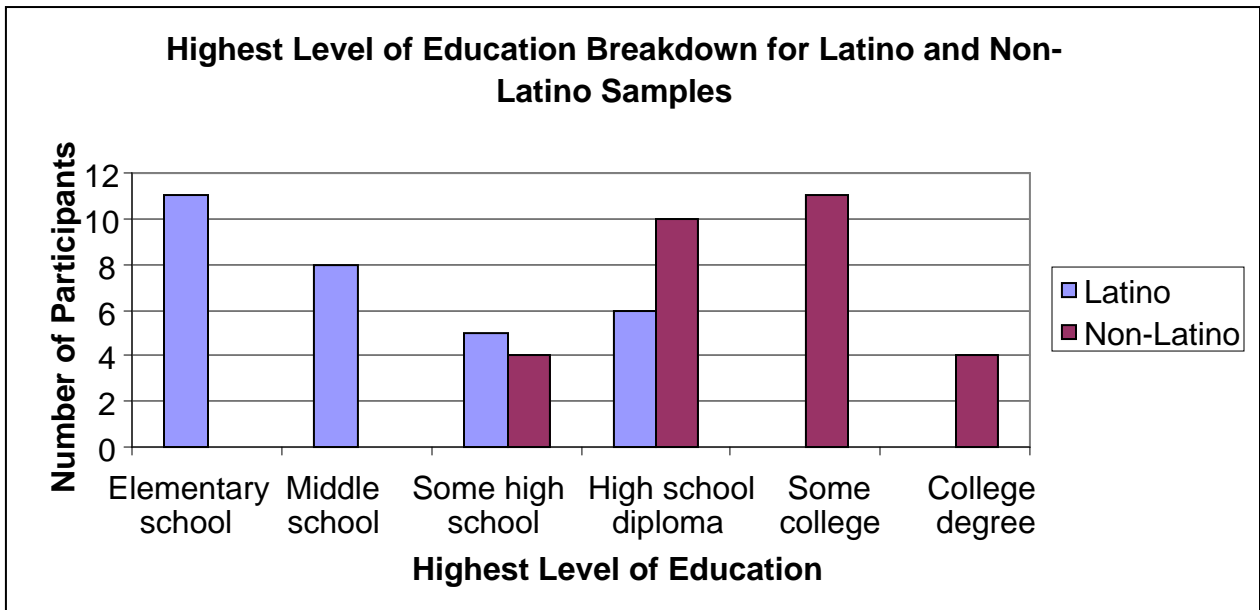
Figure 10. Highest education comleted for Latino and non-Latino samples.

3.4.6. Cultural Dimensions

   Figure 11 displays the cultural dimension ratings (collectivism, power distance, and uncertainty avoidance) for the Latino and non-Latino participants. The Latino workers had higher ratings ($M = 12.28$, $SD = 2.52$; $M = 17.17$, $SD = 3.98$; $M = 24.93$, $SD = 4.89$) than their non-Latino counterparts ($M = 9.13$, $SD = 2.80$; $M = 10.97$, $SD = 2.99$; $M = 19.76$, $SD = 5.75$) on collectivism, power distance, and uncertainty avoidance, respectively. In addition, t-tests were conducted to examine cultural differences between the Latino and non-Latino participants. The Latino participants' ratings were significantly higher ($p < .001$) for all three cultural dimensions measured.

Cultural Dimensions for Latino and Non-Latino Sample
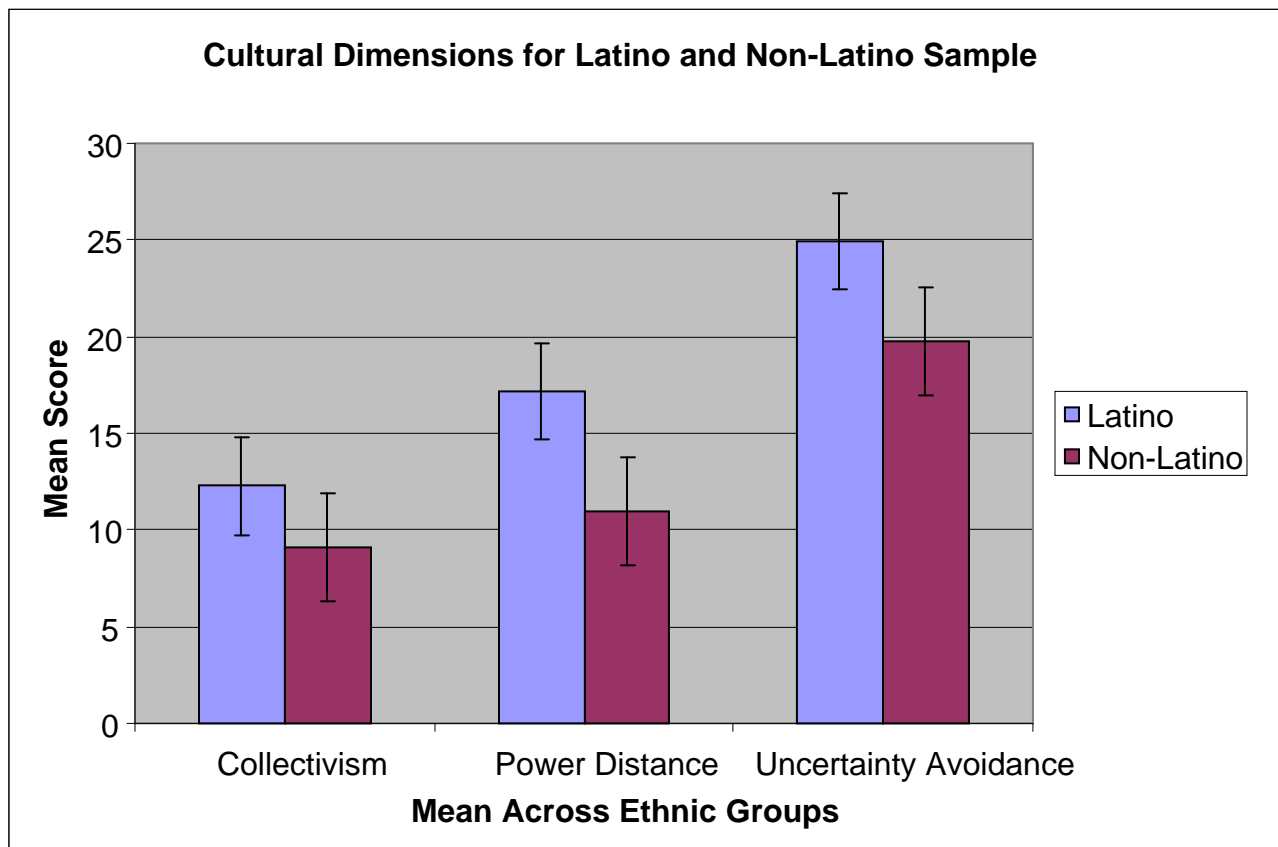
Figure 11. Cultural dimension ratings for Latino and non-Latino samples.

These results demonstrated that Latino workers were collectivists with tendencies of being high in power distance and uncertainty avoidance. Canales (2005), Hofstede (1991), and Romero (2004) concluded similar results when examining the Latino culture. As collectivists, Latinos workers are oriented towards family group rather than work-related groups. They are typically loyal subordinates and look after the group's interest rather than individual interests (Canales 2005). To avoid uncertainty, Latino workers rarely disagree or challenge authority figures. Latino workers prefer to remain silent to keep maintain their job security, rather than reporting potential workplace hazards or incidents that could provoke an adverse opinion from their employer (Vazquez and Stalnaker, 2004). As high power distance individuals, Latino workers make a clear distinction between the powerful and powerless. Latino workers believe that leaders are authority figures who deserve the utmost respect (Canales, 2005). In some situations, because of their level of respect, Latino workers do not communicate with their supervisor. Although accepted in the Latino culture, these characteristics contribute to the increase in risk for Latino workers in the construction environment (Vazquez and Stalnaker, 2004).

3.5. Validity of Questionnaire Instruments

All of the dependent variables considered in Phase One were measured using existing questionnaire instruments, each of which had a Cronbach's alpha above a .70, indicating good internal consistency. To ensure the results, internal reliability was re-tested to verify the validity of the instruments after translating them into Spanish, as well as to ensure the instruments were at a sixth -grade reading level for the participants. Cronbach's alpha was calculated to measure the internal consistency of each measure

in English and Spanish. Table 8 reports the Cronbach's alpha for each scale in both

languages. All of the scales in English had a Cronbach's alpha above a .70, indicating

good internal consistency of the items. In Spanish, the distributive justice and safety

behavior scales also had a Cronbach's alpha above a .70, whereas the perceived

organizational support and safety climate scales had a Cronbach's alpha below .70.

Table 8. Cronbach's alpha for questionnaire instruments.

Measurement Scale	Cronbach's Alpha *(Cronbach's Alpha after Deleted Variables)*
Perceived organizational support *(English)*	.90
Perceived organizational support *(Spanish)*	.64 *(.70)*
Distributive justice *(English)*	.95
Distributive justice *(Spanish)*	.86
Safety climate *(English)*	.81
Safety climate *(Spanish)*	.23
Safety behavior *(English)*	.83
Safety behavior *(Spanish)*	.90

To improve the internal consistency of the perceived organizational support

scale, Question Nine (*My supervisor provides me the necessary training to get the job

done correctly.)* was deleted from the scale. Deleting this item increased the

Cronbach's alpha to 0.70. A possible explanation for Question Nine having a low inter-

item correlation is that participants may have been confused about how to answer the

question since one criterion for the study was that all participants should not have had

prior formal training in their workplace. Some participants may have assumed that the

training referred to in Question Nine was *on-the-job training* rather than formal training

to cover topics related to OSHA regulations, statistics on injuries, accidents and fatalities in the workplace, safety attitudes, and safety behaviors.

The safety climate scale in Spanish had a low Cronbach's alpha of 0.23, indicating low internal consistency. Unlike the perceived organizational support scale, none of the items in the safety climate scale could be deleted to improve the internal consistency of the scale. The low Cronbach's alpha for the safety climate questionnaire completed by the Latino construction workers in this study brings up a concern about the social validity of the scale (Triandis, 1998). It is possible that the scale was not sensitive to the culture of Latino construction workers. The items on this scale required the participants to rate beliefs about their supervisor. Because of the lack of formal hierarchy and structure in informal work systems such as small construction firms, it is possible that the Latino construction workers' definition of supervisor was different than their non-Latino counterparts. In addition, the scale could have introduced either a construct bias (in which the construct being measured was not identical across both ethnic groups) or an item bias (in which inadequate translation concordance occurred) (Bahr and Stauss, 1972; Campbell and Fisk, 1959).

3.6. Investigating the Research Questions

The empirical study portion of the needs analysis was conducted to answer Research Questions One, Two, and Three, namely:

1. How do perceived organizational support, distributive justice, safety climate, and safety behavior differ between Latino and non-Latino workers?

2. What are the relationships between perceived organizational support, distributive justice, and safety climate for Latino and non-Latino construction workers?

3. What is the relationship between perceived safety climate and safety behavior for Latino and non-Latino construction workers?

3.6.1. Research Question One

For Research Question One (*How do perceived organizational support, distributive justice, safety climate, and safety behavior differ between Latino and non-Latino workers?*), four hypotheses were tested—one pertaining to each dependent variable in the study: perceived organizational support, distributive justice, safety climate, and safety behavior. It was hypothesized that Latino construction workers would have a lower rating of perceived organizational support, distributive justice, and safety climate and a higher rating of safety behavior. For non-Latino construction workers, the opposite was hypothesized—namely, that non-Latino construction workers would have a higher rating of perceived organizational support, distributive justice, and safety climate and lower rating of safety behavior. These hypotheses were tested by collecting data on the participants' perceived organizational support, distributive justice, safety climate, and safety behaviors. T-tests were conducted to determine if any significant differences between ethnic group for social exchange, perceived safety climate, and safety behaviors were specific to either Latino or non-Latino construction workers. The alpha was set at a level of 0.05, and significant differences were found.

Table 9 displays the comparison between the Latino and non-Latino samples for the dependent variables. There were no significant differences found for perceived organizational support and distributive justice ratings; however, there were significant differences found for perceived safety climate ($p < 0.01$) and safety behavior ($p < 0.01$)

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ratings. Latino workers reported higher ratings for perceived safety climate scale and

lower ratings for the safety behavior scale (Figure 12).

Table 9. Mean and standard deviation of dependent variables.

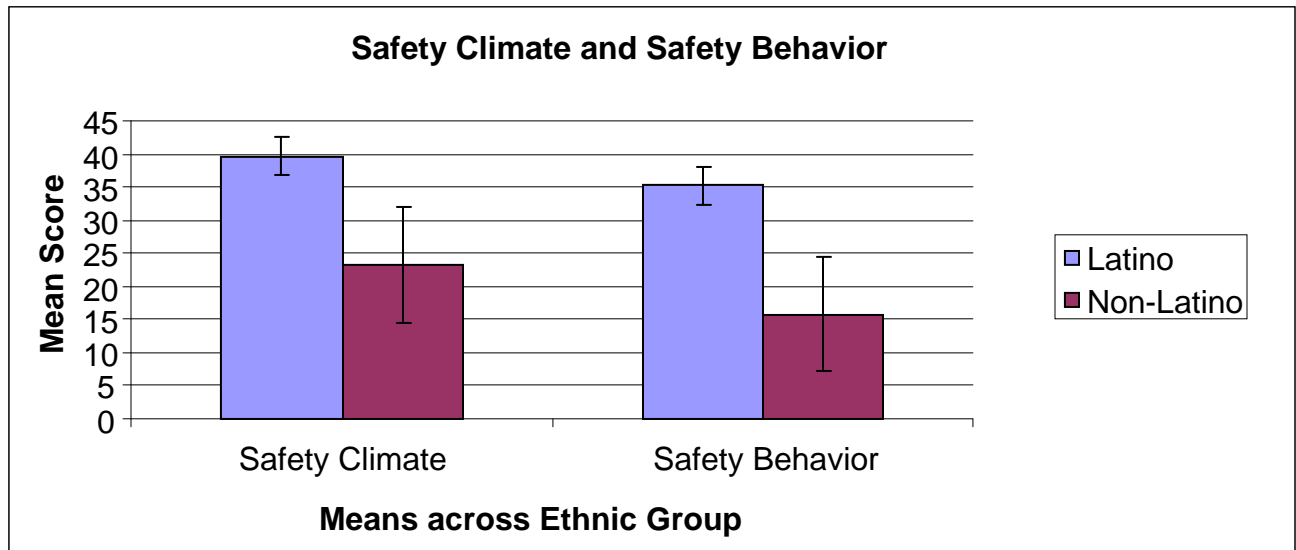| Dependent Variable	Latino Sample Means (Standard Deviation)	Non-Latino Sample Means (Standard Deviation)
Perceived organizational support	37.55 (4.76)	35.73 (6.81)
Distributive justice	18.77 (4.73)	18.17 (3.64)
Safety climate*	39.69 (2.85)	35.28 (4.04)
Safety behavior*	23.20 (8.68)	15.83 (6.01)

*$p < .01$

Figure 12. Safety climate and safety behavior differences for Latino and non-Latino

sample ($p < .01$).

The t-tests indicated that both Latino and non-Latino workers had similar

perceptions of organizational support and distributive justice in the workplace. These

results imply that all of the workers, regardless of ethnic group, have a relatively equal perception of organizational support and fairness in their work environment, not supporting the hypothesis that non-Latino construction workers would have a higher rating of perceived organizational support and distributive justice.

The results for perceived safety climate and safety behavior partially support the hypotheses for this study, in that there were significant differences between Latino and non-Latino construction workers with respect to these two dependent variables. On the other hand, the higher ratings of perceived safety climate for the Latino workers was in opposition to results reported in other studies examining safety climate differences among ethnic groups.

3.6.2. Research Question Two

To answer Research Question Two (*What are the relationships between perceived organizational support, distributive justice, and safety climate for Latino and non-Latino construction workers?*), it was hypothesized that the two social exchange measures (perceived organizational support and distributive justice) would be positively correlated to perceived safety climate. This hypothesis was tested by collecting social exchange data (perceived organizational support and distributive justice) and perceived safety climate scores from the participants.

A Pearson correlation analysis was performed to describe the relationships among perceived organizational support, distributive justice, and safety climate. Using an alpha level of .05, significant correlations were found all the dependent variables. These data were as analyzed based on the assumption that as perceived organizational support and distributive justice increased, safety climate would increase and safety

behavior would decrease (Hofmann et al., 2003). Tables 10 displays the correlations for the study sample (Latino and non-Latino participants).

Table 10. Summary of correlation analysis for study sample.

Pearson Correlation Coefficients (r)				
	Perceived Organizational Support	Distributive Justice	Safety Climate	Safety Behavior
Perceived Organizational Support	----------			
Distributive Justice	.48**	----------		
Safety Climate	.43**	.30*	----------	
Safety Behavior	.06	-.11	.29*	----------

*$p < .05$, **$p < .001$

For the study sample, significant positive correlations were found between perceived organizational support and distributive justice (r (58) = .48, $p < .001$), perceived organizational support and safety climate (r (58) = .43, $p < .001$), and distributive justice and safety climate *(r (58) = .30, $p < .05$)*. The positive correlations among the dependent variables support the social exchange theory stating when one party acts in a way that benefits another party (e.g., organization provides support to workers), implicit obligation for future reciprocity is created, resulting in behavior(s) designed to benefit the initiating party (Goulder, 1960; Settoon, Bennett, and Liden, 1996). Based on the social exchange theory, a positive correlation was expected between perceived organizational support and the dependent variables distributive justice and safety climate. These results demonstrate that workers with high

perceptions of organizational support have high perceptions of distributive justice and safety climate.   Cooper and Phillip (2004), Hofmann et al. (2003), and Wayne et al. (2002) concluded similar results examining the relationship between organizational factors and safety climate**.** In Phase Three the affect of training on the dependent variables will be further explored.

3.6.3. Research Question Three

To answer Research Question Three (*What is the relationship between perceived safety climate and safety behavior for Latino and non-Latino construction workers?*), it was hypothesized that perceived safety climate would be negatively related to safety behavior. This hypothesis was tested by collecting perceived safety climate and safety behavior data from the participants.

A Pearson correlation analysis was performed to describe the relationships between safety climate and safety behavior. Using an alpha level of .05, a significant correlation was found between safety climate and safety behavior. These data were analyzed based on the assumption that high perceptions of safety climate (high safety climate ratings) would result in less risky safety behaviors (low safety behavior ratings). Tables 10 display the results of the Pearson correlations for the study sample. For the study sample, a significant positive correlation was found between safety climate and safety behavior *(r* (58) = .29, *p* < .05). The results of this study demonstrate that workers with a high perception of safety climate have higher ratings of safety behavior. Although researchers have reported that an individual's perception of safety climate affects his or her safety behavior in the work environment (Hofmann and Stetzer, 1996), the positive correlation is inconsistent with studies conducted by Hofmann (1996) and

Hofmann and Morgerson (1999) concluding that high perceptions of safety climate lead to lower ratings of safety behavior.

3.7. Limitations

Two limitations for Phase One of this study included the threat of differential validity and social validity of the safety climate scale. The low Cronbach's alpha for the safety climate questionnaire completed by the Latino construction workers confirmed the impact of these two limitations. Engaging in cross-cultural research requires the use of culturally appropriate instruments (Marín and Marín, 1991). However, achieving cultural appropriateness goes beyond translating an instrument from one language to another—in the case of this study from English to Spanish. Cultural appropriateness refers to an instrument's ability to accurately reflect the cultural assumptions of the participants instead of the researcher's culture (Kreuter, Lukwago, Bucholtz, Clark, and Sanders-Thompson, 2003). To achieve a culturally appropriate instrument means eliciting responses that are equivalent conceptually or convey similar meanings to members of the various groups a study (e.g., Latino, African-American, Native-American, and Caucasian). For this study, a low internal consistency rating of .23 for the Spanish language safety climate questionnaire, and a high internal consistency rating of .83 for the English language safety climate questionnaire indicated that the Spanish questionnaire was probably not culturally appropriate for the Latino participants.

3.8. Engineering Design Recommendations

It is vital for researchers to address the cultural appropriateness of an instrument when conducting cross-cultural research. Researchers should go beyond mere translation to ensure an instrument has the ability to reflect the cultural assumptions of the ethnic group being studied. As reported by Marín and Marín (1991), two suggestions for developing culturally appropriate instruments include (1) the cultural immersion of the researcher, and (2) consulting with experts. Cultural immersion should go beyond short visits to the ethnic area in question, eating at representative ethnic restaurants, or being exposed to ethnic media through print, radio or television. Immersion really involves experiencing and/or living in a culture in the same way that "natives" do. In this way, a researcher will have a better chance of perceiving the reality of a study's subject in a more significant and accurate way. Due to time limitations and financial constraints, however, it may be difficult to fully immerse oneself in a culture. Therefore consulting with an expert is a way to benefit from the knowledge and experience of someone with prolonged and first-hand knowledge of the culture to be studied. If the individual is truly knowledgeable about the culture in question, he or she can sensitize the researcher to ways of making the study more culturally appropriate.

A marcroergonomics method, participatory ergonomics, is recommended as a method to compliment immersion when designing cultural appropriate instruments. Participatory ergonomics is defined as *the involvement of people in planning and controlling a significant amount of their own work and activities, with sufficient knowledge and power to influence both processes and outcomes to achieve desirable goals* (Wilson, 1995, p.37). When designing cultural appropriate instruments, it is

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necessary to involve individuals from the cultural group the instrument is being designed

for. For the Latino population, it is recommended that participants come from different

dialects of Spanish language used within the community and represent low and middle

education levels or social class. Participation from individuals in the targeted group in

the design of the instrument can provide the researcher insight on the following

concepts of cultural adaptation:

- Conceptual equivalence: Do people attach the same meanings to terms
  and concepts (Stewart and Napoles-Springer, 2000)?

- Cultural equivalence: Are the cultural norms, beliefs, values, and
  expectations the same for different populations (Stewart and Napoles-
  Springer, 2000)?

- Linguistic equivalence: Do the words and grammar have similar meanings
  across different cultures and languages (Geisinger, 1994; Sperber,
  Devellis, and Boehlecke, 1994)?

- Metric equivalence: Do the numbers mean the same thing (Geisinger,
  1994; Sperber et al., 1994)?

Implementing the knowledge gained about cultural adaptation from the participatory

approach will improve the cultural appropriateness of instruments for future research.

3.9. Future Research

The role of organizational support on safety behavior in informal work systems

such as small construction firms is still largely uncertain. The findings of this study did

not reveal a positive relationship between perceived organizational support and safety

behavior. Because the self-reported safety behavior measurement used is a surrogate

of actual safety behavior, inferences drawn from the ratings of safety behavior are limited in scope. Therefore, further research should be conducted to link perceived organizational support and safety behavior by other measures of surrogates of actual safety behavior (e.g., behavioral intent, observations).

Future research should also re-examine this study controlling for age. On average, Latino worker are typically five years younger than non-Latino workers in construction (Center to Protect Workers' Rights, 2002). In 2000, BLS reported that one-fifth of Latino construction workers were less than 25 years old, compared to one-tenth of non-Latino construction workers. These statistics are consistent with the findings of this study, wherein, the Latino workers were significantly younger ($p < .001$) than their non-Latino counterparts. Given the age difference between Latino and non-Latino workers in the construction workforce and the difficulty to recruit workers for field studies in construction, age was not controlled for in this study. Consequently, it is possible that age could have been a contributing factor for the higher ratings of risky safety behavior. According to the 2007 BLS report, the overall U. S. fatal work injury rate per 100,000 workers was 3.9. Workers 25-34, 35-44, and 45-54 years old had lower rates than the overall U.S. rate. Their rates were 3.2, 3.6, and 4.0, respectively. Conversely, the youngest group of workers (18-24 years old) rate was 5.4, higher than the overall U.S. rate. Because of the higher fatality rates for younger adults, it is possible that younger workers have higher risk-taking behaviors. Additionally, studies related to driving behavior (Turner and McClure, 2003) and drinking patterns (Bell, Amoroso, Yore, Smith, and Jones, 2000) revealed that younger participants had higher ratings for risk-taking

behaviors than the older participants. It is likely that a similar trend, higher ratings for

risk-taking behaviors were reported for safety behavior in the construction workplace.

In addition to controlling for age, ethnic group differences should be further

explored. It is probable that the "white male" effect occurred. The "white male" effect is

caused by white male participants judging risks lower than people of color (Finucane,

Slovic, Mertz, Flynn, and Satterfield, 2000). The Latino workers had a significantly

higher ($p < .001$) rating for safety climate question, "Taking risks is part of my job", than

their non-Latino counterpart. Although a significant difference for the safety climate item

associated with taking risks was not found between the Caucasians and African-

Americans in the non-Latino group, group differences are worth exploring with a larger

sample size. In addition, to gain a holistic understanding among the Latino culture, both

native-born and foreign-born Latino workers should be examined.   The Latino workers

in this study were all foreign-born Latino construction workers. Hence, future research

should include data collection from foreign-born and native-born Latino construction

workers. It is possible that a "migrant" effect occurred, whereas migrant participants

judge risks higher than non-migrant participants because migrant workers are assigned

to more hazardous and dangerous tasks than their non-migrant counterparts. To

uncover these uncertainties, a study controlling for ethnicity, age, occupation, and

experience may help explain the relationships found in this study.

3.10. Method

3.10.1. Needs Analysis

In addition to the empirical study, a needs analysis was also conducted in Phase

One. The purpose of the needs analysis was to identify sources of perceived

organizational support in small construction firms. The needs analysis consisted of data

collection using semi-structured interviews to gain insights on how to incorporate

perceived organizational support into the experimental training program (ETP). Upon

completion of the interviews, the interview transcripts were analyzed using a content

analysis. The following sections of this dissertation discuss the participants in the

needs analysis, the equipment, apparatus, and procedures used in the study, and the

data analysis of the results.

3.10.2. Participants

Ten semi-structured interviews were conducted with construction workers and

supervisors who did not participate in Phase One. Two interviews were conducted with

non-Latino supervisors, three interviews were conducted with non-Latino construction

workers, and five interviews were conducted with the Latino "bilingual link employee" in

the small construction firm. A bilingual link employee refers to the individual who

communicates job duties to the company's non-English speaking construction workers

(Arbelaez, 2003; Canales, 2005; Vasquez and Stalnaker, 2004).   The combination of

non-Latino supervisors, non-Latino workers, and Latino bilingual link employees was

selected to gain insight on the supervisors' and Latino and non-Latino workers'

perception of organizational support. These participants were recruited from the

Commonwealth of Virginia. Participation in the study was limited to individuals who met

the following criteria:

Supervisors

- At least 18 years of age

- Supervised both Latinos and non-Latinos for at least 6 months

- Supervisor of a crew of 2 or more people with at least one person being a Latino worker

- Supervisor of a self-owned/managed construction business employing between three and 20 people

Non-Latino construction workers

- At least 18 years of age

- Not of Latino ethnicity (U.S.-born)

- Had worked in construction for at least 30 days

- Had worked in a crew with at least one Latino construction worker

- Had worked for a self-owned/managed construction business employing between three and 20 people

Bilingual link worker

- At least 18 years of age

- Of Latino ethnicity (foreign-born or U.S.-born)

- Had worked in construction for at least 30 days

- Had worked in a crew with at least one Latino and one non-Latino construction worker

- Had worked for a self-owned/managed construction business employing between three and 20 people

- Had served as the main translator and communicator between Latino and non-Latino construction workers on the construction site for at least 30 days

3.10.3. Equipment and Apparatus

<u>Semi-structured interviews</u>

The semi-structured interviews were utilized to elicit construction workers' beliefs about their experience in construction as it related to training and working with individuals of different ethnic backgrounds. The interviews consisted of eight questions designed to elicit information about perceived organizational support and safety training in the workplace (Appendix E). Examples of perceived organizational support (e.g., goal setting, feedback, pay raise, promotion, job retention, supervisory involvement) extracted from the body of literature on perceived organizational support (Eisenberger et al., 1986; Eisenberger et al., 1997; Settoon et al., 1996) were used to develop the interview questions. In addition to the pre-established questions, additional questions for ongoing formulation of additional probes were asked.

To elicit valuable data from an interview, it is essential to have an experienced interviewer who is capable of facilitating the goals of the research and ensure the quality of the interview data. For the non-Latino interviews, the researcher functioned as the interviewer; for the Latino interviews, the interviewer was a bilingual undergraduate researcher. The bilingual interviewer was preferred to help build rapport with the Latino participants and create a comfortable environment for them. To familiarize the bilingual interviewer with conducting semi-structured interviews, the interviewer was trained on interviewing skills and techniques (Gubrium and Holstein, 2002) by the researcher. All interviews were audio taped using a digital recorder.

3.10.4. Procedures

The needs analysis component of Phase One was conducted at three different construction sites located throughout the Commonwealth of Virginia by the researcher and the bilingual undergraduate researcher. The researcher conducted the study with the non-Latino participants, and the undergraduate researcher conducted the study with the Latino participants. Participants read and signed the informed consent form (Appendix D) while the researcher read the informed consent form orally. After completing the informed consent, the participants completed a demographics questionnaire (Appendix A) to elicit information related to their demographics and construction experience. After completing the questionnaire, the participants answered eight questions (Appendix E) about their perception of organizational support (e.g., support from supervisor, feedback, reward, pay raise, and promotion) and their safety training experience (e.g., type of training, length of training, location of training, training content, and training material). Each interview lasted less than one hour, and each participant was compensated $10/hour at the end of Phase One.

3.11. Results and Discussion

This section presents the results and discussion of the content analysis conducted to analyze the interviews from the needs analysis segment of this study. First, the content analysis that was conducted is explained, followed by an overview of the sources of perceived organizational support elicited from the semi-structured interviews. This section concludes with a discussion of the limitations and recommendations of the needs analysis.

3.11.1. Content Analysis

A content analysis was performed to provide insights on how to incorporate perceived organizational support into informal work systems and their training programs. The following systematic approach was used to complement the richness of the purposeful sample used for the interviews and to the code the qualitative data. Prior to beginning the content analysis, a coding scheme was developed using priori coding. The following themes were established based on social exchange theory and examples of perceived organizational support (Eisenberger et al., 1986; Eisenberger et al., 1997; Settoon et al., 1996):

- Characteristics of supportive supervisor

- Supervisor involvement to promote safety behavior

- Examples of feedback

Next, the interview transcripts were coded independently by the researcher for major themes and analyzed in greater depth using a content analysis (Krippendorf, 1980 and 2004; Stemler, 2001). The coding scheme was developed from the phrases used to answer the interview questions (Appendix E) in the needs analysis. Answers to each question were coded as single classification, meaning that the phrase would be assigned only to one code (Insch, Moore, and Murphy, 1997), unless it applied to multiple modalities. Some of the comments also included multiple phrases, which resulted in each phrase being coded separately. In addition, while reading through the participant comments, a new theme (examples of motivators) emerged using an inferred method. After the initial code development, the codes were subjectively analyzed to make sure there was no overlap. Once the list was finalized, there were 4 major themes

and 24 codes. Major themes and codes identified during the content analysis were analyzed on the basis of frequency (Table 11), and the results of the needs analysis were used to design the experimental training program used in Phase Two.

3.12. Limitations

Three limitations were identified for the needs analysis. The first limitation related to the data analysis. The coding for the content analysis was completed by one coder, the researcher. Utilizing the researcher as the coder served as a strength and possible limitation in this study. Using the researcher as the coder for the content analysis was an asset to the study because of the researcher's familiarity with conducting content analysis and the literature on social exchange and perceived organizational support. However, to improve the reliability of the qualitative data, especially the data from the Latino participants, a bilingual coder could have been utilized also. Since the study explored perceived organizational support for Latino and non-Latino workers, a Latino coder could have reveal additional perceptions of organizational support the non-Latino researcher may have overlooked. Having an additional coder could have possibly captured more examples of perceived organizational support.

Sample size and selection were another limitation. The study interviewed 10 participants, two supervisors, three non-Latino workers and five Latino bilingual "link" workers, to elicit knowledge about construction workers' perception of organizational support. A larger sample would have presented more qualitative depth. Also, in addition to interviewing the "link" workers, the Latino workers who were not "link"

workers should have been interviewed. It is possible that regular Latino workers would

have had different perceptions of organizational support.

Table 11. Major theme, code, and frequency counts.

Major Theme	Code	Freq (Latino)	Freq (Non-Latino)	Freq (Total)
Characteristics of supportive supervisor	Praise workers for accomplishments verbally	5	2	7
	Assign worker important responsibility	3	2	5
	Provide pay raises/promotions	3	0	3
	Treat worker with respect	4	3	7
	Understands and explain work clearly	3	3	6
	Present on job	2	0	2
	Remind workers about safety	2	0	2
	Provides constructive criticism	1	0	1
Supervisor involvement to promote safety behavior	Explains safety procedure	4	2	6
	Trains workers on a regular basis	1	0	1
	Check on workers daily	1	1	2
	Available to answer questions	2	1	3
	Discuss real-life safety examples	2	1	3
	Check PPE	1	1	2
	Demonstrate proper safety behavior	1	1	2
Examples of feedback	Ensure job security	1	3	4
	Provide training	2	3	5
	Announce accomplishments to organization	2	0	2
	Provide bonuses/Rewards	3	4	7
	Provide pay raises	3	4	7
	Offer safety meetings	0	2	2
Examples of motivators	Raises	3	2	5
	Training	2	3	5
	Verbal praise	2	0	2
	PPE	1	2	3

The third limitation related to the design of the interview questions and the understanding of perceived organizational support. The interview questions were designed based on examples of perceived organizational support (e.g., goal setting, feedback, pay raise, promotion, job retention, supervisory involvement) extracted from the body of literature on perceived organizational support (Eisenberger et al., 1986; Eisenberger et al., 1997; Settoon et al., 1996). A more systematic approach to the design of the interview questions could have resulted with more in-depth information about perceived organizational support. Prior to designing the interview questions, the researcher could have conducted an organizational role analysis to understand the workers' perception of supervisor in the workplace. Then the interview questions could have been validated by a construction expert.

3.13. Recommendations

Phase One revealed four qualities Latino and non-Latino construction workers perceive as organizational support in the workplace. These qualities include:

- Have a supportive supervisor

- Have a supervisor who promotes safety

- Have a supervisor who recognizes workers' performance

- Be motivated by supervisor

Table 12 displays a list of perceptions of organizational support for Latino and non-Latino construction workers were derived from the interviews in this phase. Researchers can use this to list to understand perceived organizational support differences between Latino and non-Latino construction workers. In addition, this list

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can be used to tailor organizational policies or protocols for an organization comprised of Latinos and non-Latinos workers.

3.14. Future Research

Because of the limitations of the needs analysis, future research should consider modifying the interview questions to elicit more detailed design recommendations for perceived organizational support. Modifications can include providing a scenario or example training program for the workers to relate the answers to the interview questions. Larger sample sizes should be interviewed. The sample should include all target users of the training program that will have the embedded sources of organizational support. Finally, to increase the reliability of the qualitative data, especially, when different ethnic groups are involved, there should be coders representing both ethnic groups in this study to reduce the possibility of overlooking qualitative data that is unfamiliar because of cultural background.

Future research should also consider focus groups as an exploratory approach to elicit more insight on perceptions of organizational support in small construction firms. The focus group can also be used to gain a better understanding of the organizational structure of small construction firms. Focus groups are suggested as an alternative to interviews because focus groups typically gather greater amounts of information shorter and more efficient time spans (Krueger, 1994) and the group synergy cultivates more creativity and therefore provides for a greater range of thought and experiences (Vaughn, Schumm, and Sinagub, 1996).

Table 12. List of perceptions of organizational support for Latino and non-Latino construction workers.

Latino and Non-Latino Construction Workers' Perceptions of Organizational Support

A supportive supervisor should:

- Provide workers verbal praise (e.g., good job.)
- Assign workers important responsibility.
- *Provide monetary or non-monetary (e.g. gift certificates) rewards.
- Provide pay raises and promotions to workers who have been promoted or taken on additional responsibility in the workplace.
- Treat workers with respect.
- *Communicate with workers about performance.
- Be knowledgeable about job tasks and be able to explain job tasks clearly.
- *Be available on the job to answer questions and provide explanations.

To promote safety, supervisors should:

- Demonstrate proper safety behavior in the workplace.
- Discuss real-life safety examples.
- Explains safety procedure.
- *Remind workers about safety on the job.
- Provide workers personal protective equipment (PPE).
- *Trains workers at the start of new projects.
- *Check on workers daily (e.g., ensure proper PPE, job task being completed, performance).

To recognize performance, supervisors should:

- Ensure job security.
- Provide training for new responsibilities.
- *Announce accomplishments to organization.
- Provide monetary and/or non-monetary rewards (e.g., gift certificate).
- Provide pay raises and/or promotions.

To motivate workers, supervisors should:

- Give verbal praise.
- Provide raises and/or promotions.
- Provide PPE.

*Perceptions of organizational support from Latino construction workers only.

3.15. Conclusion

The purpose of Phase One was to investigate the relationships between social exchange variables and safety climate and identify sources of perceived organizational support to embed into the experimental safety training program evaluated in Phase Three. Phase One confirmed the social exchange theory that predicted relationships between perceived organizational support and the other dependent variables, distributive justice and safety climate. Additionally, Phase One demonstrated that both the Latino and non-Latino groups had relatively equal perceptions of organizational support and distributive justice. This is of particular importance for Phase Three because both groups are homogenous for perceived organizational support, the main variable of interest for this study. In addition, the output of Phase One was a set of input (sources of perceived organizational support) that was embedded into the control training program (CTP) in Phase Two.

CHAPTER 4. PHASE TWO: DEVELOPMENT OF SAFETY TRAINNIG PROGRAM

4.1. Phase Two – Development of Safety Training Program

In Phase Two, an experimental training program (ETP) was designed that was subsequently tested in Phase Three. Unlike the control design, the ETP included the following sources of perceived organizational support: supervisor involvement, positive feedback, incentives, and job security. These sources of perceived organizational support were gathered as a result of the semi-structured interviews conducted and analyzed in Phase One of the study. A formative evaluation was performed to ensure the level of sensitivity between the control and experimental training programs. Results from the formative evaluation indicated that the two training programs were distinctive enough to obtain differing results when testing both training programs in Phase Three.

This section describes the control training program (CTP), the development of the ETP, and presents the results and discussion of the formative evaluation conducted in Phase Two. The first section provides a descriptive summary and screenshots of the CPT. Next, a descriptive summary and screenshots of the experimental design of the training program is presented. Chapter Four concludes with an overview of the formative evaluation.

4.2. Control Training Program (CTP)

The CTP was adapted from BuildIQ®, a company that creates, publishes, and hosts a comprehensive curriculum of web-based training courses that focus on best practices in residential building. The BuildIQ® training program was selected as the CTP for this research endeavor because of Virginia Tech's Center for Innovation in

Construction Safety and Health's partnership with BuildIQ® and the researcher's

prerequisite to use an existing training program designed for supervisors and workers in

residential construction. The curriculum of the BuildIQ® training program was designed

based on knowledge from leading production homebuilders, construction industry

experts, and building scientists to provide homebuilding professionals information and

education on Best Practices in Homebuilding™. Although the curriculum includes

interaction between the training and the trainee and provides real-world best practice

solutions, the training program lacked a pedagogy framework. The primary objectives

of the training program were to train the construction workers about safety regulations,

including how to prevent falls in the workplace and how to maintain safety on stairs and

ladders. The training program contained two modules:

- Module 1, Fall safety basics: Addressed the hazards of falling on the
  jobsite and introduced fall protection
- Module 2, Stairways and ladders: Explained how to ensure fall
  protection for workers on stairways and ladders

Each module followed the same format. Both modules were divided into two lessons

each of which consisted of the following features:

- Learning Objectives: Explained the purpose of the lesson
- The Big Idea: Explained the major concept for the lesson
- Safety Information: Discussed workplace hazards and how to identify,
  avoid, and control them

- Click Thru: Displayed examples of hazards and ways to control hazards in the workplace

- Try It: Displayed an interactive quiz covering safety information covered in the lesson

In addition, the CTP was available in English and Spanish and included an audio option participants could select. To ensure translation fidelity, a bilingual (Spanish and English) individual translated the English versions of the script for the video into Spanish and then a second bilingual individual translated it back to English to assure comparable meaning (Ang et al., 2003; Brislin, 1980; Triandis, 1976). Below is a screen shot (Figure 13) of the layout and content used for the training programs in English. The complete set of screenshots for the Spanish and English versions of the control and experimental training programs can be found in Appendix F.


Figure 13. Screen shot of control training program page (adapted from BuildIQ®, with permission).

4.3. Experimental Training Program (CTP)

The ETP was developed using information about perceived organizational support elicited from the participants during the semi-structured interviews in Phase One. The themes of organizational support (supportive supervisor, supervisor involvement, feedback, motivation) provided from the participants were translated into tangible sources that could be embedded into the ETP. To ensure the participants assigned to either the control and experimental training programs were being trained on the same information and in the same way, both training programs used the same content and design layout (Table 13). Below are screen shots (Figures 14 and 15) of the layout and content used for the training programs in English. The complete set of screenshots for the Spanish and English versions of the control and experimental training programs can be found in Appendix G.
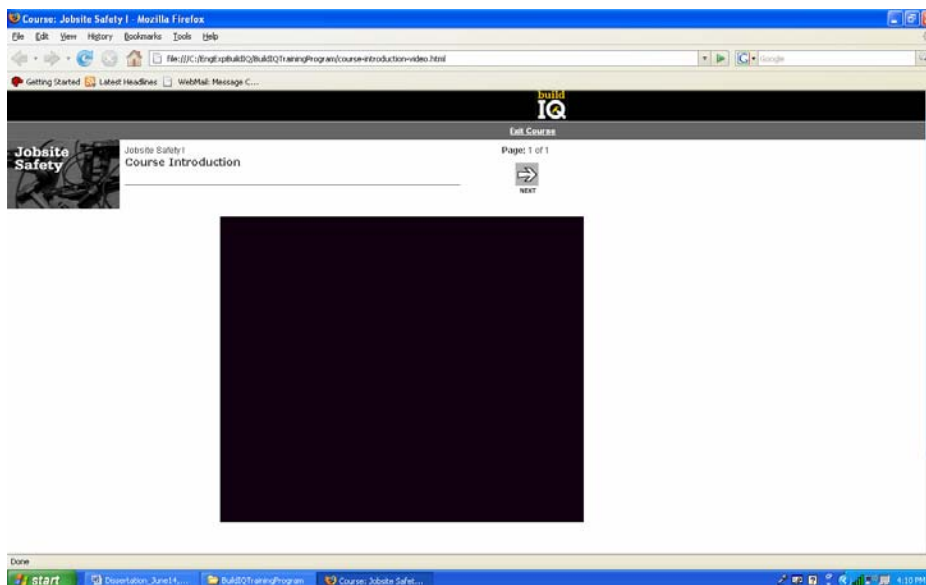
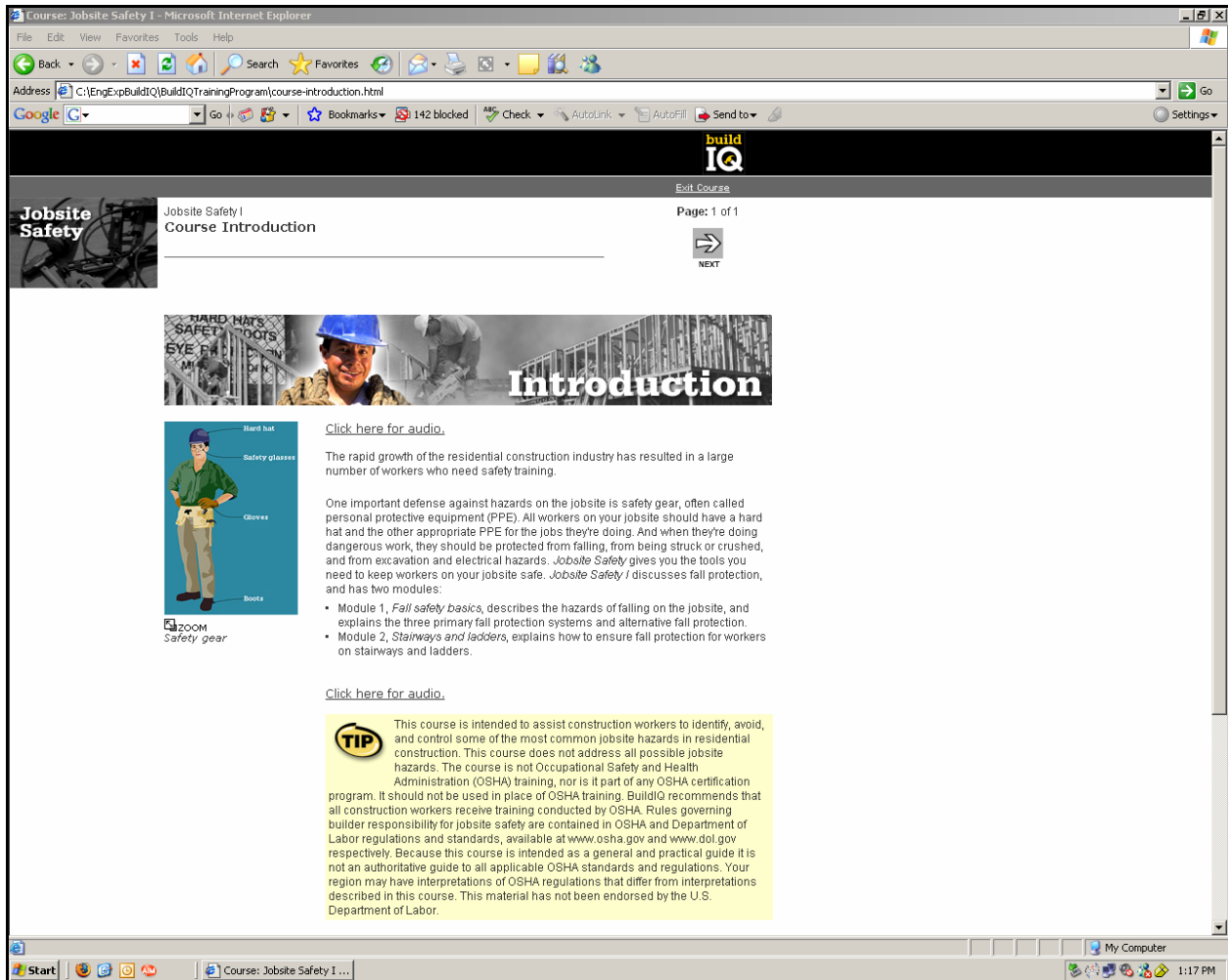Figure 14. Screen shot of video from experimental page (adapted from BuildIQ®, with permission).

Figure 15. Screen shot of experimental page (adapted from BuildIQ®, with permission).

4.4. Embedded Organizational Support

The difference between the two training programs was that the ETP had sources of organizational support embedded in the training (Table 13). The sources of organizational support were selected based on their ability to be successfully embedded the sources in a web-based safety training program—primarily as video material. Table 16 displays the sources of organizational support that were embedded in the ETP and a description of how the source was embedded in the training program.

Table 13. Overview of the features of the control and experimental training programs.

Features of the Control and Experimental Training Programs		
	Control Training Programs (BuildIQ® version)	**Experimental Training Programs** (Build IQ® version with embedded perceptions of organizational support)
Format	Web-based	Web-based
	Self-paced	Self-paced
	14-20 point text size	14-20 point text size
	Audio in Spanish and English	Audio in Spanish and English
	Spanish and English	Spanish and English
Layout	2 modules (fall safety basics and stairways and ladders)	2 modules (fall safety basics and stairways and ladders)
	16 examples of hazards and ways to control hazards in the workplace	16 examples of hazards and ways to control hazards in the workplace
	3 interactive assessments, 1 at the end of each lesson	3 interactive assessments, 1 at the end of each lesson
Media	None	3 videos to demonstrate organizational support
Perceptions of organizational support	None	Supervisor support
		Supervisor involvement to promote safety behavior
		Supervisor feedback

Table 14. Sources of perceived organizational support (POS) sources embedded in the experimental training program.

Theme	Coding Unit	How POS is Embedded into the Experimental Training Program	Tool used to Deliver POS	Example of Text used in Video
Characteristics of supportive supervisor	Praise workers for accomplishments verbally	Verbal encouragement/praise from supervisor at end of modules	Feedback and conclusion video	*Congratulations, you have completed the safety training on falls, stairs, and ladders. Good job.*
	Provide pay raises/promotions	Supervisor discusses that not having injuries/accidents result in not missing work, which can lead to pay raises, promotions, and job security	Welcome video	*In addition to saving lives, being safe on the construction site and following proper safety procedures can lead to pay raises and you keeping your job.*
Supervisor involvement to promote safety behavior	Discuss safety behavior	Supervisor discusses fatalities in construction and relationship to individual safety behavior and safety in the work environment	Welcome video	*In 2005, 5,702 workers were fatally injured on the job. Out of the 5,702 workers fatally injured, 917 were Latino workers. Among these 917 Latino workers, 625 were Latino workers not born in the U.S. This is the highest number ever for fatalities for Latino workers.* *It is very important that you carefully read or listen to the training information so you can understand and be aware of safety practices that can save your life and the lives of workers around you. In addition to saving lives, being safe on the construction site and following proper safety procedures can lead to pay raises and you keeping your job. Please remember to be safe in the workplace. If you see someone not being safe, please show the person the safe way of doing things or let me know. I am here to help keep our workplace safe.*

Table 14, con't. Sources of perceived organizational support (POS) sources embedded in the experimental training program.

Theme	Coding Unit	How POS is Embedded into the Experimental Training Program	Tool used to Deliver POS	Example of Text used in Video
Examples of feedback	Announce accomplishments	Participants receive a certificate of completion signed by the supervisor	Certificate given to participant at end of training program	*You will receive a certificate for completing the training and you will be paid your hourly rate for two hours for completing the training program. In addition, you will receive free personal protective equipment for successfully completing each lesson. There are 2 lessons you must complete, one on fall safety and one on stairs and ladder safety. After successfully completing the fall safety, you will receive a free pair of gloves, and after completing the stairs and ladder safety, you will receive a free hardhat.*
	Bonuses/Rewards	Participants receive free PPE and paid hourly wage for completing training program	Welcome video	
	Pay raises	Supervisor discusses that not having injuries/accidents result in not missing work, which can lead to pay raises, promotions, and job security	Welcome and conclusion video	*In addition to saving lives, being safe on the construction site and following proper safety procedures can lead to pay raises and you keeping your job.*
	Job security	Supervisor discusses that not having injuries/accidents result in not missing work, which can lead to pay raises, promotions, and job security	Welcome and conclusion video	*In addition to saving lives, being safe on the construction site and following proper safety procedures can lead to pay raises and you keeping your job.*

Table 14, con't. Sources of perceived organizational support (POS) sources embedded in the experimental training program.

Theme	Coding Unit	How POS is Embedded into the Experimental Training Program	Tool used to Deliver POS	Example of Text used in Video
Examples of motivators	Raises	Supervisor discusses that not having injuries/accidents result in not missing work, which can lead to pay raises, promotions, and job security	Welcome and conclusion video	*In addition to saving lives, being safe on the construction site and following proper safety procedures can lead to pay raises and you keeping your job.*
	Verbal praise	Verbal encouragement/praise from supervisor at end of modules	Feedback and conclusion video	*Congratulations, you have completed the safety training on falls, stairs, and ladders. Good job.*
	Personal protective equipment (PPE)	Participants receive free PPE	Welcome video and participants debriefed at end of study that training program was a fictional scenario so they would not receive PPE, but they could purchase PPE with their $15 compensation	*...you will receive free personal protective equipment for successfully completing each lesson. There are 2 lessons you must complete, one on fall safety and one on stairs and ladder safety. After successfully completing the fall safety, you will receive a free pair of gloves, and after completing the stairs and ladder safety, you will receive a free hardhat.*

Three videos (welcome, feedback, and conclusion) were embedded into the training program to integrate the perceived organizational support. All of the videos were completed in English and Spanish for the two training programs. To ensure translation fidelity, a bilingual (Spanish and English) individual translated the English versions of the script for the video into Spanish and then a second bilingual individual translated it back to English to assure comparable meaning (Ang et al., 2003; Brislin, 1980; Triandis, 1976). The welcome video, which occurred at the beginning of the ETP, featured the supervisor of the company introducing himself to the construction worker and then discussing each of the following:

- Statistics of falls in construction

- Importance of safety in the work environment

- Importance of the safety training program

- How to successfully complete the training program

- Role of workers to ensure safety in the work environment

- Results of safe behavior in the work environment (reduced number of injuries and accidents, pay raises, promotions)

- Rewards for completing the training (personal protective equipment, including safety glasses and hard hat)

- Payment for completing training (paid hourly wage)

The second video, the feedback video, came after the completion of the first safety module on falls. In the feedback video, the supervisor did the following:

- Congratulated the construction worker for completing the first safety
  module

- Encouraged workers to see him on the job site if they had more
  questions about what they learned or needed additional information to
  clarify the training material in module

- Reemphasized the importance of training and safety in the workplace

The conclusion video was shown at the end of the training program. In the
conclusion video, the supervisor did the following:

- Congratulated the construction worker for completing the safety
  training program

- Encouraged the workers to see him on the job site if they had more
  questions about what they learned or needed additional information to
  clarify the training material in module

- Discussed the statistics of falls in construction, the importance of
  safety in the work environment, the role of workers to ensure safety in
  the work environment, and the results of safe behavior in the work
  environment (reduced number of injuries and accidents, pay raises,
  promotions)

4.5. Formative Evaluation

A formative evaluation approach adapted from Dick, Carey, and Carey (2001)
was conducted to test the ease of use of the ETP (e.g., ability to understand instructions
and navigate through lessons), to ensure the training program showed evidence of

perceived organizational support, and to uncover any technical or content problems.

The Dick, Carey, and Carey process was used to evaluate the ETP because of its

systematic and iterative approach. Dick et al. (2001) suggest the use of expert

reviewers to make certain the training program: 1) meets the needs and goals of the

organization, 2) content is complete, accurate, and current, and 3) principles of learning,

instruction, and motivation clearly evident in the materials. Where as, the one-to-one

evaluations with trainees are suggested to identify and remove obvious errors in the

instruction, and to obtain initial performance indicators and reactions to the content by

the trainees. Expert reviews were conducted with two subject matter experts, a usability

expert and a perceived organizational support expert, and one-to-one evaluations were

conducted with two members of the target audience for the training program, a Latino

and non-Latino construction worker.

4.5.1. Expert Reviews

Expert reviewers were performed before testing each training program, which

was accomplished through dry runs with representative users, to ensure organizational

support was embedded in the ETP. Subject matter experts were solicited on listserves

and Craig's List, an online advertisement website, and the two subject matter experts

selected for the evaluation were selected because of their high level of proficiency with

respect to usability or perceived organizational support. The usability expert was a

usability analyst with over eight years of experience in user-centered research and

interface design. Her research areas include visual programming of educational

simulations with end user programming, usability evaluation, and computer supported

collaborative work. The perceived organizational support expert was a Ph.D. candidate

in psychology with four years of teaching and research experience related to social exchange theory and perceived organizational support. Her area of research is work motivation. She has conducted studies related to worker motivation and Internet use, multitasking, and diversity. Construction safety experts were considered, but were not used for the formative evaluation because 1) construction safety experts reviewed the safety training programs and translated the content from English to Spanish and 2) the safety content was not being evaluated in this study.

4.5.2. One-to-One Evaluations

The one-to-one evaluations were performed using representative users of the training programs to identify and eliminate any prominent errors in the training programs. Past participants in a previous research endeavor related to construction were contacted to serve as evaluators for the training program, and two participants (one Latino and one non-Latino) were selected. Both the Latino and non-Latino users were construction workers in roofing employed by a small construction company with fewer than 20 employees.

4.6. Results and Discussion

For each evaluation, all of the participants completed the control and experimental training programs and evaluated both training programs by completing the training evaluator's questionnaire (Appendix H) and the perceived organizational support questionnaire for the training program (Appendix I). Tables 15 and 16 display the results from the training evaluator's questionnaire (Appendix H) and the perceived organizational support questionnaire for the training program (Appendix I), respectively.

Both scales were Likert scales that ranged from one (strongly disagree) to five (strongly agree). The mean total score for the training evaluator's questionnaire and the perceived organizational support questionnaire for the training program were higher for the experimental group compared to the control group. Higher scores for the experimental group indicate that more organizational support was embedded in the ETP.

Table 15. Results of evaluators' scores for evaluation of organizational support embedded in training program.

Question/Measure	Control Training Program Mean Score *(Standard Deviation)*	Experimental Training Program Mean Score *(Standard Deviation)*
1. This training provided me with feedback to help me understand how to apply this information.	2.67 (1.52)	4.67 (0.57)
2. A supervisor was involved with this training.	2.00 (1.73)	4.33 (0.58)
3. There was a reward for completing this training.	1.33 (0.58)	4.33 (0.58)
4. Completing the training will help me keep my job.	3.67 (0.58)	4.33 (0.58)
5. Completing the training will help me get promoted.	3.67 (0.58)	4.33 (1.16)
Total Mean Score	**13.33 (4.04)**	**22.00 (2.65)**

Table 16. Results of evaluators' scores for POS questionnaire for training program.

Question/Measure	Control Training Program Mean Score (Standard Deviation)	Experimental Training Program Mean Score (Standard Deviation)
1. Providing training shows that my supervisor values my contribution to the company I work for.	4.00 (0.00)	4.00 (1.41)
2. The training strongly considers my goals and values.	3.25 (0.83)	3.67 (0.47)
3. The training will give me help when I have a question about safety at work.	3.75 (1.30)	4.33 (0.47)
4. Providing training shows that my supervisor cares about my well-being.	4.00 (0.71)	5.00 (0.00)
5. The training will help me move up in the company I work for.	4.00 (1.00)	4.33 (0.47)
6. Providing training shows that my supervisor cares about my satisfaction at work.	3.50 (0.50)	4.33 (0.94)
7. Providing training shows that my supervisor has very little concern for me.	1.25 (0.50)	1.75 (0.94)
8. Providing training shows that my supervisor cares more about me than making a profit.	2.50 (1.50)	3.67 (1.25)
9. My supervisor tried to make the training as interesting as possible.	3.75 (0.43)	3.67 (0.94)

Table 16, con't. Results of evaluators' scores for POS questionnaire for training program.

Question/Measure	Control Training Program Mean Score (Standard Deviation)	Experimental Training Program Mean Score (Standard Deviation)
10. This training provided me feedback to help me understand how to apply this safety information to my job.	4.00 (1.23)	4.33 (0.47)
11. My supervisor was involved with this training.	2.00 (1.23)	4.00 (0.82)
12. There was a reward for completing this training.	2.00 (1.23)	3.67 (1.25)
13. Receiving a reward made me pay more attention to the information in the training.	2.50 (1.67)	2.67 (0.47)
14. Completing the training will help me keep my job.	3.75 (0.43)	4.33 (0.47)
15. Completing the training will help me get promoted.	4.25 (0.83)	4.33 (0.47)
16. Receiving feedback during the training motivates me to apply what I learn during the training to my job.	4.50 (0.50)	3.67 (0.94)
17. My supervisor being involved with the training motivates me to apply what I learn during the training to my job.	2.25 (1.30)	4.33 (0.47)

Table 16, con't. Results of evaluators' scores for POS questionnaire for training program.

Question/Measure	Control Training Program Mean Score *(Standard Deviation)*	Experimental Training Program Mean Score *(Standard Deviation)*
18. Receiving a reward at the end of the training motivates me to apply what I learn during the training to my job.	2.25 (1.30)	2.67 (1.70)
19. Knowing that completing the training will help me keep my job motivates me to apply what I learn during the training to my job.	4.50 (0.87)	4.33 (0.471)
20. Knowing that completing the training will help me get promoted motivates me to apply what I learn during the training to my job.	4.75 (0.43)	4.33 (0.471)
Total Score	70.00 (8.69)	80.00 (9.80)

The formative evaluation was conducted to ensure the training program showed evidence of perceived organizational support, and to uncover any technical or content problems. Table 17 displays the feedback gathered from the formative evaluation and the modifications made to the training programs based on the feedback.

Table 17. Feedback and modifications from formative evaluation.

Feedback	Modification
1. Feedback present in experimental training program and feedback not present in control training program	None
2. Supervisor involvement present in experimental training program and supervisor involvement not present in control training program	None
3. Reward present in experimental training program and reward not present in control training program	Reward presented in experimental training program was changed from monetary reward to personal protective equipment
4. Completing the control and experimental training programs provide job security	Job security emphasized more (from one to three times) in experimental training program
5. Completing the control and experimental training programs can result in promotion	Promotion emphasized more (from one to three times) in experimental training program
6. Control and experimental training programs shows supervisor value contribution to organization	None
7. Control and experimental training programs considers the goals and values of the trainees	None
8. Control and experimental training programs provide safety knowledge	None
9. Control and experimental training programs demonstrates supervisor support	None

Table 17, con't. Feedback and modifications from formative evaluation.

Feedback	Modification
10. Control and experimental training programs are interesting	None
11. Receiving rewards do not motivate trainees to apply knowledge gained from training (control and experimental) to the workplace	Monetary rewards removed from experimental training program
12. Linking training to job security motivates trainees to apply knowledge gained from training (control and experimental) to the workplace	Job security linked to training and emphasized more (from one to three times) in experimental training program
13. Linking training to promotion motivates trainees to apply knowledge gained from training (control and experimental) to the workplace	Promotion linked to training and emphasized more (from one to three times) in experimental training program

The results from this evaluation demonstrated that the experimental training program had the following perceived organizational support sources: supervisor involvement, feedback, and reward. Where as the control training program did not have these embedded sources of perceived organizational support. Although sources of perceived organizational support was embedded in the experimental training program, the evaluation revealed that providing training, regardless of the type of training (presence or absence of sources to perceived organizational support) demonstrates supervisor support. Therefore, training was viewed as a source of perceived organizational support.

The formative evaluation also revealed that linking training to job security and promotion motivates trainees to apply knowledge gained form training to the workplace. These results were consistent with the literature (Wayne et al., 1997; Wayne et al., 2002) stating that job security and promotions are associated with perceived organizational support. However, two sources of perceived organizational support, job security and promotion, were embedded in the experimental training program, but the experimental training program did not have high ratings of perceived organizational support for the items. Therefore, information about job security and promotions were adjusted in the experimental training program. Information about job security and promotions were repeated three times in the videos throughout the training program.

Surprising results about rewards originated in Phase Two. The evaluation revealed that receiving rewards do not motivate trainees to complete training or apply knowledge gained from training to the workplace. This contradicts Condly, Clark, and Stolovitch (2003) research findings that rewards or incentives can significantly increase work performance and worker motivation. Therefore, the rewards provided in the experimental training program were modified to accommodate the findings from the evaluation. Instead of providing monetary rewards and bonuses for completing training, protective property equipment was provided. After modifying the experimental training program based on the results of the formative evaluation, Phase Three tested the affect of the control and experimental training program on the dependent variables (perceived organizational support, distributive justice, safety climate, and safety behavior) of the research endeavor.

4.7. Conclusion

The purpose of Phase Two was to use the output of Phase One (sources of perceived organizational support) to develop the ETP, a safety training program with embedded sources of perceived organizational support. The following sources elicited from Phase One were embedded into the ETP in Phase Two:

Supportive supervisor

Verbal praise for completing training program

Opportunity for pay raises and promotions

Supervisor involvement to promote safety behavior

Discussion of desired safety behavior

Recognition for training accomplishments

Free PPE

Opportunity for pay raises

Supervisor feedback

Opportunity for job security

Motivation

Opportunity for raisers

Free PPE

Verbal praise for completing training program

All of these sources were embedded into the ETP through videos. After developing the ETP, the training program was evaluated and modified based on the experts and users' feedback. Then in Phase Three, the modified ETP and the CTP were tested to

determine the training programs' impact on perceived organizational support,

distributive justice, safety climate, and safety behavior.

CHAPTER 5. PHASE THREE: PRETEST-POSTTEST CONTROL GROUP DESIGN

Phase Three was conducted to investigate the impact of safety training on perceived organizational support, distributive justice, perceived safety climate, and safety behavior and to answer Research Question Four: *How does safety training affect the perceptions of organizational support, distributive justice, safety climate, and safety behaviors of Latino and non-Latino workers in small construction firms?* To answer this question, changes in perceived organizational support, perceived safety climate, and safety behavior from pretest to posttest were examined. It was hypothesized that the social exchange (perceived organizational support and distributive justice), perceived safety climate, and safety behavior ratings of the experimental group (the group that received safety training) would increase from pretest to posttest, whereas no change would occur in the social exchange, perceived safety climate, and safety behavior ratings of the control group (the group that did not receive safety training). This hypothesis was tested by using a pretest-posttest control group experimental design. A pretest-posttest control group experimental design was selected to minimize threats to internal validity (e.g., selection, history, maturation, differential effects of testing) (Campbell and Stanley, 1963; Martin, 2000), and two-way repeated measures ANOVAs were performed to determine if significant differences from pretest to posttest occurred for perceived organizational support, distributive justice, perceived safety climate, and safety behavior. Alpha was set at a level of 0.05, and the data analysis revealed that the main effect for time and the interactions between time and ethnic group and time and training group were significant ($p < .05$). Tukey's Honestly Significantly Different (HSD) was conducted to examine the significant differences.

5.1. Method

5.1.1. Experimental Design

This study used a pretest-posttest control group design with two between-subject factors (Campbell and Stanley, 1963; Martin, 2000):

Experimental Group O_1 X O_2

Control Group O_1 O_2

The main factors were ethnic group and training group. Detailed information about the levels and type of each factor is provided in Table 18.

Table 18. Factor levels and types.

Factor Name	Levels	Type
Ethnic group (A)	Latino and Non-Latino	Between-Subject, Fixed Effects
Training group (B)	Control and Experimental	Between-Subject, Fixed Effects
Subjects (S)	$S_1…S_{60}$	Random Effects

In Phase One, the study consisted of 60 male construction workers (30 Latino, 30 non-Latinos). However, in the interim between Phase One to Phase Three, 14 participants left the study because of job changes or relocation. Thus, Phase Three consisted of 46 male construction workers (19 Latino, 27 non-Latinos). All of these participants were randomly assigned to the experimental or control group. Both groups were administered counterbalanced questionnaires.

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Table 19 illustrates the data matrix for the pretest-posttest control group design.

Table 19. Data matrix.

		Training Group	
		Control	Experimental
Ethnic Group	Latinos	S_1	S_{22}
		S_2	S_{23}
		S_3	S_{24}
		…	…
		S_9	S_{31}
	Non-Latinos	S_{10}	S_{32}
		S_{11}	S_{33}
		S_{12}	S_{34}
		…	…
		S_{21}	S_{46}

5.1.2. Independent Variables

The independent variables for this study were training group and ethnic group. Both variables were between-subject factor with two levels. The two levels for training group were control and experimental (training embedded with sources of organizational support), and the two levels for ethnic group were Latino and non-Latino. To help ensure the equivalency of the groups, the construction businesses selected for the study were limited to businesses that met the following criteria:

- Employed 20 or less employees

- Employed individuals of Latino and non-Latino ethnicity

- Did not provide safety training for their employees

5.1.3. Dependent Variables

As discussed in Section 3.2.3., the four dependent variables in Phase Three were perceived organizational support (Appendix B), distributive justice (Appendix B), safety climate (Appendix C), and safety behavior (Appendix C).

5.1.4. Participants

Nineteen Latino and 27 non-Latino construction workers participated in Phase Three. Since these participants also took part in Phase One of this research study, they met the same criteria set for participation in Phase Three. Phase Three took approximately two hours for each participant. At the completion of the study, all of the participants were compensated $7.50/hour for their participation in Phase Three.

5.1.5. Equipment and Apparatus

Questionnaires

All participants completed alternate forms of the pre- and post-test knowledge assessment (Appendix J and K), reaction questionnaire (Appendix L), and a perceived organizational support for training questionnaire (Appendix I). The pre-test knowledge assessment was administered at the beginning of the study, and the post-test knowledge assessment was administered at the end of the study, almost two hours later. In addition, the participants completed the social exchange (Appendix B) and perceived safety climate (Appendix C) questionnaires that were completed in Phase One also. All of the survey instruments were written in both English and Spanish at a sixth-grade level to ensure the instruments were suitable for individuals with a lower level of literacy. The non-Latino participants completed the questionnaires in English

and the Latino participants completed the questionnaires in Spanish. Similar to procedures used in Phase One, for the questionnaires in Spanish, a bilingual (Spanish and English) individual translated the English version of the questionnaires into Spanish and then a second bilingual individual back-translated them to English to ensure comparable meaning (Ang et al., 2003; Brislin, 1980; Triandis, 1976).

Pretest and Posttest Knowledge Assessment

The alternate forms of the pre- and post-test knowledge assessment questionnaires (Appendix J and K) each included six questions related to the topics covered in the safety training program. The pre-test knowledge assessment was administered to collect baseline data for knowledge, and the post-test knowledge assessment was administered to measure knowledge retention (Goldstein and Ford, 2002). Moreover, the questions were made sufficiently difficult to reduce the chance of a ceiling effect (enabling all of the participants to have high scores close to or at the maximum score), but not too difficult to reduce the chance of a floor effect (all of the participants have very low scores close to or at the minimum score).

Reaction Questionnaire

Kirkpatrick's first level of evaluation, reaction, was measured to ensure the participants were motivated and interested in learning (Kirkpatrick, 2006; Winfrey, 1999). The reaction questionnaire (Appendix L) was comprised of 12 Likert questions and one open-ended question to measure the trainee's satisfaction with the training program, course structure, and course material (Morgan and Casper, 2000).

<u>Perceived Organizational Support for Training Questionnaire</u>

The perceived organizational support for training questionnaire (Appendix J) was adapted from the Perceived Organizational Support Scale (Eisenberger et al., 1986). Twenty Likert questions were modified to specifically address the level of perceived organizational support in the training program, rather than in the organization itself.

5.1.6. Procedures

The safety training program and data collection were conducted at eight different construction sites located throughout the Commonwealth of Virginia by the researcher and the bilingual undergraduate researcher. The researcher conducted the study with the non-Latino participants, and the undergraduate researcher conducted the study with the Latino participants. Participants read and signed the informed consent form (Appendix M) while the researcher read the informed consent form orally. After completing the informed consent, the participants completed the pre-test knowledge assessment questionnaire (Appendix J). Next, the participants completed either the control (Appendix F) or experimental (Appendix G) safety training program. Following completion of the safety training program, the participants completed the reaction questionnaire (Appendix L), post-test knowledge assessment (Appendix K), perceived organizational support for training questionnaire (Appendix I), social exchange questionnaire (Appendix B), and safety questionnaire (Appendix C).

5.2. Results and Discussion

This section presents the results and discussion of Phase Three of this research endeavor. The first section encompasses a brief overview of the study sample

demographics. The second section presents the results and discussion of the training

group (control and experimental) differences for perceived organizational support,

safety climate, and safety behavior, followed by the results and discussion of Latino and

non-Latino group differences for the different training programs. In the third section,

several explanations for the results attained in Phase Three are suggested. This

section concludes by proposing engineering design recommendations formed from this

study, as well as suggests a number of future research needs based on the limitations

of this study and gaps in the literature.

5.3. Demographics

The study sample for Phase One consisted of 60 male construction workers (30

Latino, 30 non-Latinos). However, in the interim between Phase One to Phase Three,

14 participants left the study because of job changes or relocation. Therefore, new

demographics data of the 46 participants (19 Latino, 27 non-Latinos) in Phase Three

are presented.

5.3.1. Age

Participants' ages ranged from 19-63 ($M = 33.96$, $SD = 13.20$).   The Latino

participants' ages ranged from 19-42 ($M = 25.21$, $SD = 6.26$), and the non-Latino

participants' ages ranged from 21-63 ($M = 25.21$, $SD = 6.26$).

5.3.2. Ethnicity

Participants were given the following choices of ethnicity: *African American,*

American Indian, Asian, Caucasian, Latino/Hispanic, Other, if so, what ethnicity? To

ensure the participants understood the term *ethnicity,* the researcher used common

terms used by the federal government to classify ethnicity (Office of Management and

Budget, 2003). Participants responded as follows: 30% (14) indicated African

American, 28% (13) indicated Caucasian, and 41% (19) indicated Latino/Hispanic.

5.3.3. Construction Experience

The number of years in construction as indicated by the participants on the

demographics questionnaire (Appendix A) was broken down into four groups as follows:

0-1 year, 2-5 years, 6-10 years, and more than 10 years. Figure 16 displays the

distribution of construction experience. Eleven indicated that they had been in

construction for 0-1 year, 10 indicated that they had been in construction for 2-5 years,

9 indicated that they had been in construction for 6-10 years, and 15 indicated that they

had been in construction for more than 10 years.

Construction Breakdown of Study Sample
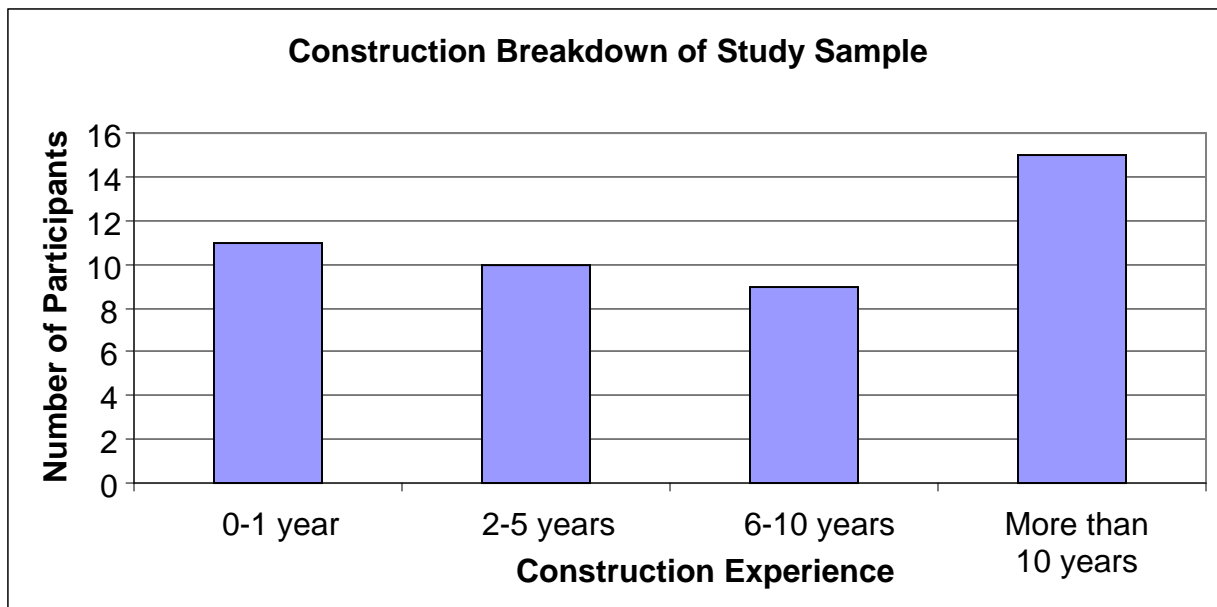
Figure 16. Construction experience for study sample.

Figure 17 displays the construction experience for each group, Latino and non-Latino sample. For the Latino sample, 7 participants indicated that they had been in construction for 0-1 year, 7 for 2-5 years, 3 for 6-10 years, and 2 for more than 10 years. For the non-Latino sample, 4 participants indicated that they had been in construction for 0-1 year, 3 for 2-5 years, 16 for 6-10 years, and 13 for more than 10 years. Similar to Phase One, the non-Latino sample had more experience in construction than their Latino counterparts. Because the non-Latino sample was an older sample than the Latino group, it was expected that the sample would have had more construction experience.
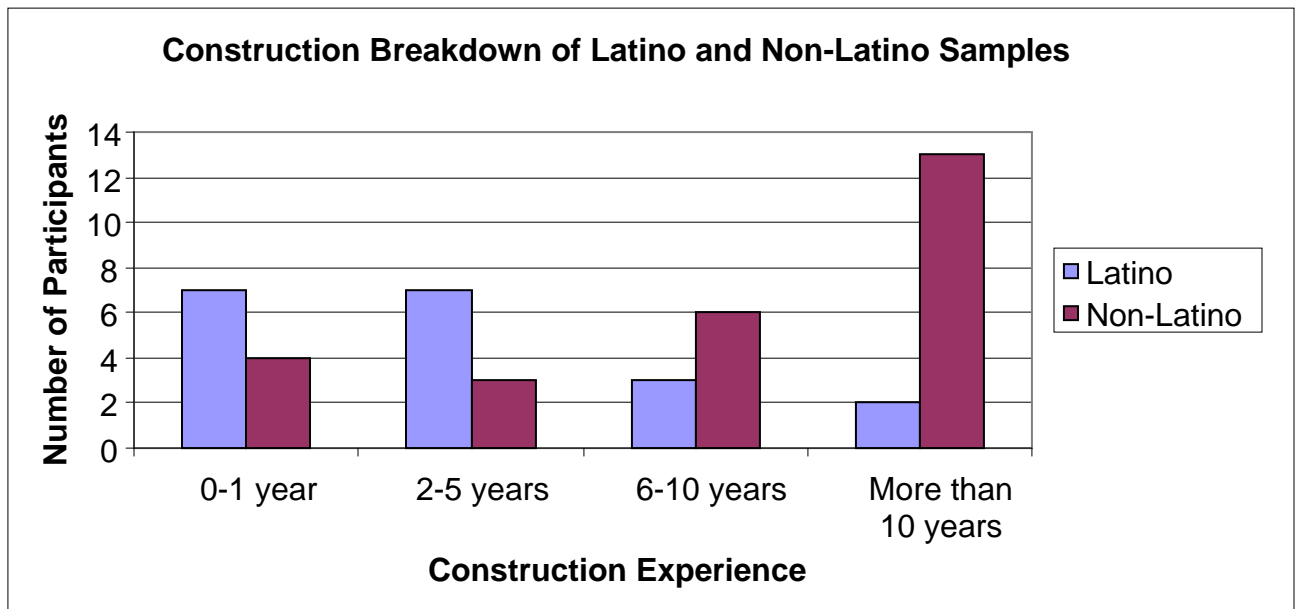
Figure 17. Construction experience for Latino and non-Latino samples.

5.3.4. Relationship Status

Table 20 displays the relationship status of the participants in the study. Among the construction workers, a larger percentage, 67% (20), of the Latino workers were

single, whereas the opposite was found for the non-Latino workers. Forty-seven

percent (14) of the non-Latino construction workers were married and 20% (6) of the

non-Latino construction workers were single. Again, this difference can be attributed to

the age difference between the Latino and non-Latino samples. The Latino workers

were younger—63% (19) of them were 25 years old or younger—and therefore many of

the Latino workers had not yet married.

Table 20. Relationship status of participants.

Relationship Status	Total Sample	Latino sample	Non-Latino sample
Single and never married	19	12	7
Single and divorced	7	1	6
Married	17	6	11
Married, but separated	3	1	2

5.3.5. Education Level

Figure 18 compares the highest level of education completed in the Latino and

non-Latino samples. Seventy-seven percent (21) of the non-Latino workers had at least

a high school diploma, while 84% (16) of the Latino workers had not yet earned a high

school diploma.
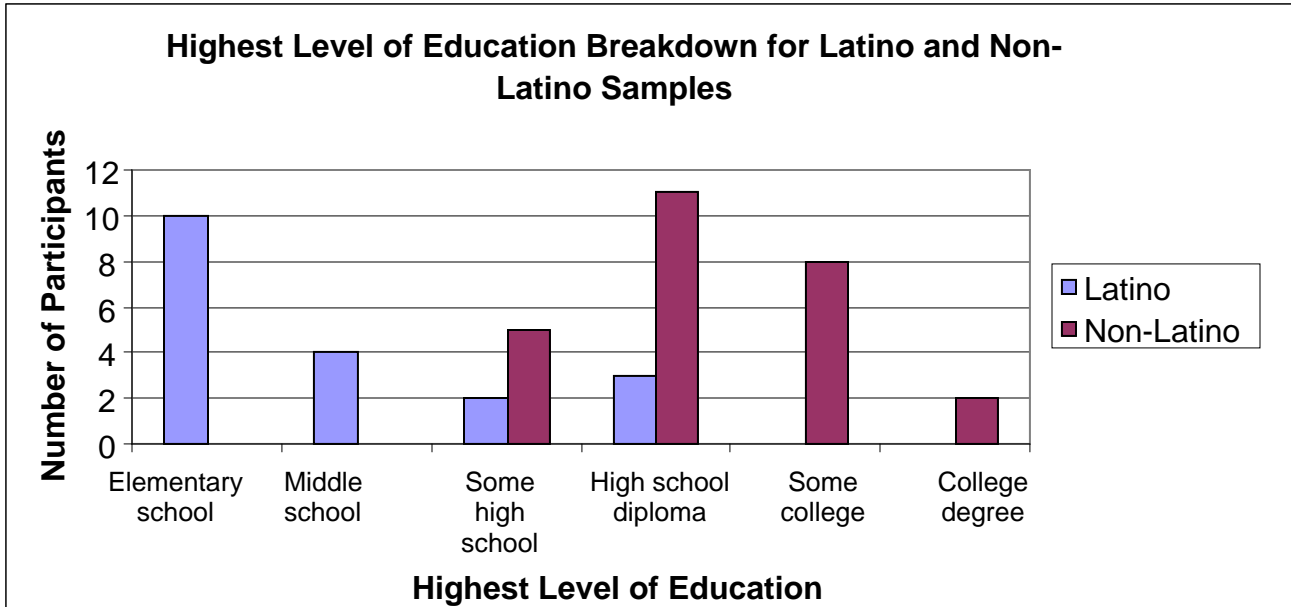
Figure 18. Highest education completed for Latino and non-Latino samples.

5.4. Repeated Measures ANOVA

For Research Question Four (*How does safety training affect the perceptions of organizational support, distributive justice, safety climate and safety behavior of Latino and non-Latino workers in small construction firms?*), it was hypothesized that the perceptions of the experimental group (the group that received safety training with embedded sources of organizational support) with regard to social exchange, safety climate, and safety behavior would improve as a result of training. To test this hypothesis, a two-way repeated measures ANOVA with two between-subject factors (training group and ethnic group) was used to analyze the participants' pre- and post-test scores for all dependant variables (perceived organizational support, distributive justice, safety climate, and safety behavior).

5.4.1. Perceived Organizational Support

For perceived organizational support, it was hypothesized that the experimental group's score would be higher than the control group's score. Although this hypothesis was not completely substantiated in this study, from pre-test to post-test, the repeated-measures ANOVA results revealed a significant increase ($F_{1,42} = 12.30$, $p < .01$) in perceived organizational support (Figure 19). Overall, the participants' perceived organizational support post-test score ($M = 35.75$, $SD = 4.24$) was significantly higher than the participants' perceived organizational support pre-test score ($M = 29.02$, $SD = 11.30$). In addition, the results of the repeated measures ANOVA revealed a significant interaction ($F_{1,42} = 20.23$, $p = < .001$) for the perceived organizational support score difference from pre-test to post-test based on ethnic group (Figure 20). Post hoc results indicated that the Latino workers' scored significantly higher on the perceived organizational support post-test ($M = 39.08$, $SD = 3.64$) than the non-Latino participants ($M = 34.29$, $SD = 6.09$).
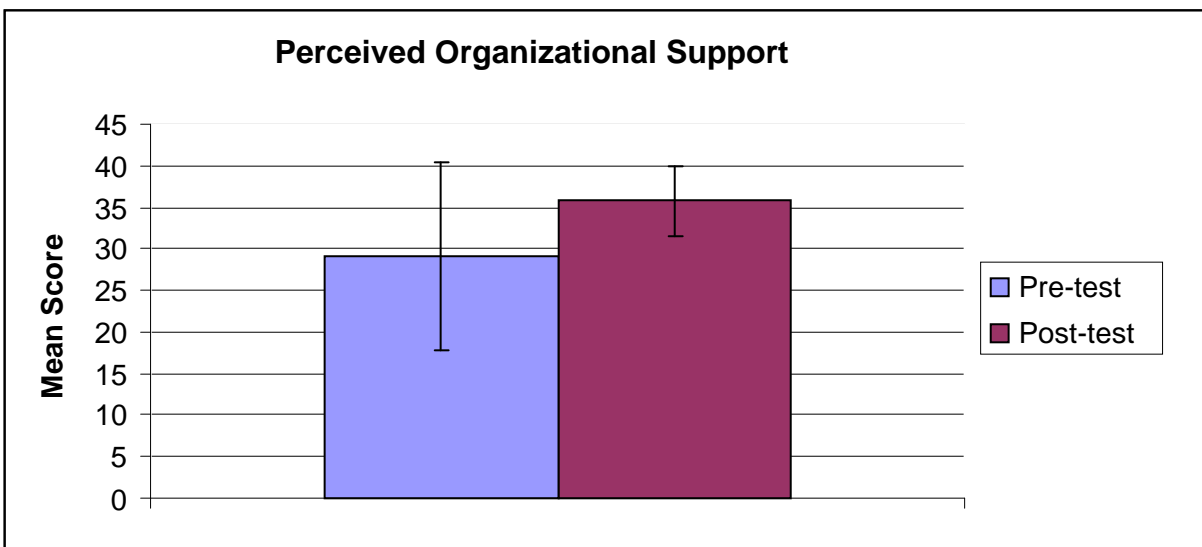
Figure 19. Perceived organizational support pre-test and post-test scores (p < .01).
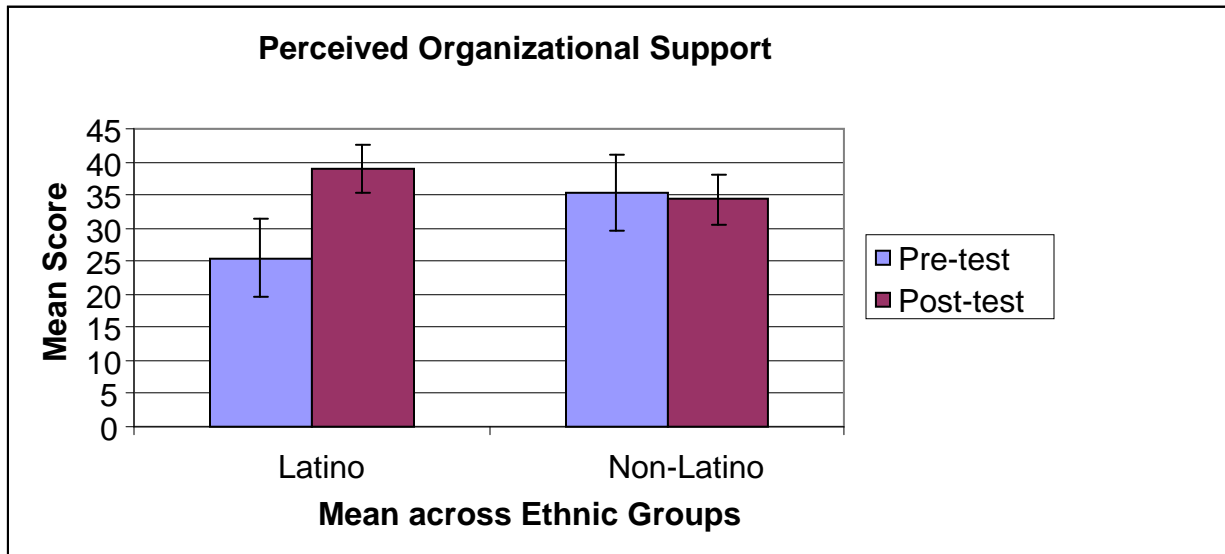
Figure 20. Comparison of perceived organizational support by ethnic groups (p < .001).

Prior to the study, none of the workers were exposed to safety training within their organization. Therefore, the overall increase in perceived organizational support scores from pre-test to post-test imply that providing training with or without embedded sources of organizational support could have resulted in higher perceptions of organizational support. These results are consistent with Wayne et al. (1997) study in which training was used as a source of perceived organizational support.

Based on the demographic questionnaires, all of Latino construction workers were born in Latin American countries (e.g., Guatemala, Honduras, and Mexico), and the majority of them (70%) had been in the U.S. for less than five years. As a result, many of the Latino workers may not have been accustomed to practicing safe behaviors and receiving safety training because construction safety regulations in the U.S. tend to be more stringent than in Latin American countries (Ali, 2006). Therefore, it is reasonable to presume that Latino workers believed that safety training demonstrated

an organization's support and concern for the well-being of its workers. Conversely, non-Latino workers may have reported lower ratings of perceived organizational support because they were more likely to believe that because safety training was required by law, it was a mandated display of an organizational support rather than a voluntary representation of organizational support.

5.4.2. Distributive Justice

With respect to distributive justice, the results of this study supported the hypothesis that the experimental group's score would be higher than the control group's score. From pre-test to post-test, the repeated-measures ANOVA results revealed a significant increase ($F_{1,42}$ = 7.89, p = < .01) in distributive justice (Figure 21). Overall, the participants' distributive justice post-test score (M = 17.84, SD = 2.46) was significantly higher than the participants' perceived organizational support pre-test score (M = 15.58, SD = 5.49). The results of the repeated measures ANOVA also revealed a significant interaction ($F_{1,42}$ = 6.43, p = < .05) for the distributive justice score difference from pre-test to post-test based on training group (Figure 22). Post hoc results indicated that the experimental group scored significantly higher on the distributive justice post-test (M = 20.11, SD = 2.47) than the control group (M = 18.62, SD = 4.15). Even though higher distributive justice scores occurred for the experimental group, it could not be concluded that the embedded sources of organizational support, alone, contributed to this increase because the perception of distributive justice was increased among all the participants, both control and experimental groups. However, it was possible that the embedded perceived organizational support sources in the experimental training program had an indirect impact on the significant increase

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between the control and experimental training programs. Prior research findings

(Greenberg, 1990; Fabrego and Starkey, 2001) have suggested that a high perception

of organizational support is typically associated with high ratings of distributive justice.
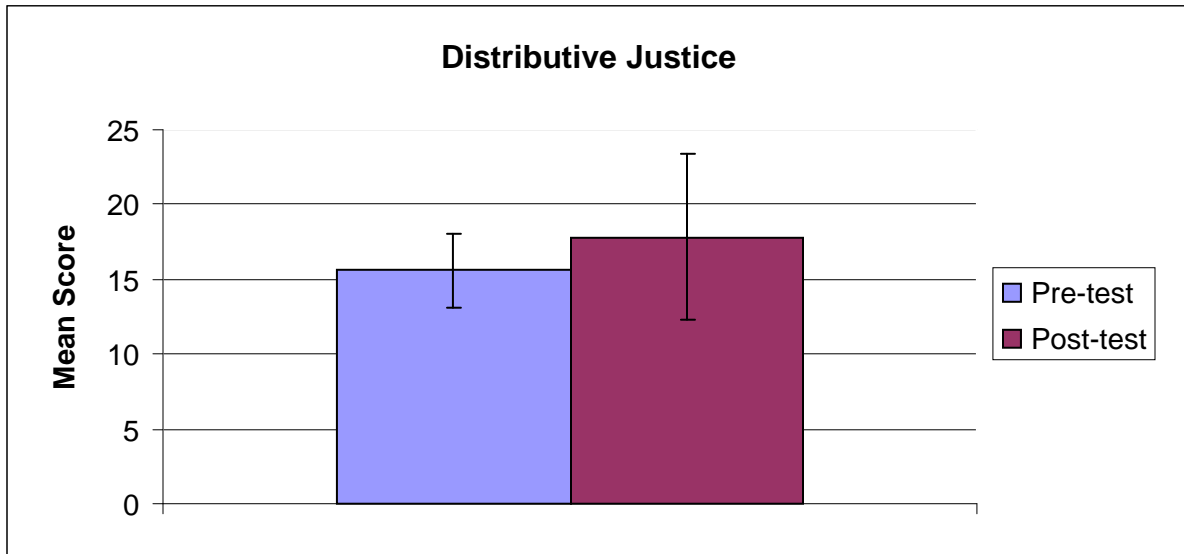
Figure 21. Distributive justice pre-test and post-test scores (p < .01).
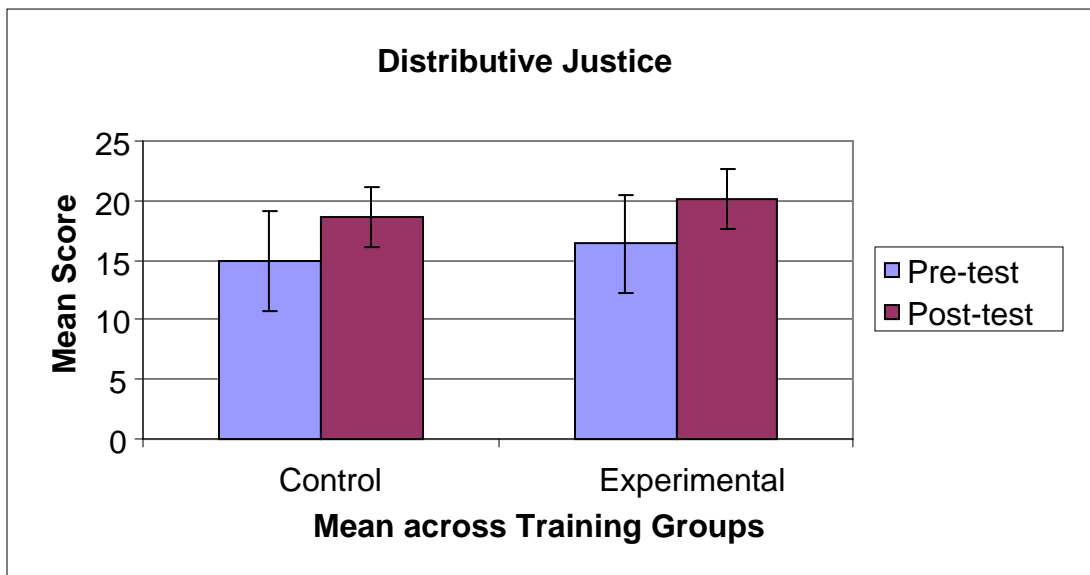
Figure 22. Comparison of distributive justice by training groups (p < .05).

Although not hypothesized, the results of the repeated measures ANOVA revealed a significant interaction ($F_{1,42}$ = 7.48, p = < .01) for the distributive justice score difference from pre-test to post-test based on ethnic group (Figure 23). Post hoc results indicated that the Latino workers scored significantly higher on the distributive justice post-test (M = 19.86, SD = 4.97) than the non-Latino workers (M = 18.25, SD = 2.22). As discussed for perceived organizational support, the ethnic group difference can be a result of the Latino workers not being accustomed to safe working conditions and non-Latino workers expecting safe working conditions.
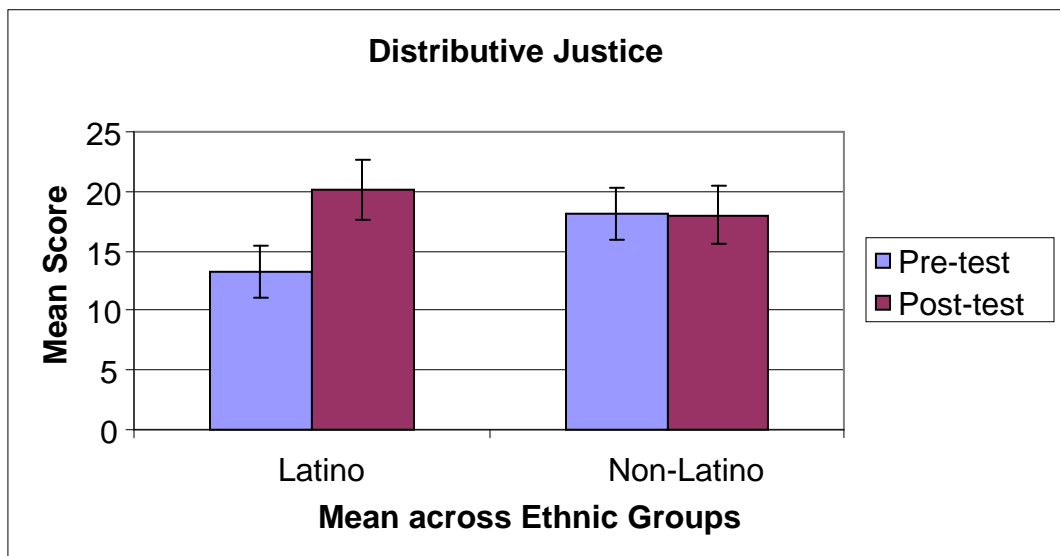
Figure 23. Comparison of distributive justice by ethnic groups (p < .01).

5.4.3. Safety Climate

For safety climate, the results of this study supported the hypothesis that the experimental group's score would be higher than the control group's score. From pre-test to post-test, the repeated-measures ANOVA results revealed a significant interaction ($F_{1,42}$ = 5.94, p = < .05) for the safety climate score difference from pre-test

to post-test based on training group (Figure 24). Post hoc results indicated that the experimental group scored significantly higher on the safety climate post-test ($M =$ 39.73, $SD = 11.57$) than the control group ($M = 36.10$, $SD = 12.40$). The higher safety climate score for the experimental group could have contributed to the embedded sources of perceived organizational support in the experimental training program. Unlike the control training program, through videos, the experimental training program presented statistics of falls in construction and explicitly emphasized the importance of safety in the work environment, the importance of a safety training program, the workers role to ensure safety in the work environment, and the results of safe behavior in the work environment (e.g., reduced number of injuries and accidents). These additions could be responsible for the higher safety climate perception for the experimental group.

Figure 24. Comparison of safety climate by training groups (p < .05).

5.5. Additional Analyses

5.5.1. Two-way ANOVA

A two-way ANOVA (training group and ethnic group) was used to analyze the participants' scores for reaction and perceived organizational support for training. The results of the two-way ANOVA for reaction revealed that the interaction between training group and ethnic group was significant ($p < .05$). For perceived organizational support for training, the two-way ANOVA revealed that the main effect for training was significant ($p < .01$). Tables 21 and 22 display the ANOVA summary tables for reaction scores and perceived organizational support for training score, respectively.

Table 21. ANOVA summary table for reaction scores.

Factor	DF	SS	MS	F-value
Training group	1	0.91	0.91	0.05
Ethnic group	1	3.93	3.93	0.21
Training group x Ethnic group	1	99.52	99.52	5.24*

*$p < .05$

For reaction scores, there was a significant interaction between training group and ethnic group ($F_{1,44} = 5.24$, $p = < .05$) (Figure 25). Post hoc results indicated that the experimental group had significantly higher reaction scores ($M = 47.89$, $SD = 5.10$; $M = 46.93$, $SD = 3.32$) than the control group ($M = 44.70$, $SD = 0.60$; $M = 44.08$, $SD = 6.38$ for the Latino and non-Latino samples, respectively.

Past research has not found evidence that media influences learning. Several authors (Clark, 2001; Clark and Salomon, 1986; Kozma, 1994) have concluded that learning benefits do not exist because of any medium or combination of medium. For

this study, the insignificant factors are also of interest, specifically training group. The lack of significance between the two training groups for the participants' reaction implies that including an additional medium (e.g., video) to deliver the sources of perceived organizational support in the experimental training program confirms prior research stating that media (e.g., video) does not affect the content of the training program.
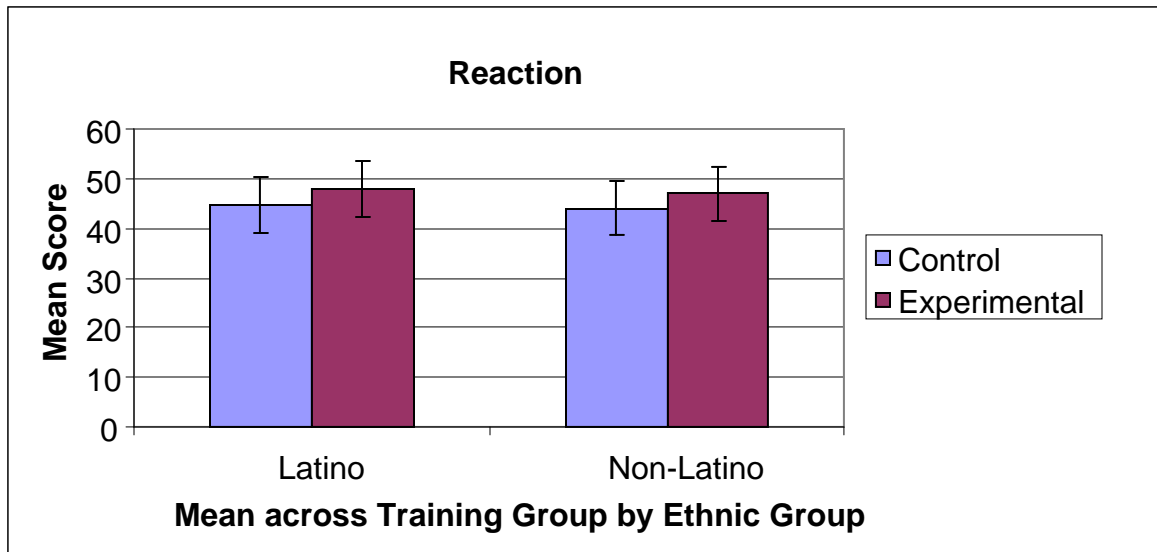
Figure 25. Training group by ethnic group interaction for reaction score (p < .05).

Table 22. ANOVA summary table for perceived organizational support for training scores.

Factor	DF	SS	MS	F-value
Training group*	1	351.38	351.38	9.10
Ethnic group	1	99.00	99.00	2.56
Training group x Ethnic group	1	31.43	31.43	0.81

*p < .01

To measure perceived organizational support in the control and experimental training programs, a new scale, Perceived Organizational Support for Training (POST) scale (Appendix I), was created. This scale was adapted from Eisenberger et al.'s (1986) Perceived Organizational Support Scale. The questions from the Perceived Organizational Support Scale were modified to address perceived organizational support in the training program. To test the internal reliability of the scale, Cronbach's alpha was calculated to measure the internal consistency of each measure in English and Spanish. Table 23 reports the Cronbach's alpha for the scale in both languages. The English and Spanish version of the POST scale had a Cronbach's alpha above a 0.70, indicating good internal consistency of the items.

Table 23. Cronbach's alpha for Perceived Organizational Support for Training Scale.

Language	Cronbach's Alpha
English	.74
Spanish	.71

For perceived organizational support for training score, the two-way ANOVA revealed that the main effect for training group was significant ($F_{1,44} = 9.10$, $p = < .01$) (Figure 26). Post hoc results indicated that the experimental group's perceived organizational support for training score ($M = 76.81$ $SD = 7.64$) was significantly higher than the control group's perceived organizational support for training score ($M = 70.99$ $SD = 5.93$). These results indicated that the two training programs were significantly different with respect to perceived organizational support ratings. The experimental training program was rated higher for perceived organizational support.
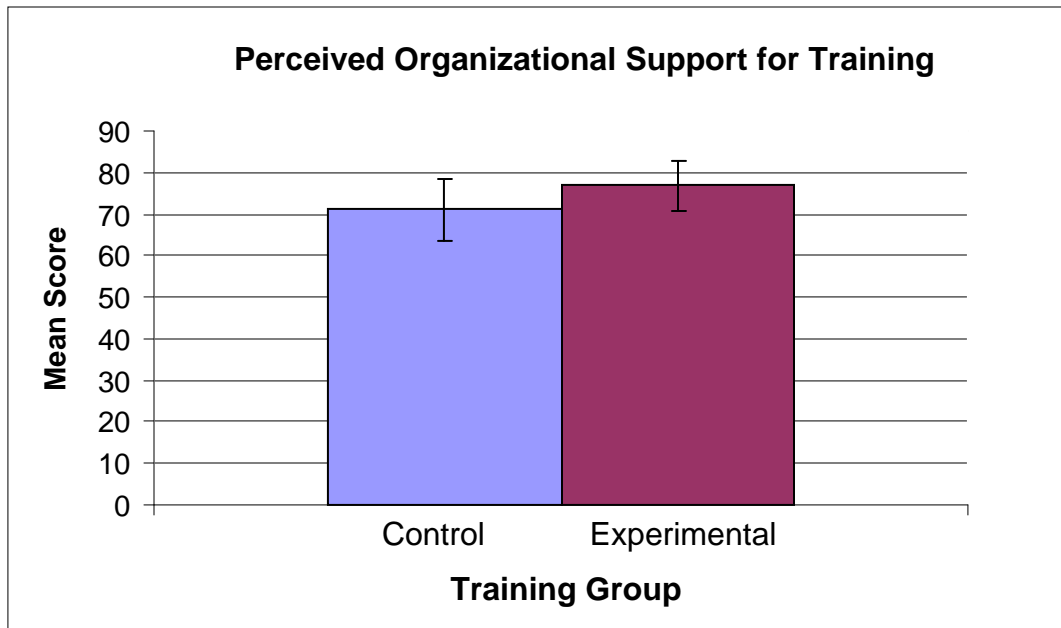
Figure 26. Comparison of perceived organizational support for training by training groups (p < .01).

5.5.2. Repeated Measures ANOVA

A repeated measures ANOVA was used to analyze the participants' pre- and post-test scores for safety knowledge. From pre-test to post-test, the repeated-measures ANOVA results revealed a significant increase ($F_{1,41}$ = 53.94, p = < .01) in safety knowledge (Figure 27). Overall, the participant's knowledge post-test score (M = 80.69, SD = 14.38) was significantly higher than the participant's knowledge pre-test score (M = 56.52, SD = 18.70). In addition, the results of the repeated measures ANOVA revealed a significant interaction ($F_{1,41}$ = 5.33, p = < .05) for the knowledge score difference from pre-test to post-test based on training group (Figure 28). Post hoc results indicated that the control group's knowledge post-test score (M = 77.94, SD = 14.93) was significantly higher than the knowledge pre-tests score (M = 47.42, SD = 20.19). Additionally, the experimental group's knowledge post-test score (M = 82.84,

SD = 14.06) was significantly higher than the knowledge pre-test score (*M* = 82.84, *SD*

= 17.27). These results revealed that the participants' safety knowledge improved from

pre-test to post-test. This was particularly important for the Latino construction workers

because the results indicated that the Latino construction workers did understand the

training program, despite their lower levels of education and the translation of the

training program content from English to Spanish.
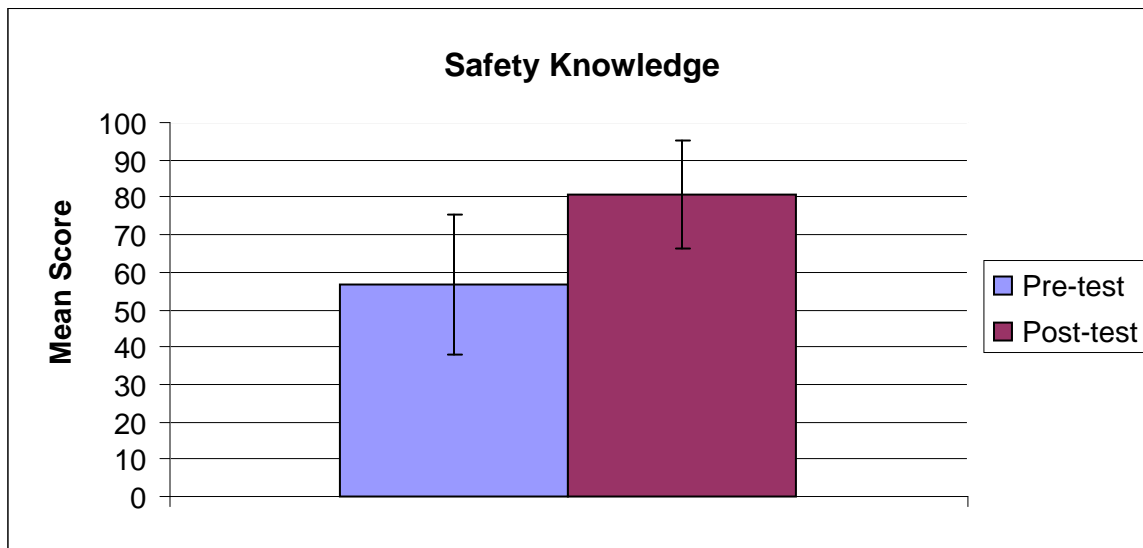
Figure 27. Safety knowledge pre-test and post-test scores (p < .01).
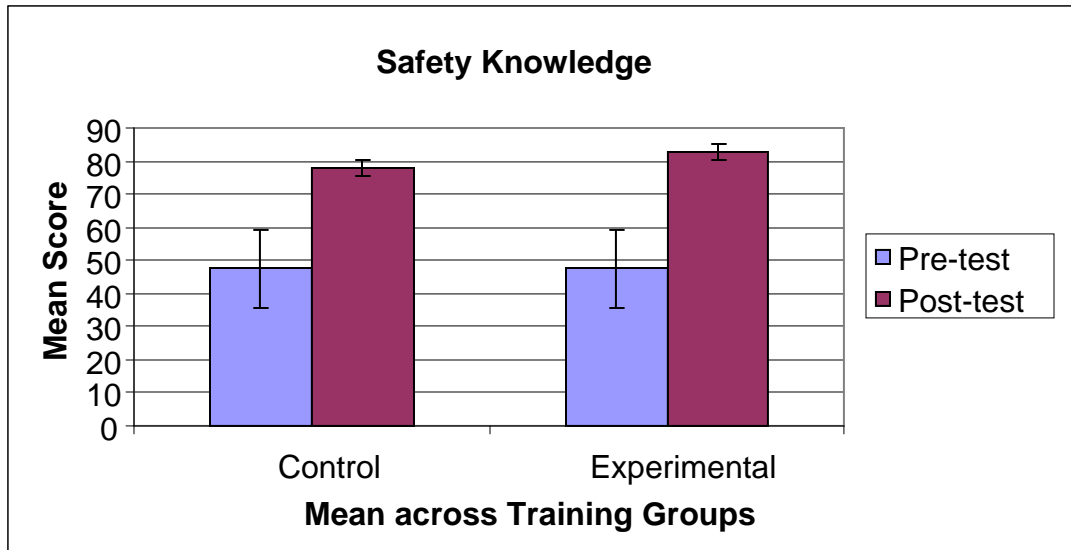
Figure 28. Comparison of pre-scores and post-scores for safety knowledge across

training groups (p < .05).

5.5.3. Content Analysis

Two open-ended questions were asked at the conclusion of Phase Three to gain

insight on whom the participants refer to as their supervisors. The following questions

were asked:

- Who is your supervisor at your workplace?

- What relationship do you have with your supervisor?

A content analysis using the same method discussed in Section 3.5.1. on page 78 was

conducted. Table 24 displays the results for the Latino and non-Latino participants.

Table 24. Major theme, code, and frequency counts.

Major Theme	Code	Freq (Latino)	Freq (Non-Latino)	Freq (Total)
Supervisor	Crew Leader	1	3	4
	Link worker	18	0	18
	Owner	0	24	24
Relationship with supervisor	Authority figure	8	27	35
	Brother	5	0	5
	Mentor	14	4	16
	Father	13	0	13
	Friend	2	21	23

The results of the content analysis revealed that the Latino and non-Latino workers have a different perception of who their supervisor is in the workplace. Latino workers referred to the link worker as their supervisor, while the non-Latino workers referred to their crew leader or owner of the company as their supervisor. In addition, differences between the type of relationship the Latino and non-Latino workers have with their supervisor were presented. The Latino workers have a familial type bond (e.g., father, brother); where as the non-Latino workers view their supervisor as a friend and authoritative figure.

5.6. Limitations of Phase Three

5.6.1. Threats to Internal Validity

In Phase Three, one major threat to internal validity was history (Martin, 2000). In the time from Phase One to Phase Three, 11 Latino participants had to remove

themselves from the study due to various factors (e.g., changed jobs, no longer employed by the company, returned to native country) and could not take part in Phase Three. During the two-year time span of this research study and the six-month time span between Phase One and Phase Two, immigration policies were being much more intensely scrutinized. Moreover, recent immigration protests and societal/government divergence on immigration policies could have impacted the influence of the dependent variables. In other words, important historical events with respect to immigration and issues of legal residence could have impacted the candid responses of Latinos to the questions in this study. The participants may not have wanted to disclose their true opinions about the perception of organizational support or fairness with respect to work schedules, pay levels, workload, training, and job assignments because of fear of losing their jobs and possible subsequent deportation. Therefore, the Latino workers might have rated all of the items undeservedly high (positive), thus introducing a method bias in which differential response styles across the different ethnic groups occurred. This inference is consistent with research findings indicating that Latino participants tend to provide socially desirable responses (Ross and Mirowski, 1984; Triandis, Marín, and Betancourt, 1984; Marín and Marín, 1991), inaccurately report their beliefs (Coultas, Howard, Peake, Skipper, and Samet, 1988; Pérez-Stable, Marín, Marín, Brody, and Benowitz, 1990), and report extreme responses (e.g., very fair) (Ross and Mirowski, 1984; Hui and Triandis, 1989; Marín, Gamba, and Marín, 1992).

5.6.2. Hawthorne Effect

The Latino participants had significantly higher ratings for perceived organizational support and distributive justice than their non-Latino counterparts. It is

possible that the Hawthorne effect (a phenomenon when people observed during a research study temporarily change their behavior or performance) influenced higher ratings (Martin, 2000). Since 70% of the Latino workers had been in the U.S. for less than five years, it is possible that many of these workers were undocumented workers. Instead of being asked to provide insight about their construction experience and feedback to improve safety and training in their work environment, these workers were likely used to being treated with animosity and a lack of respect. It is possible that being exposed to this atypical treatment from the researcher and being given attention, in which, they are not used to receiving, could have lead to the unexpected ratings of perceived organizational support and distributive justice. Hence, the occurrence of Hawthorne Effect likely provided a sense of belonging and a sense of support to the Latino participants.

5.6.3. Sensitivity of Training Program

Another limitation in this study involved the imbedding of perceived organizational support into the training program. Had additional sources of perceived organizational support been obtained during Phase One, this could have increased the sensitivity between the control and experimental training programs. In addition, since the training program was adapted from BuildIQ®, the researcher was limited in her ability to significantly modify the instructional design and content.

5.6.4. Perception of Supervisor

A final limitation in this study was the perception of supervisor. The Latino workers viewed their supervisor as their link worker, and the non-Latino workers viewed

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their supervisor as the owner or the company or their crew leader. Different perceptions of "supervisor" could also help explain the high perceived organizational support findings for Latino construction workers. The term *supervisor* should have been operationalized and explained to the participants prior to the beginning of the study.

5.7. Engineering Design Recommendations

Phase Three findings have suggested that embedding explicit sources of perceived organizational support in a safety training program can lead to higher perceptions of safety climate. Based on research studies investigating the relationship between safety climate and safety behaviors, researchers have concluded that perceptions of a safe workplace climate are positively correlated with engaging in safety behaviors and safety performance. If this is the case, then improving workers' perceptions of safety climate could potentially lead to safer behaviors in the workplace, which ultimately reduce the number of accidents, injuries, and fatalities in the workplace. Therefore, the output of Phase Three was a set of guidelines on how to embed perceived organizational support into training programs. Researchers can utilize these guidelines to embed perceived organizational support into training programs and to develop or reexamine workplace policies. The guidelines presented are suggestions, not rules. However, small firms may benefit thoroughly addressing each guideline. In addition, these guidelines can be exposed to workers through different forms of media (e.g., text, video, audio) and different type of training programs training programs (e.g., traditional, web-based).

When designing a safety training program, components of the program should

demonstrate perceptions of organizational support and explicitly emphasize the

importance of safety in the work environment, the importance of having a safety training

program available to workers, the workers' role to ensure safety in the work

environment, and the many desirable results of safe behaviors in the work environment

(e.g., reduced number of injuries and accidents, bonuses for an accident-free

workplace). Table 25 displays guidelines, derived from the results of this research

endeavor and literature related to cultural dimensions (Hofstede, 1997; Kras, 1995),

and characteristics of foreign-born Latino workers in construction (Escarcega, 2004), to

incorporate the aforementioned components.

Table 25. Guidelines to improve foreign-born workers' perception of organizational

support and safety climate.

Guidelines to Improve Foreign-Born Workers' Perception of Organizational Support and Safety Climate
1. Describe the importance of safety in the work environment. Provide migrantforeign workers safety statistics that personally relate to them as an individual. These statistics can relate to the workers occupation, age, ethnic group, etc. Demonstrating the relevance of safety to the individual will potentially help increase the foreign-born workers' self-esteem and value. For example, foreign-born Latino immigrants typically have a sense of economic deficiency, and they migrate to the United States to make money. When foreign-born Latino workers, especially undocumented workers, arrive in the United States, they have feelings of low self-esteem (value for oneself), desperation, and a need to survive (Escarcega, 2004). The feelings of low self-esteem develop from the feeling of not having the freedom to live their lives and do what they would like to do and not having a high level of education and being able to read and write. Because migrantforeign workers typically need to make money (Kras, 1995), they are willing to take on more dangerous jobs and take short cuts to finish the job faster so they can get paid sooner. To help reduce the high risks migrantforeign workers take in the workplace, supervisors should explain the importance of safety and address concerns relevant to migrantforeign Latino workers.

Table 25, con't. Guidelines to improve foreign-born Latino workers' perception of organizational support and safety climate.

Guidelines to Improve Foreign-Born Workers' Perception of Organizational Support and Safety Climate
2. Be clear and precise about the importance of completing safety training programs. Explicitly discuss the purpose of the safety training and the desired outcome of the training program as it relates to the individual workers, the group of workers, and the work environment. Often migrantforeign workers have a lower level of education than their non-migrantforeign counterparts. For example, a majority of foreign-born Latino workers likely have an average education no higher than a sixth-grade level (Brunette, 2005). Therefore, many of these workers fundamental reading, writing, and communication skills are limited, and they are probably not accustomed to formal training in their native countries. When foreign-born Latino workers do receive formal training or education, it may take time for them to adjust to this new experience (Escarcega, 2004). As they adjust, questions of trust may develop. Since many foreign-born Latino workers are not used to receiving training, they may question the supervisor, "What is the catch?" or "What do you want from me?" To alleviate this concern of trust, supervisors should ensure that migrantforeign workers understand why safety training is taking place, the importance of safety training, and the results of completing safety training in the workplace.
3. Describe the worker's role to ensure safety in the work environment. Hold migrantforeign workers accountable for ensuring a safe work environment (individual safety, group safety, task safety). Communicate with the worker his or her responsibility to ensure workplace safety. Safety is not always strictly regulated and monitored in some countries outside of the United States. For example, many Latin countries do not have a governing body, like OSHA, to regulate safety. Therefore, it may be difficult for foreign-born Latino workers to understand the importance of individual safety. These workers typically work to live (Kras, 1995) and are used to working in unsafe conditions in extreme weather conditions without personal protective equipment or proper training. Many foreign-born workers likely associate accidents as being part of the job. In addition to communicate with the workers their responsibility to ensure workplace safety, supervisors should be aware that foreign-born Latino workers come from a collectivist culture, in which, identity is usually based on family and extended family, where as non-Latino workers typically come from a individualist culture, in which, identity is based on the individual (Hofstede, 1997). Understanding this cultural difference will allow supervisors to emphasize the importance of being safe and how being safe can protect the migrantforeign workers, and co-workers from accidents, injuries, and fatalities in the workplace.
4. Be clear and precise about the desired results of safe behaviors in the work environment. Explicitly discuss the desired safety behaviors in the workplace. MigrantForeign workers from a collectivist and high power distant country are likely accustomed to being assigned tasks, not authority (Kras, 1995). For example, Latino workers usually show exceptional respect for authority figures and will rarely disagree with individuals in position of authority. As a result, many workers do not know how to communicate their needs and feelings of frustration. Additionally, showing emotions, crying, or sharing personal problems or feelings to anyone can possibly take away self-respect Latino workers have as men (Escarcega, 2004). If problems exist, Latino workers typically will only speak up when approached by the supervisor, whereas non-Latino workers generally will not hesitate to approach supervisors with concerns (Hofstede, 1986). When migrantforeign workers demonstrate desired behaviors in the workplace, supervisors should provide verbal praise and appreciation. However, for undesired behaviors, supervisors should provide positive feedback to correct the unwanted behavior.

5.8. Future Research

A new perceived organizational support instrument (Appendix I) was developed during the course of this study. Although the Cronbach's alpha of the perceived organizational support for training was above .70, future studies should re-test the reliability of the instrument across another source of perceived organizational support (e.g., promotion, professional development course). If re-testing were to verify the internal reliability of the instrument at that level or higher, the questionnaire can be used to design products or services to improve perceived organizational support in the workplace. In addition, this instrument could also be used as a model to test the cultural appropriateness of other instruments that may be used to evaluate a dual-language English-Spanish workplace.

In general, this study concluded that providing safety training does make employees feel supported by an organization. However, a direct relationship between perceived organizational support and safety behavior was not found. Future work can investigate the effects of perceived organizational support and safety behavior longitudinally. An advantage of longitudinal studies is greater detail and precision of information. Examining safety behavior over a period of time may lead to a more representative awareness of how Latino and non-Latino workers behave in the workplace. Researchers can also consider an alternate method to measure safety behavior. Instead of questionnaires, direct observations may be more reliable. In addition, conducting a longitudinal study may lead to more reliable ratings for safety behavior, especially the Latino construction workers.

5.9. Conclusion

The purpose of Phase Three was to investigate the impact of safety training on perceived organizational support, distributive justice, perceived safety climate, and safety behavior. The results from Phase One's empirical study were used as baseline data (pretest data) to conduct the pretest-posttest control group design in Phase Three, and the qualitative results from Phase One's needs analysis were inputted into the design of the ETP in Phase Two. In Phase Two, the ETP was developed and evaluated by a usability expert, psychologist, and one Latino and non-Latino user. Based on feedback from the evaluators, modifications were made to the ETP, and the modified ETP was tested in Phase Three to determine the impact of safety training on the study's dependent variables (perceived organizational support, distributive justice, perceived safety climate, and safety behavior). After the participants completed the CTP and ETP, results of the pretest-posttest control group design revealed that training, regardless of the type of training, improves workers' perception of organizational support. In addition, the participants exposed to the ETP had a significantly higher increase for distributive justice and safety climate ($p < .05$) than the participants exposed to the CTP. These results imply that embedding organizational support in training programs can increase workers' perception of distributive justice and safety climate, and based on social exchange theory, if workers perceive strong organizational support and distributive justice in the workplace, workers are likely to exhibit the behavior the organization desires in the workplace. However, in this research endeavor, training did not improve the safety behavior of the workers. An explanation for this result is the theory of risk homeostasis, where individuals have a built-in target

level of acceptable risk which does not change (Wilde, 2001). Concluded from item

seven of the safety climate questionnaire, *taking risks is part of my job*, both Latino and

non-Latino workers agreed that taking risks was part of their job. It is possible that to

improve the participants' safety behavior, the level of acceptable risk in one part of the

participants' life must change in order to reduce their perception of acceptable risk in the

workplace.

CHAPTER 6. CONCLUSION

The primary purposes of this research endeavor were to: 1) use social exchange theory to examine the role of perceived organizational support in small construction firms to help explain why Latino workers have a disproportionate number of construction casualties compared to their non-Latino counterparts and; 2) design a training program to improve the safety behavior of Latino and non-Latino workers in small construction firms. Although this research endeavor did not demonstrate significant differences for perceived organizational support between the two training groups (control and experimental), this dissertation laid some groundwork for understanding the interactions between perceived organizational support, distributive justice, perceived safety climate and safety behavior and the affect of embedding perceived organizational support into training programs.

This research endeavor was one of the first known explorations to utilize social exchange theory to examine safety climate and safety behavior in small construction firms. The role of perceived organizational support in small construction firms is still largely uncertain. However, this research endeavor demonstrated that training, regardless of the type of training, increases both Latino and non-Latino workers' perception of organizational support. The findings and recommendations from this study will enable researchers to better understand the role of organizational factors in the safety arena and provide safety practitioners ideas for embedding perceived organizational support in safety training programs for small construction firms.

6.1. Summary of Outcomes

6.1.1. Phase One

In Phase One, the goals of the study were to use social exchange theory to investigate the relationships between social exchange variables (perceived organizational support and distributive justice), safety climate, and safety behavior and identify sources of perceived organizational support to embed into the experimental safety training program in Phase Three. Social exchange theory states that when one party acts in a way that benefits another party (e.g., organization provides support to workers), implicit obligation for future reciprocity is created, resulting in behaviors (e.g., less risky safety behavior) designed to benefit the initiating party (Goulder, 1960; Settoon, Bennett, and Liden, 1996). This study partially confirmed this theory. Significant positive relationships between the social exchange variables (perceived organizational support and distributive justice) and safety climate occurred. Surprisingly, the Latino workers had significantly higher ($p < .05$) ratings of perceived organizational support than their non-Latino counterparts. These strong ratings can possibly be contributed to the Latino sample being undocumented workers and the Latino participants' misconception of who the supervisor is in the workplace.

The higher ratings from the Latino participants could be a result of a sampling bias, in which, the Latino participants provided socially acceptable ratings for the measures collected in the study. These ratings can possibly be contributed to the Latino sample being foreign-born Latino workers and likely undocumented workers since 70% of the sample have lived in the U.S. for less than five years. Because all of the Latino participants were born outside of the United States in Latin countries (e.g.

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Guanajuato, Honduras, and Mexico), they are probably accustomed to a higher uncertainty avoidance, in which Latino workers will rarely disagree or challenge authority figures. Latino workers prefer to remain silent to keep maintain their job security, rather than reporting potential workplace hazards or incidents that could provoke an adverse opinion from their employer (Vazquez and Stalnaker, 2004). Therefore, it is possible that the Latino workers provided less than fully candid answers in fear of losing their jobs.

Another reason for the high ratings from the Latino sample could be conflicting perception of supervisor. Based on the responses to the open-ended interview questions at the end of the study, this study concluded that it is likely that the Latino and non-Latino participants had different perceptions of who their supervisor is in the workplace. Among these Latino workers, the study revealed that Latino workers perceived their link worker as their supervisor. Below are comments the Latino workers made to state the type of relationship they have with their supervisor:

Participant #5: *My supervisor is my friend. We came to the United States together.*

Participant #9: *…our supervisor is my brother.*

Participant #11: *My boss watches out for us. We live in the same apartment so we spend a lot of time together, and we know each other very well.*

Contrary to the comments made by the Latino participants, the non-Latino participants referred to their supervisor as the owner of the construction firm and the authority figure in the workplace. Below are the comments the non-Latino workers stated:

Participant #3: *Our boss is the guy who is in charge. He is the one who finds us work and pays us each week.*

Participant #14: *I've been working for my boss for six years. We met on another job and he decided to start his own construction business. I left when he left.*

Participant #21: *My supervisor is our crew leader. He's the one that makes sure we're getting the job done right and on time. He reports to the big boss.*

These comments demonstrate differing views from the Latino and non-Latino participants about whom their supervisor is in the workplace. Consequently, the Latino and non-Latino participants were probably rating different individuals as their supervisor in the workplace.

Additionally, this research endeavor concluded that positive relationships between perceived organizational support, distributive justice, and safety climate exist, supporting social exchange theory. However, a relationship between perceived organizational support and safety behavior was not found. The lack of support demonstrating the relationship between the social exchange variables and safety behavior could be contributed to multiple reasons, the use of self-reported behaviors as a surrogate of actual safety behavior or possible "white male effect", where white males typically rate risks lower than people of color.

On the other hand, Phase One confirmed that both the Latino and non-Latino groups had relatively equal perceptions of organizational support and distributive justice, which is consistent with a study examining ethnic group differences for perceived organizational support (Yoshimura, 2006), but contradicts ethnic group differences found when examining perceived organizational support and distributive

justice (Mor et al., 1988). These findings could imply that both Latinos and non-Latinos have identical needs of support or that the construction firms' practices meet the support the workers need regardless of ethnicity. With inconsistent findings for ethnic group differences related to constructs of social exchange, this study demonstrated a need to understand workers in informal work systems' perception of organizational support. Therefore, an outcome of Phase One was a list of how supervisors can ensure workers perceive organizational support in the workplace:

1. A supportive supervisor should:

   - Provide workers verbal praise (e.g., good job)

   - Assign workers important responsibility

   - Provide monetary or non-monetary (e.g. gift certificates) rewards

   - Provide pay raises and promotions to workers who have been promoted or taken on additional responsibility in the workplace

   - Treat workers with respect

   - Communicate with workers about performance

   - Be knowledgeable about job tasks and be able to explain job tasks clearly

   - Be available on the job to answer questions and provide explanations

2. To promote safety, supervisors should:

   - Demonstrate proper safety behavior in the workplace
   - Discuss real-life safety examples

   - Explains safety procedure

   - Remind workers about safety on the job

- Provide workers personal protective equipment (PPE)

- Trains workers at the start of new projects

- Check on workers daily (e.g., ensure proper PPE, job task being completed, performance)

3. To recognize performance, supervisors should:

- Ensure job security

- Provide training for new responsibilities

- Announce accomplishments to organization

- Provide monetary and/or non-monetary rewards (e.g., gift certificate)

- Provide pay raises and/or promotions

4. To motivate workers, supervisors should:

- Give verbal praise

- Provide raises and/or promotions

  Provide personal protective equipment (PPE)

6.1.2. Phase Two

In Phase Two, a training program with embedded sources of perceived organizational support was designed and evaluated. The embedded sources of perceived organizational support were developed from the qualitative data explaining Latino and non-Latino workers' perception of organizational support. The qualitative data from construction workers were transformed into sources of perceived organizational support that were embedded into training programs to increase the perceived organizational support the worker receives when completing the training program. These sources of perceived organizational support included: verbal praise,

recognition, pay raise, promotion, job security, and reward. The evaluation of the

experimental training program demonstrated that rewards do not always motivate

trainees to complete training or apply knowledge gained from training to the workplace.

Therefore, safety professionals should be aware that using rewards or incentives as

motivation in the workplace may not result in the performance or behavior desired.

However, these findings support the behavioral-based safety process, which suggests

the use of rewards or incentives as positive reinforcement may improve goal attainment

in the workplace (Geller, 2001).

6.1.3. Phase Three

Phase Three focused on the impact of the experimental training program

(training with embedded sources of perceived organizational support). The outcome of

Phase Three was providing training, with or without embedded perceptions of

organizational support, increases Latino and non-Latino workers' perception of

organizational support. Consistent with studies examining training as a source of

organizational support, this study suggested that training can be used as a form social

exchange in the work environment (Cooper and Phillip, 2004; Hofmann et al., 2003;

Wayne et al., 2002). This study also demonstrated that embedded sources of

perceived organizational support in the training program increase workers' perceptions

of distributive justice and safety climate. Since high perceptions of safety climate are

linked to less risky safety behaviors, embedding perceived organizational support into

training programs can have an indirect affect on the workers' safety behavior. For that

reason, improving the safety behavior of workers and the workers' perception of a safe

work environment can lead to reduced accidents, injuries, and fatalities in the

construction industry. As a result, an outcome of Phase Three was to produce four

guidelines to improve foreign-born workers' perception of organizational support and

safety climate:

Guideline 1: Describe the importance of safety in the work environment

Provide migrantforeign workers safety statistics that personally relate to them as

an individual. These statistics can relate to the workers occupation, age, ethnic group,

etc. Demonstrating the relevance of safety to the individual will potentially help increase

the foreign-born workers' self-esteem and value. For example, foreign-born Latino

immigrants typically have a sense of economic deficiency, and they migrate to the

United States to make money. When foreign-born Latino workers, especially

undocumented workers, arrive in the United States, they have feelings of low self-

esteem (value for oneself), desperation, and a need to survive (Escarcega, 2004). The

feelings of low self-esteem develop from the feeling of not having the freedom to live

their lives and do what they would like to do and not having a high level of education

and being able to read and write. Because migrantforeign workers typically need to

make money (Kras, 1995), they are willing to take on more dangerous jobs and take

short cuts to finish the job faster so they can get paid sooner. To help reduce the high

risks migrantforeign workers take in the workplace, supervisors should explain the

importance of safety and address concerns relevant to migrantforeign workers.

Guideline 2: Be clear and precise about the importance of completing safety training

programs

Explicitly discuss the purpose of the safety training and the desired outcome of

the training program as it relates to the individual workers, the group of workers, and the

work environment. Often migrantforeign workers have a lower level of education than their non-migrantforeign counterparts. For example, a majority of foreign-born Latino workers likely have an average education no higher than a sixth-grade level (Brunette, 2005). Therefore, many of these workers fundamental reading, writing, and communication skills are limited, and they are probably not accustomed to formal training in their native countries. When foreign-born Latino workers do receive formal training or education, it may take time for them to adjust to this new experience (Escarcega, 2004). As they adjust, questions of trust may develop. Since many foreign-born Latino workers are not used to receiving training, they may question the supervisor, "What is the catch?" or "What do you want from me?" To alleviate this concern of trust, supervisors should ensure that migrantforeign workers understand why safety training is taking place, the importance of safety training, and the results of completing safety training in the workplace.

Guideline 3: Describe the worker's role to ensure safety in the work environment

Hold migrantforeign workers accountable for ensuring a safe work environment (individual safety, group safety, task safety). Communicate with the worker his or her responsibility to ensure workplace safety. Safety is not always strictly regulated and monitored in some countries outside of the United States. For example, many Latin countries do not have a governing body, like OSHA, to regulate safety. Therefore, it may be difficult for foreign-born Latino workers to understand the importance of individual safety. These workers typically work to live (Kras, 1995) and are used to working in unsafe conditions in extreme weather conditions without personal protective equipment or proper training. Many foreign-born workers likely associate accidents as

being part of the job. In addition to communicate with the workers their responsibility to ensure workplace safety, supervisors should be aware that foreign-born Latino workers come from a collectivist culture, in which, identity is usually based on family and extended family, where as non-Latino workers typically come from a individualist culture, in which, identity is based on the individual (Hofstede, 1997). Understanding this cultural difference will allow supervisors to emphasize the importance of being safe and how being safe can protect the migrantforeign workers, and co-workers from accidents, injuries, and fatalities in the workplace.

Guideline 4: Be clear and precise about the desired results of safe behaviors in the work environment

Explicitly discuss the desired safety behaviors in the workplace. MigrantForeign workers from a collectivist and high power distant country are likely accustomed to being assigned tasks, not authority (Kras, 1995). For example, Latino workers usually show exceptional respect for authority figures and will rarely disagree with individuals in position of authority. As a result, many workers do not know how to communicate their needs and feelings of frustration. Additionally, showing emotions, crying, or sharing personal problems or feelings to anyone can possibly take away self-respect Latino workers have as men (Escarcega, 2004). If problems exist, Latino workers typically will only speak up when approached by the supervisor, whereas non-Latino workers generally will not hesitate to approach supervisors with concerns (Hofstede, 1986). When migrantforeign workers demonstrate desired behaviors in the workplace, supervisors should provide verbal praise and appreciation. However, for undesired

behaviors, supervisors should provide positive feedback to correct the unwanted behavior.

Although these guidelines were derived from a study examining foreign-born Latino workers in construction, these guidelines can likely be applied to foreign workers in other countries. Globally, individuals are migrating to different countries for higher wages and more opportunities. In the last decade, laborer migration has become one of the significant socio-economic phenomena worldwide. Almost 175 million people world-wide are living outside of their native countries for work and better living (Zaronaite and Tirzite, 2006). Employing foreign workers is a global business trend, especially in nations that experience shortages of workers in their local labor markets (Rogler, 1994). In 2006, foreign workers accounted for 15.3% of the United States' workforce (BLS, 2007), with over 50% of these foreign workers being of Latino ethnicity. Furthermore, similar trends exist in other countries: Austria – 11% (Krenn, 2007), Germany - 10%, Greece - 6% (Schomberg and Reynard, 2000), Israel - 13% (Ellman and Laacher, 2003), Switzerland – 21% (Swiss Labour Force Survey, 2006). In the abovementioned countries, approximately 40% of the foreign workers migrate from countries outside of the European Union (e.g., Albania, Romania), 30% from Africa (e.g., Morocco, Tunisia) and 30% from Asia (e.g., Philippines, China). Comparable to the phenomenon of Latino workers migrating to the United States for work and a better living, individuals are migrating to countries in Western Europe for the same reasons. Additionally, these workers are being faced with the similar challenges (e.g., exploitation, assigned to more hazardous jobs, unfair salary, less education and training) as foreign Latino workers in the United States. Because of the parallelism between foreign-Latino workers and

migrants finding work in countries outside of the United States, these guidelines can be

applied to foreign workers migrating to other countries for higher paying jobs.
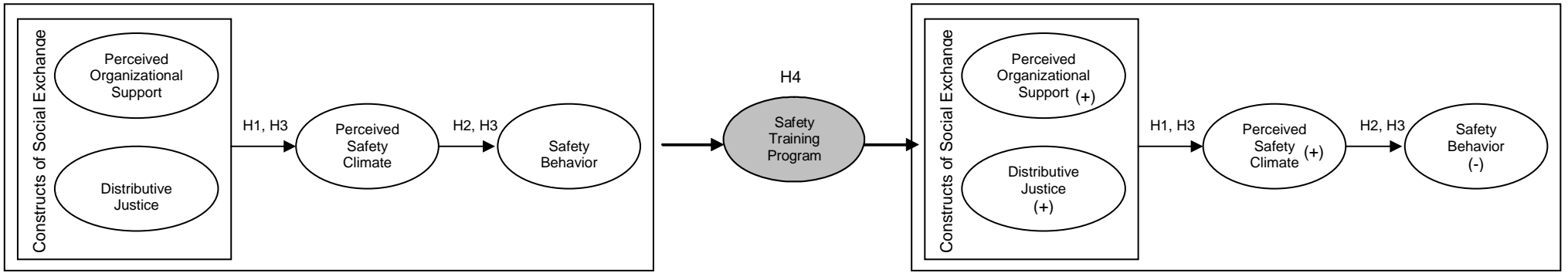
Figure 29. Proposed Research Model and Hypotheses.
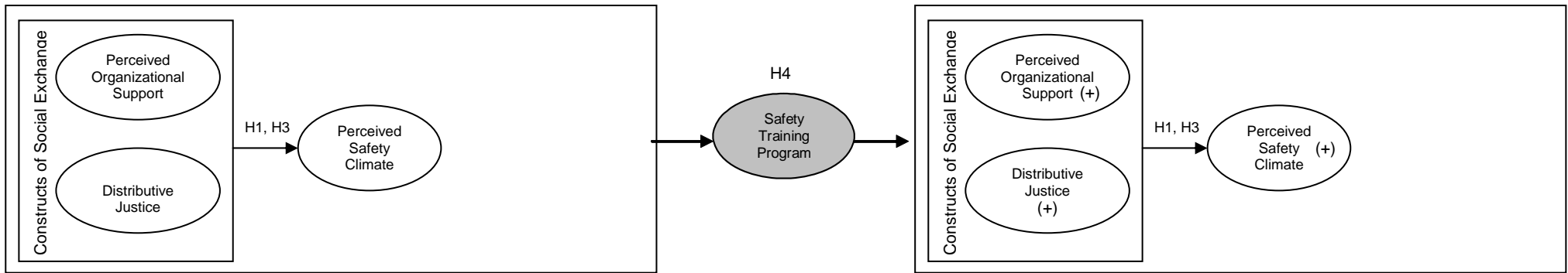
Figure 30. Study's Research Model and Hypotheses.

6.2. Overall Conclusion

This research endeavor partially supported the model (Figure 29) proposed for this study demonstrating training, of any type, results in an increase of perceived organizational support, distributive justice, and safety climate (Figure 30). From pre-test to post-test, the Latino and non- Latino construction workers' perceptions of distributive justice and safety climate increased after completing the experimental training program. However, there was no change in safety behavior from pre-test to post-test. Self-reported safety behavior is a surrogate of actual safety behavior. Unfortunately, it is not always possible to measure actual behavior. The time and costs associated with behavioral studies preclude their use in many situations.

Moreover, the results of this study have suggested that while field studies in construction are difficult to conduct, they can be accomplished if properly designed and executed. Most importantly, perhaps, this study has opened the doors for future research to be conducted on understanding the effects of perceived organizational support on training and safety in small informal construction businesses and ethnic group differences between Latino and non-Latino construction workers. Future research examining the construction industry is vital to reduce the injury and fatalities rates in construction. Since the construction industry has a large number of Latino workers whose native language is Spanish, it is difficult for non-Spanish speaking researchers to conduct research with this cohort. In addition to the obvious language barriers (non-native language and various dialects of Spanish), another reason for the difficulty in recruiting Latino construction workers—and especially undocumented workers—is their concern that providing personal information (e.g., income, immigration

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status) could be used against them, which might lead to deportation (Marín and Marín, 1991). As an outgrowth of this research endeavor, a set of recommendations to help recruit and collect data from Latino construction workers were developed. Although these recommendations were developed for research conducted with Latino construction workers, these recommendations are good practice for non-Latino constructions workers also. Twelve recommendations were developed during the course of the present study. The recommendations are detailed below in no particular order of importance.

1. Have a champion on the research team

2. Build trust and relationships with potential participants

3. Maintain short-term and long-term contact with Latino participants.

4. Know the Spanish language

5. Gain support from authority figures

6. Explain relevance to Latino community

7. Understand the nature of the work environment

8. Research type of compensation

9. Visit construction sites to recruit construction workers

10. Conduct study during lunch or after work

11. Take referrals from current participants

12. Expect the unexpected

Recommendation 1: Have a Champion on the Research Team

If the primary researcher is not bilingual, it is imperative to have a bilingual (Spanish and English) researcher or research champion on the research team.

Research champions are in the best position to encourage Latino construction workers to participate in the study. The purpose of the research champion is to build trust in the Latino community and to serve as the voice of the primary researcher. Additionally, the research champion should know all the details of the research study. These details include, but not are limited to, demographics of the participants (e.g., education level, socioeconomic status), the purpose of the study, study benefits to the researcher and participant, who is funding the study, criteria for participants, procedures of the study, what is required of the participants during the study, when the study will take place, instruments used in the study, estimated time for the study, and compensation for the study. For this study, the research champion was a bilingual undergraduate student with previous research experience and exposure to the construction industry.

Recommendation 2: Build Trust and Relationships with Potential Participants

To gain access to the Latino community—or to any ethnic community that is to be the subject of a research study—it is necessary for the researcher to build trust within that community by building relationships with potential participants. Building trust and building relationships are essential to the successful execution of any research project. For the Latino community, building trust in people is an especially important core value (Vásquez and Stalnaker, 2004) that can facilitate greater access to a viable participant cohort. For researchers, this process of building trust should begin at least six months prior to the onset of the study. To help build trust and subsequent relationships in the Latino community, the researcher and research champion should try to immerse themselves in the Latino community. Although physical immersion into the

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Latino culture and exposure to daily lifestyle is preferred, there are other opportunities

for immersion that require less time and financial resources. These activities include

attending Latino interest group meetings, dining at Latino restaurants, shopping at

Latino stores, and taking part in Latino cultural events. These strategies will allow the

Latino community to become familiar with the researcher and his or her research

interests, thereby enabling the researcher to build a network of Latino individuals and

meet key Latino advocates in the community. Becoming known in the Latino

community and networking with Latino individuals prior to conducting research helps

provide easier access to potential participants.

Recommendation 3: Maintain Short-term and Long-term Contacts with Latino
Participants

When building relationships with the Latino community, it is important to maintain

short-term (e.g., 1-3 months) and long-term (6-12 months) contact with participants.

Short-term contact is necessary once participants have agreed to participate in the

study. For example, a month or more before the study is to be conducted, it is

important to call or visit the participants occasionally (every two weeks) to say, *hola*

(hello), remind them about their commitment to the study, and ask them if they know

other participants that may be interested in participating in the study. Furthermore,

contact with the participants one to two days prior to the study is required to remind

them about the study and to clarify the logistics of the study. In the case of construction

work, unpredictable weather and deadlines can alter daily activities. Therefore, calling

five to eight hours prior to conducting the study is essential to ensure participants will be available at the appointed time and place.

Long-term contact is also essential when a study requires the manipulation of data longitudinally. For example, some research studies require multiple data collection sessions at various intervals; therefore, maintaining long-term contact is critical for retaining participants for the existing or future studies. Besides, continued contact with participants over a period of time will assist with future studies in which other Latino participants are needed. Keeping in touch with participants demonstrates a genuine interest in the participants, making them more willing to assist the researcher in finding potential participants for future studies. Ways to maintain long-term contact with Latino participants include calling the participants occasionally after completing the study, visiting the participants' worksite, sending cards on appropriate holidays, and remaining active in the Latino community.

Recommendation 4: Know the Spanish Language

Although the research team may consist of a Spanish speaking individual, it is critical for all team members to have some familiarity with the Spanish language. It is not necessary to be fluent in Spanish, but it is essential to know key phrases (e.g., hello, good-bye, my name is, I am from, how are you, thank you, you are welcome, I speak very little Spanish), and be willing to try to converse in at least a minimal way in Spanish with Latino participants. Latino individuals are generally pleased to know that non-Spanish speaking individuals want to communicate in Spanish, even if the non-Spanish speaking researchers may not say phrases in Spanish properly. Trying to communicate

in Spanish or knowing common phrases in Spanish demonstrates the researcher's willingness to learn Spanish and communicate in Spanish. In turn, the Latino individuals are likely to be more receptive to working with the researchers. For this study, the researcher took Spanish courses for five years so she was able to initiate some type of communication with the participants. However, if the researcher does not have any experience with the Spanish language, the researcher should consider taking a Spanish course or using a self-helped book or audio tape to learn Spanish.

Recommendation 5: Gain Support from Authority Figures

When dealing with the construction industry, whether it is residential or commercial, it is important to gain the support of the person in charge of the construction project (superintendent, project manager, and/or general contractor). To gain support, the researcher should come prepared to share the important details of the study with the appropriate authority figure. These details include the purpose of the study, estimated length of time, number of participants needed, when the study will take place (including time of day), what is required of the participants, and the type of compensation the participants will receive. Time is essential in this industry so the researcher should try to explain everything succinctly in just 5-10 minutes. After gaining support from an authority figure, the researcher should use this figure of authority to inform the sub-contractors and workers on his or her site about the research study. If potential participants are encouraged by their supervisor or an authority figure to participate in the study, it is easier to recruit dependable participants. To gain support and to recruit participants for this study, the researcher and the research champion

should visit different construction sites and make contact with the general contractors of construction projects and supervisors of crews.

Recommendation 6: Explain Relevance to Latino Community

A key factor in recruiting Latino participants is to inform the potential participants about the importance of the research and how the research could benefit him or her as a Latino construction worker, and thus the larger Latino community. As long as Latino construction workers are valued, treated with respect, and can understand how they are contributing to the research topic, they are likely to be a loyal resource to assist with the research study. Most of the time, they enjoy taking part in research studies because they feel they are being accepted in the U.S. and that non-Latino individuals care about their well-being. This type of treatment is, unfortunately, atypical for Latino construction workers because of the discrimination and disrespect they often face in the U.S. (Vásquez and Stalnaker, 2004). To explain why the research is relevant to the Latino community, the researcher and research champion always presented the statistics of fatalities in construction to demonstrate the importance of this research before discussing participation in the study. After discussing the statistics and why the research is focused on Latino construction workers, it was not difficult to convey the importance of this study to the Latino community.

Recommendation 7: Understand the Nature of the Work Environment

When it comes to conducting research in the construction environment, it can be very frustrating because of the relative lack of formality in construction. For example,

start/finish and break times can be highly variable from job site-to-job site. To be successful in conducting research in the construction field, the researcher should be flexible and understand that a variety of unanticipated circumstances can postpone or even derail data collection. These circumstances include schedule changes, weather, fatigue, and high employee turnover. It is not unusual for a construction project to fall behind schedule, making it difficult for a worker to find time to contribute to the study. Conversely, if a project finishes ahead of schedule, the worker may leave early and be unavailable at the appointed time. Under certain weather conditions, construction workers may not come to work at all or may leave work early. Moreover, since construction is a manual labor-intensive field, at the end of the workday a participant may be physically exhausted to contribute to the study, requiring the researcher to postpone and reschedule. To understand the nature of the work environment, prior to the study, researchers should interview and/or shadow construction workers and supervisors to learn more about the demands and structure of the area of construction he or she is researching.

Recommendation 8: Research Type of Compensation

It is usual for participants to receive some type of compensation for taking part in a research study (Marín and Marín, 1991). In human factors engineering research, participants are normally compensated at a rate of $7-10 per hour. In this study, Latino construction workers are very hesitant about receiving monetary compensation for participating in a study. A possible explanation for being reluctant to accept payment could be their high level of power distance, in which the Latino workers may have

viewed the researcher as an authority figure. If this is the case, the researcher should

discuss with the potential participants what they would like in exchange for participating

in the study. Suggestions for other forms of compensation include giving English

lessons (for free or at a discount), providing them with protective equipment (e.g., safety

glasses, hard hat, ear plug or muff), tools (e.g., hammer, nail gun), or clothing items

(e.g., t-shirts, hats) that they can use for their job. The researcher could also consider

giving the participants gift certificates to a hardware store (e.g., Home Depot, Lowe's,

etc.) where they can purchase personal protective equipment or tools of their choosing.

Recommendation 9: Visit Construction Sites to Recruit Construction Workers

There are many avenues to pursue when recruiting construction workers. For

example, a researcher can compile a list of construction companies from the phone

book, newspaper, Internet, home builders associations, or current construction sites to

call or email to solicit participation in the research study. The researcher can also make

unannounced visits to local construction sites, which is often the most successful way of

soliciting support. When walking on-site, remember to be safe, obey the signs, and

wear personal protective equipment (PPE). Once at the site, find a figure of authority to

whom to explain the study. Sometimes the figure of authority may be busy or not on

site. If this is the case, the researcher has three options: (1) the researcher can return

at a later time to talk to the authoritative figure, (2) the researcher can discuss the study

with the construction workers present, or (3) the researcher can do both. If time

permits, discussing the study with the workers present and returning to the construction

site at a later time to meet with the authority figure is often the best option. Also, if the

researcher is already collecting data when he or she visits a new construction site, he or she should be prepared to conduct the study then and there, since the workers may be willing to and available to participate in the study on the spot.

Recommendation 10: Conduct the Study during Lunch or After Work

If the study involves more than visual observation, the best time to conduct the study is during the lunch hour. If possible, the researcher should provide lunch for the participants. Prior to providing lunch, the researcher would want to know what is the most common type of food Latino workers consume. Providing lunch is a nice gesture to show appreciation, and a free lunch can also be used as an incentive to get more participants for the study. Alternatively, if a study cannot be conducted during the lunch hour, the next best time to conduct the study is immediately after work. If conducting the study after work, it is important to note that most Latino construction workers carpool to their jobsite. Therefore, a group of Latino construction workers will likely be taking part in an "after-hours" study.   Estimate double time for the data collection—it typically takes the Latino participants longer to complete the study.

Recommendation 11: Take Referrals from Current Participants.

Referrals are an excellent recruitment tool. After successfully finding participants for the research, always ask the participants if they know other construction workers who may be interested in participating in the study. Most construction workers know other construction workers on other job sites. If they had a good experience during the study, they are more likely to be willing to tell other construction workers about the

study. However, if the protocol calls for random selection, referrals cannot be made. As an alternative to taking referrals, the researcher can ask the participant to post flyers advertising the study in common areas Latino construction workers convene.

Recommendation 12: Expect the Unexpected

Always expect the unexpected. When conducting studies with Latino construction workers, a researcher is likely to experience no-shows, or perhaps even more people than originally scheduled for the study. Moreover, a researcher will experience rejection. No matter how persuasive the researcher and/or research champion is, or how important the study is likely to be to the Latino community, there will be individuals who will want no part of the study. The researcher should not become discouraged, but accept the fact that research in the field of construction is likely to be unpredictable.

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APPENDIX A: Demographic Questionnaire (English)

Instructions: Please respond to the following statements about your background. For the rating statements, put an "X" on the box that represents your opinion concerning your experience at work. There are no 'correct' responses for the rating statements; it is your own views that are important.

RATING QUESTION EXAMPLE

I love watching television.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

I marked a "**5".** A "**5"** means I am between agree and strongly agree, but I am closer to agree about my love for watching television.

Demographics Information Sheet   Participant # _____

Section 1. General background information

Age: _____

Gender: (check one)   _____Male   _____Female

Marital Status: (check one)

_____Single/Never been married   _____Single/Divorced   _____Married/Separated _____Married

Ethnicity: (check one)

_____African American   _____American Indian   _____Asian   _____Caucasian   _____Latino/Hispanic

_____Other, if so, what ethnicity? _____

Household annual income: (check one)

_____less than $10,000   _____$10,000 – 24,999   _____$25,000 – 49,999   _____$50,000 - 74,999

_____$75,000 – 99,999   _____$100,000 or more

What country were you born in? _____

    If you were not born in the United States, how old were you when you arrived in the United States? _____

How long have you been living in the United States? (check one)

        _____0 to 1 year   _____2 to 5 years   _____6 to 10 years   _____More than 10 years

Section 2. Education

What is the highest level of education you have received? (check one)

_____Elementary school   _____Middle school   _____Some high school

_____High school diploma   _____Vocational/technical school   _____Some college

_____College degree   _____Advance college degree

Section 3. Work experience

How long have you been involved in construction in the United States? (check one)

        _____0 to 1 year   _____2 to 5 years   _____6 to 10 years   _____More than 10 years

What trade(s) of construction have you been involved in while you have been in the United States? (check all that apply)

_____Bricklaying/Masonry   _____Carpentry   _____Electricity   _____Flooring

_____Heating and ventilation   _____Landscaping   _____Maintenance   _____Painting

_____Construction labor   _____Drywalling   _____Plastering   _____Roofing

_____Concrete   _____Other, if so, what trade? _____

How long have you been employed by the company you are working for? (check one)

_____0 to 6 months   _____7 months to 1 year   _____2 to 5 years   _____6 to 10 years   _____More than
                                                                                              10 years

How many workers do the company you work for have? _____

Does the company you work for have a bilingual worker who can communicate between the English speaking and Spanish speaking workers? _____Yes, all the time. _____No _____Sometimes   _____I don't know

How many other construction companies have you worked for in the United States? (check one)

        _____1 to 3   _____4 to 6   _____7 to 10   _____More than 10

How much construction experience did you have prior to coming to the United States? (check one)

        _____0 to 1 year _____2 to 5 years   _____6 to 10 years   _____More than 10 years

What trade(s) of construction did you have experience in prior to coming to the United States?

_____Bricklaying/Masonry   _____Carpentry   _____Electricity   _____Flooring

_____Heating and ventilation   _____Landscaping   _____Maintenance   _____Painting

_____Construction labor   _____Drywalling   _____Plastering   _____Roofing

_____Concrete   _____Other, if so, what trade? _____

Have you been involved in any construction related accidents? _____Yes _____No

        If yes, how many accidents? _____

        What type of accidents? _____

Section 4. English/Spanish experience

How is your understanding of English?

1 = very poor	2	3	4 = not poor nor good	5	6	7 = very good

How is your speaking in English?

1 = very poor	2	3	4 = not poor nor good	5	6	7 = very good

How is your writing in English?

1 = very poor	2	3	4 = not poor nor good	5	6	7 = very good

How is your understanding of Spanish?

1 = very poor	2	3	4 = not poor nor good	5	6	7 = very good

How is your speaking in Spanish?

1 = very poor	2	3	4 = not poor nor good	5	6	7 = very good

How is your writing in Spanish?

1 = very poor	2	3	4 = not poor nor good	5	6	7 = very good

Section 5. Cultural background

1. I prefer to work with others in a group than working alone.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

2. Working with a group is better than working alone.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

3. It is better not to disagree with my supervisor or boss's decisions.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

4. When my supervisor or boss makes a decision with which I disagree, I prefer to accept it rather than question it.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

5. I believe that it is not right to disagree with my boss.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

6. It is better to have job requirements and instructions spelled out in detail so that workers always know what they are expected to do.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

7. I prefer to work for supervisors or bosses who expect workers to closely follow instructions and procedures.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

8. Rules and regulations are important because they inform workers what the company expects from him.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

9. I prefer work that has detailed standard operating procedures spelled out.

1 = strongly disagree	2	3	4 =agree	5	6	7 = strongly agree

Section 6. Job satisfaction

1. How satisfied are you with this job?

1 = very dissatisfied	2	3	4 = satisfied	5	6	7 = very satisfied

2. How satisfied are you with the kind of work you do on the job?

1 = very dissatisfied	2	3	4 = satisfied	5	6	7 = very satisfied

APPENDIX A: Demographic Questionnaire (Spanish)
Cuestionario Demográfico

Instrucciones: Responda por favor a las siguientes preguntas sobre su antecedentes. Para cada pregunta, marque una "X" en la caja que representa su opinión referente a su experiencia en el trabajo. No hay ninguna respuesta "correcta" para las declaraciones evaluadas; Lo importante es su propio punto de vista.

PREGUNTA DE VALORACION EJEMPLO

Me gusta ver televisión.

1 = totalmente desacuerdo	2	3	4 =acuerdo	5	6	7 = totalmente acuerdo

Marqué "**5".** "**5"** significa que estoy en el medio de estar acuerdo y totalmente acuerdo, pero estoy más cercano a estar acuerdo que me gusta ver televisión.

Hoja de información Demográfica   Participante #_____

Sección 1. Información general

Edad: _____

Género: (marque uno) _____Masculino _____Femenino

Estado Civil: (marque uno)

_____Soltero/nunca casado _____Soltero/divorciado _____Casado/Separado _____Casado

Pertenencia Étnica: (marque uno)

_____Americano Africano _____Indio Americano _____Asiático

_____Blanco _____Latino/Hispano _____Isleño pacífico

_____ ¿Otro, si es así qué pertenencia étnica? _____

Ingreso Anual del Hogar: (marque uno)

_____menos de $10.000 _____$10.000 - 24.999 _____$25.000 - 49.999 _____$50.000 - 74.999

_____$75.000 - 99.999 _____$100.000 o más

¿En qué país nació usted? _____

   ¿Si usted no nació en los Estados Unidos, cuantos años tenia usted cuando llegó a los Estados Unidos?
_____

 ¿Cuanto tiempo usted ha estado viviendo en los Estados Unidos? (marque uno)

      _____0 a 1 año _____2 a 5 años _____6 a 10 años _____Más de 10 años

Sección 2. Educación

¿Cuál es el nivel más alto de educación que usted ha recibido? (marque uno)

_____Escuela primaria _____Escuela media _____Algo de Preparatoria

_____Diploma de Preparatoria _____Escuela vocacional/ técnica _____Algo de Universidad

_____Grado de la Universidad _____Grado anticipado de la universidad

Sección 3. Experiencia profesional

¿Cuanto tiempo usted ha estado trabajando en la construcción en los Estados Unidos? (marque uno)

_____0 a 1 año _____2 a 5 años _____6 a 10 años _____Más de 10 años.

¿En que áreas de construcción ha trabajado durante el tiempo que ha estado en los Estados Unidos? (marque todo lo que se aplique)

_____Bloque/Ladrillo/albañilería   _____Carpintería   _____Electricidad   _____Pisos

_____Calefacción y ventilación   _____Jardines   _____Mantenimiento   _____Pintura

_____Trabajo de construcción   _____Paredes   _____Enyesado   _____Techos

_____Concreto   _____ ¿Otro, sí, qué comercio? _____

¿Cuanto tiempo usted ha trabajado en la compañía para la cual está trabajando ahora?

(Marque uno)

_____0 a 6 meses _____7 meses a 1 año _____2 a 5 años _____6 a 10 años _____Más de 10 años

¿Cuántos trabajadores tienen la compañía para la cual usted trabaja? _____

¿La compañía para la cual usted trabaja tiene un trabajador bilingüe que pueda comunicarse entre los trabajadores de hablan ingles y los trabajadores que hablan español?

_____ Sí, todo el tiempo. _____No _____A veces   _____No sé

¿En cuántas otras empresas de construcción ha trabajado usted en los Estados Unidos? (marque uno)

_____1 a 3 empresas _____4 a 6 empresas _____6 a 10 empresas _____Más de 10 empresas

¿Cuánta experiencia de construcción usted tubo antes de venir a los Estados Unidos? (marque uno)

_____0 a 1 año _____2 a 5 años _____6 a 10 años _____Más que 10 años

¿Qué comercios de construcción usted tubo experiencia antes de venir a los Estados Unidos?
_____Bloque/Ladrillo/albañilería   _____Carpintería   _____Electricidad   _____Pisos

_____Calefacción y ventilación   _____Jardines   _____Mantenimiento   _____Pintura

_____Trabajo de construcción   _____Paredes   _____Enyesado   _____Techos

_____Concreto   _____ ¿Otro, sí, qué comercio? _____

¿Usted ha estado ha tenido accidentes relacionados con construcción? _____Sí _____No

¿Si sí, cuántos accidentes? _____

¿Qué tipo de accidentes? _____

Sección 4. Ingles/Español experiencia

¿Cómo está su comprensión de inglés?

1 = muy pobre	2	3	4 = no pobre ni bueno	5	6	7 = muy bueno

¿Cómo está su comunicación en inglés?

1 = muy pobre	2	3	4 = no pobre ni bueno	5	6	7 = muy bueno

¿Cómo está su escritura en inglés?

1 = muy pobre	2	3	4 = no pobre ni bueno	5	6	7 = muy bueno

¿Cómo está su comprensión de español?

1 = muy pobre	2	3	4 = no pobre ni bueno	5	6	7 = muy bueno

¿Cómo está su comunicación en español?

1 = muy pobre	2	3	4 = no pobre ni bueno	5	6	7 = muy bueno

¿Cómo está su escritura en español?

1 = muy pobre	2	3	4 = no pobre ni bueno	5	6	7 = muy bueno

Sección 5. Antecedente cultural

1. Yo prefiero trabajar con otros en un grupo que trabajando solo.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

2. Trabar con un grupo es mejor que trabajar solo.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

3. Es mejor estar en acuerdo con las decisiones de mi supervisor o mi jefe.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

4. Cuando mi supervisor o jefe toma una decisión con la cual yo no estoy de acuerdo, prefiero aceptarla en vez de preguntar.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

5. Yo creo que no esta bien estar en desacuerdo con mi jefe.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

6. Es mejor tener los requisitos de un trabajo y detalladas instrucciones así los trabajadores siempre saben lo que se espera que hagan.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

7. Yo prefiero trabajar para los supervisores o jefes que esperan que los trabajadores sigan de cerca instrucciones y procedimientos.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

8. Las reglas y las regulaciones son importantes porque informan a trabajadores lo qué la compañía espera de él.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

9. Yo prefiero un trabajo que tiene detalladamente explicado los procedimientos de funcionamiento.

1 = totalmente desacuerdo	2	3	4 = acuerdo	5	6	7 = totalmente acuerdo

Sección 6. Satisfacción profesional

1. ¿Qué tan satisfecho esta usted con este trabajo?

1 = muy insatisfecho	2	3	4 = satisfecho	5	6	7 = muy satisfecho

2. ¿Qué tan satisfecho esta usted con la clase de oficio que usted hace en el trabajo?

1 = muy insatisfecho	2	3	4 = satisfecho	5	6	7 = muy satisfecho

APPENDIX B: Social Exchange Questionnaire (English)

Participant # _____

Instructions: Please respond to the following statements by putting an "X" in the block that most accurately represents your opinion concerning your experience at work. There are no 'correct' responses; it is your own views that are important.

	1 = Not at all	2	3 = Sometimes	4	5 = All the time
PERCEIVED ORGANIZATIONAL SUPPORT					
1. My supervisor values my contribution on the job.					
2. My supervisor considers my goals and values.					
3. My supervisor provides me help when I have a problem on the job.					
4. My supervisor cares about my safety.					
5. My supervisor cares about my opinions.					
6. My supervisor understands my problems and needs on the job.					
7. My supervisor recognizes my potential.					
8. I would defend and justify my supervisor's decision if he/she was not present.					
9. My supervisor provides me the necessary training to get the job done.					
	1 = Very unfair	2	3 = Fair	4	5 = Very fair
DISTRIBUTIVE JUSTICE					
1. How fair is your work schedule?					
2. How fair is your pay level?					
3. How fair is your workload?					
4. How fair are your job assignments?					
5. How fair is your training?					

APPENDIX B: Social Exchange Questionnaire (Spanish)

Participante # _____

Instrucciones: Responda por favor a las siguientes preguntas marcando una ""X" en la caja que representa su opinión referente a su experiencia en el trabajo. No hay ninguna respuesta "correcta" para las declaraciones evaluadas; Lo importante es su propio punto de vista.

	1 = No todos	2	3 = A veces	4	5 = A toda hora
AYUDA DE ORGANIZACIÓN PERCIBIDA					
1. Mi supervisor valora mi contribución en el trabajo.					
2. Mi supervisor considera mis metas y valores.					
3. Mi supervisor me proporciona ayuda cuando tengo un problema en el trabajo.					
4. Mi supervisor cuida por mi seguridad.					
5. Mi supervisor le importan mis opiniones.					
6. Mi supervisor entiende mis problemas y necesidades en el trabajo.					
7. Mi supervisor reconoce mi potencial.					
8. Yo defendería y justificaría la decisión de mi supervisor si el/ella no estaba presente.					
9. Mi supervisor me proporciona el entrenamiento necesario conseguir el labor terminado correcto.					
	1 = Muy injusto	2	3 = Justo	4	5 = Muy justo
JUSTICIA DISTRIBUTIVA					
10. ¿Qué tan justo es el horario del trabajo?					
11. ¿Qué tan justo es el nivel del sueldo?					
12. ¿Qué tan justo es la carga de trabajo?					
13. ¿Qué tan justo son las asignaciones del trabajo?					
14. ¿Qué tan justo son las entrenamientos?					

APPENDIX C: Safety Climate and Safety Behavior Questionnaire (English)

Instructions: Please respond to the following statements by putting an "X" in the block that most accurately represents your opinion concerning your experience at work. There are no 'correct' responses; it is your own views that are important.

	1 = Highly disagree	2 = Disagree	3 = Neither disagree or agree	4 = Agree	5 = Highly agree	6 = I don't know
SAFETY CLIMATE						
1. The workers' safety practices are important to your supervisor.						
2. My supervisor cares about my safety.						
3. My supervisor talks about how to be safe on the job.						
4. When my supervisor hired me, my supervisor gave me instructions on the safety requirements for my job.						
5. My supervisor requires me to attend safety meetings on the job.						
6. I have the proper personal protective equipment (safety glasses, gloves, earpieces, etc.) on the job site to get my job done.						
7. I have control over my safety on the job.						
8. Taking risks is part of my job.						
9. I may be injured on the job in the next 12-months.						
SAFETY BEHAVIOR						
10. I ignore safety rules to get the job done.						
11. I get the job done better by ignoring some of the safety rules.						
12. I take shortcuts which involve little or no risk.						
13. Incentives encourage me to break the rules.						
14. I break the rules due to pressure from my supervisor.						
15. I break the rules due to pressure from my workmates.						
16. If I don't take risks, I will not get the job done in time.						
17. Sometimes it is necessary to ignore safety rules to keep a job going.						
18. I break the rules so I can get the job done faster.						
19. I am not aware of any safety rules on the job.						

APPENDIX C: Safety Climate and Safety Behavior Questionnaire (Spanish)

Participante #_____

Instrucciones: Responda por favor a las siguientes declaraciones marcando una "X" en el bloque que representa su opinión referente a su experiencia en el trabajo. No hay ninguna respuesta "correcta" para las declaraciones evaluadas; Lo importante es su propio punto de vista.

	1 = totalmente desacuerdo	2 = desacuerdo	3 = ni desacuerdo o convienen	4 = acuerdo	5 = totalmente acuerdo	6 = No sé
AMBIENTE DE SEGURIDAD						
1. Las Prácticas de la seguridad de los trabajadores las son importantes para su supervisor.						
2. Mi supervisor cuida por mi seguridad.						
3. Mi supervisor habla de cómo ser seguro en el trabajo.						
4. Cuando mi supervisor me empleó, mi supervisor me dio instrucciones de los requisitos de seguridad para mi trabajo.						
5. Mi supervisor requiere que atienda reuniones de seguridad en mi trabajo.						
6. Tengo el equipo protector personal apropiado (gafas de seguridad, guantes, auriculares, etc.) en el sitio del trabajo donde yo realizo mi trabajo.						
7. Yo tengo control sobre mi seguridad en mi trabajo.						
8. Tomar riesgos es parte de mi trabajo.						
9. Yo puedo lastimar en el trabajo en los 12 meses próximos.						
COMPORTAMIENTO DE SEGURIDAD	1 = totalmente desacuerdo	2 = desacuerdo	3 = ni desacuerdo o convienen	4 = acuerdo	5 = totalmente acuerdo	6 = No sé
10 Yo no hago caso de reglas de seguridad para terminar un trabajo.						
11. Yo hago mejor trabajo cuando ignoro algunas de las reglas de seguridad.						

12. Yo tomo atajos que implican poco o nada de riesgo.						
13. Los incentivos me animan a que rompa las reglas.						
14. Yo rompo las reglas debido a la presión de mi supervisor.						
15. Yo rompo las reglas debido a la presión de mis compañeros de trabajo.						
16. Si yo no tomo riesgos, no terminare el trabajo hecho a tiempo.						
17. A veces es necesario no hacer caso de las reglas de seguridad para continua con el trabajo.						
18 Yo rompo las reglas así que puedo conseguir el trabajo hecho más rápido.						
19. Yo no estoy enterado de ninguna reglas de seguridad en el trabajo.						

APPENDIX D: Informed Consent Form – Phase One (English)

Participant # _____

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
GRADO DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING
MACROERGONOMICS AND GROUP DECISION SYSTEMS LABORATORY

Informed Consent for Participants of Investigative Projects

<u>Title of Project:</u> Comparing Latino and Non-Latino Construction Workers: The Effects of Training on Social Exchange and Safety
(Phase 1)

<u>Principal Investigator:</u> Sharnnia Artis, Graduate Student, ISE

<u>Faculty Advisors:</u> Dr. Tonya Smith-Jackson, Associate Professor, ISE
Dr. Brian Kleiner, Professor, ISE

PURPOSE OF THIS RESEARCH

The purpose of this research is to bridge the gap between Latino and non-Latino construction workers by defining the fundamental needs created by a cross-cultural work environment and understanding why Latino construction workers have more injuries, accidents, and fatalities than their non-Latino counterparts.

PROCEDURES

The procedures for the study are as follows. First, you will be asked to read and sign the informed consent form for the experiment. The researcher will also read the informed consent aloud. Once the form is completed, the researcher will provide you three questionnaires to collect background information (age, gender, education level) about you and information about your experience in construction (training, safety), relationship with workers in your workplace, and information about the safety climate of your work environment.

The session will last about 1 hour.

RISKS

Participation in this project does not place you at more than minimal risk of harm.

BENEFITS OF THIS RESEARCH

Your participation in this research will be used to help reduce the number of accidents and injuries construction workers, especially Latino workers, experience and improve the safety of the construction environment. Your participation will also contribute to the efforts to developing a training program to bridge the gap between Latino and non-Latino workers in construction.

BENEFITS AND COMPENSATION

The benefits to you are an opportunity to help improve the safety conditions of the construction workforce.   Additionally, for your participation, you will receive $10/hour at the completion of the study.

EXTENT OF CONFIDENTIALITY/ANONYMITY

The results of this research will be kept strictly confidential. At no time will the researchers release the results of the study to anyone other than the individuals working on the project without your written consent. The information you provide will have your name removed and only a participant number will identify you during analyses and any written reports of the research.

FREEDOM TO WITHDRAW

You are free to withdraw from this study at anytime without penalty.

APPROVAL OF THIS RESEARCH

This research project has been approved, as required, by the Institution Review Board for projects involving human participants at Virginia Polytechnic Institute and State University and the Grado Department of Industrial and Systems Engineering. You will receive a copy of this from to take with you.

PARTICIPANTS RESPONSIBILITY

I voluntarily agree to participate in this study and know of no reason in which I would not be able to participate. As a participant in this study, I have the following responsibility: Answer each question as honestly as possible.

_____
Signature of Participant

PARTICIPANT'S PERMISSION

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent to participate in this project, with the understanding that I may discontinue participation at any time if I choose to do so.

Signature: _____

Printed Name: _____

Date: _____

If you have any questions about this research or its conduct, you may contact:

Principal Investigator: Sharnnia Artis   Phone: (540) 951-8160
Graduate Student, Grado Department of Industrial and Systems Engineering
Email: sartis@vt.edu

Faculty Advisor: Dr. Tonya Smith-Jackson   Phone: (540) 231-4119
Associate Professor, Grado Department of Industrial and Systems Engineering
Email: smithjack@vt.edu

                      Dr. Brian Kleiner   Phone: (540) 231-4926
Professor, Grado Department of Industrial and Systems Engineering
Email: bkleiner@vt.edu

If you feel you have not been treated accordingly to the descriptions in this form, or your rights as a participant have been violated during the course of this project, you may contact Dr. David Moore, Chair of the Institution Review Board Research Division at (540) 231-4991.

APPENDIX D: Informed Consent Form – Phase One (Spanish)

Forma Informativa de Consentimiento

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
DEPARTAMENTO DE GRADO DE INGENIERÍA INDUSTRIAL Y SISTEMAS
MACROERGONOMICS Y GRUPO DE DECISIONES DEL LABORATORIO DE SISTEMAS.

Consentimiento Informado para los Participantes en el Proyecto de Investigación.

Título del proyecto: Comparar trabajadores de Construcción Latinos y No-Latinos: Los Efectos de Entrenamiento en Intercambio Social y Seguridad. *(Fase 1)*

Investigador Principal: Sharnnia Artis, estudiante graduado, ISE

Consejeros de la facultad: Dr. Tonya Smith-Jackson, Profesor Asociado, ISE
Dr. Brian Kleiner, Profesor, ISE

PROPÓSITO DE ESTA INVESTIGACIÓN

El propósito de esta investigación es tender un puente entre el espacio de trabajadores de construcción Latino y No-Latino así, definiendo las necesidades fundamentales creadas por un cruce de culturas en un ambiente de trabajo y entendiendo porqué los trabajadores Latino tienen más lesiones, accidentes, y fatalidades que sus contrapartes del non-Latino.

PROCEDIMIENTOS

Los procedimientos para el estudio son los siguientes. Primero, le pedirán leer y firmar la forma informativa del consentimiento para el experimento. El investigador también leerá el consentimiento informado en voz alta. Una vez que se llene el formulario, el investigador le proporcionará tres cuestionarios para recoger la información de antecedentes (edad, género, educación) sobre usted y la información sobre su experiencia en la construcción (entrenamiento, seguridad), la relación con los trabajadores en su lugar de trabajo, y la información sobre el clima de seguridad en su trabajo.

La sesión durará cerca de 1 hora.

RIESGOS

La participación en este proyecto no le coloca en el riesgo más mínimo riesgo de maltrato.

VENTAJAS DE ESTA INVESTIGACIÓN

Su participación en esta investigación será utilizada para ayudar a reducir el número de los accidentes y de los trabajadores de la construcción de lesiones, especialmente trabajadores Latinos, expertos y a mejorar la seguridad del ambiente de la construcción. Su participación también contribuirá en los esfuerzos para desarrollar un programa de entrenamiento para tender un puente entre trabajadores de construcción Latino y No-Latino

VENTAJAS Y REMUNERACIÓN

Las ventajas para usted son la oportunidad de ayudar a mejorar las condiciones de seguridad de la mano de obra de la construcción. Además, por su participación, usted recibirá una $10/hora al terminar el estudio.

GRADO DE CONFIDENTIALITY/ANONIMIDAD

Los resultados de esta investigación serán mantenidos terminantemente confidenciales. En ningún momento los investigadores darán su resultado del estudio a cualquier persona a excepción de los individuos que trabajan en el proyecto sin su consentimiento escrito. La información que usted proporciona tendrá se le quitara su nombre y solamente un número del participante lo identificará durante análisis y cualquier informe escrito de la investigación.

LIBERTAD A RETIRARSE

Usted está libre de retirarse de este estudio a toda hora sin ninguna penalidad.

APROBACIÓN DE ESTA INVESTIGACIÓN

Este proyecto de investigación ha sido aprobado, como requerimiento, por el comité examinador de la institución para los proyectos que implicaban a participantes humanos en el instituto de Virginia Polythechnic Institute and State University y el departamento de Grado de Ingeniería Industrial y de Sistemas. Usted recibirá una copia de esto para usted mantenga.

RESPONSABILIDAD DE LOS PARTICIPANTES

Yo voluntariamente acorde en participar en este estudio y no se ninguna razón por la cual no podría participar. Como participante en este estudio, tengo la siguiente responsabilidad. Contestar a cada pregunta tan honesta como sea posible.

_____
Firma del participante

PERMISO DEL PARTICIPANTE

Yo he leído y entiendo el consentimiento y las condiciones informadas de este proyecto. He hecho todas mis preguntas claras. Reconozco por este medio el antedicho y doy mi consentimiento voluntario para participar en este proyecto, con la comprensión que puedo no continuar la participación en cualquier momento si elijo hacer tal.

Ponga por favor sus iniciales al lado de la declaración apropiada del consentimiento.

_____ **Consiento** ser grabado en audio como parte de mi participación en este estudio.

_____ **No hago ningún consentimiento** para ser audio grabado como parte de mi participación en este estudio.

Firma: _____

Nombre impreso: _____

Fecha: _____

Si usted tiene algunas preguntas sobre esta investigación o su conducta, usted puede entrar en contacto con:

Investigador principal: Sharnnia Artis   Teléfono: (540) 951-8160
                                 Estudiante graduado, Departamento de Grado de Ingeniería Industrial y de Sistemas
                                 Email: sartis@vt.edu

Consejero de la facultad: Dr. Tonya Smith-Jackson   Teléfono: (540) 231-4119
                                 Profesor de asociado, departamento de Grado de Ingeniería Industrial y de Sistemas
                                 Email: smithjack@vt.edu

                                 Dr. Brian Kleiner   Teléfono: (540) 231-4926
                                 Profesor, departamento de Grado de Ingeniería Industrial y de Sistemas
                                 Email: bkleiner@vt.edu

Si usted siente que no a sido tratado de acuerdo a las descripciones en esta forma, o sus derechos como participante se han violado durante el curso de este proyecto, usted puede entrar en contacto con Dr. David Moore, Director de la división de investigación del comité examinador de la institución al (540) 231-4991.

APPENDIX E: Interview Questions (English)

Interviewer: The purpose of this research is to bridge the gap between Latino and non- Latino construction workers by defining the fundamental needs created by a cross-cultural work environment. When answering these questions, please be as honest as possible so the designer can ensure the best training for both Latino and non- Latino construction workers.

Warm-up questions

Question 1:
How long have you been in construction?
　　Probe: Why did you choose to go into construction?

Question 2:
What do you like about construction work?
　　Probe: What do you dislike about construction work?

Question 3:
Have you had any formal training in construction?
　　Probe: How did you learn your trade?

Break -- SHOW FIGURE

Question 4:
Why do you think accidents are frequent in the construction workplace?
　　Probe: Why do you think Latinos have more injuries and fatalities than other ethnic groups?

Question 5:
Do you think training will help reduce the number of accidents and fatalities in the construction industry?
　　Probe: What type of training do you think is necessary?
　　Probe: Who should take part in the training?
　　Probe: What should workers be trained on?
　　Probe: How long should the training last?
　　Probe: When is a good time to have the training?
　　Probe: Where is a good place to have the training?

Question 6:
What type of training will be helpful in the workplace?
　　Probe: How would you describe a good trainer?
　　Probe: Who should be responsible for training you the workers in the workplace?
　　Probe: How often should the training take place?

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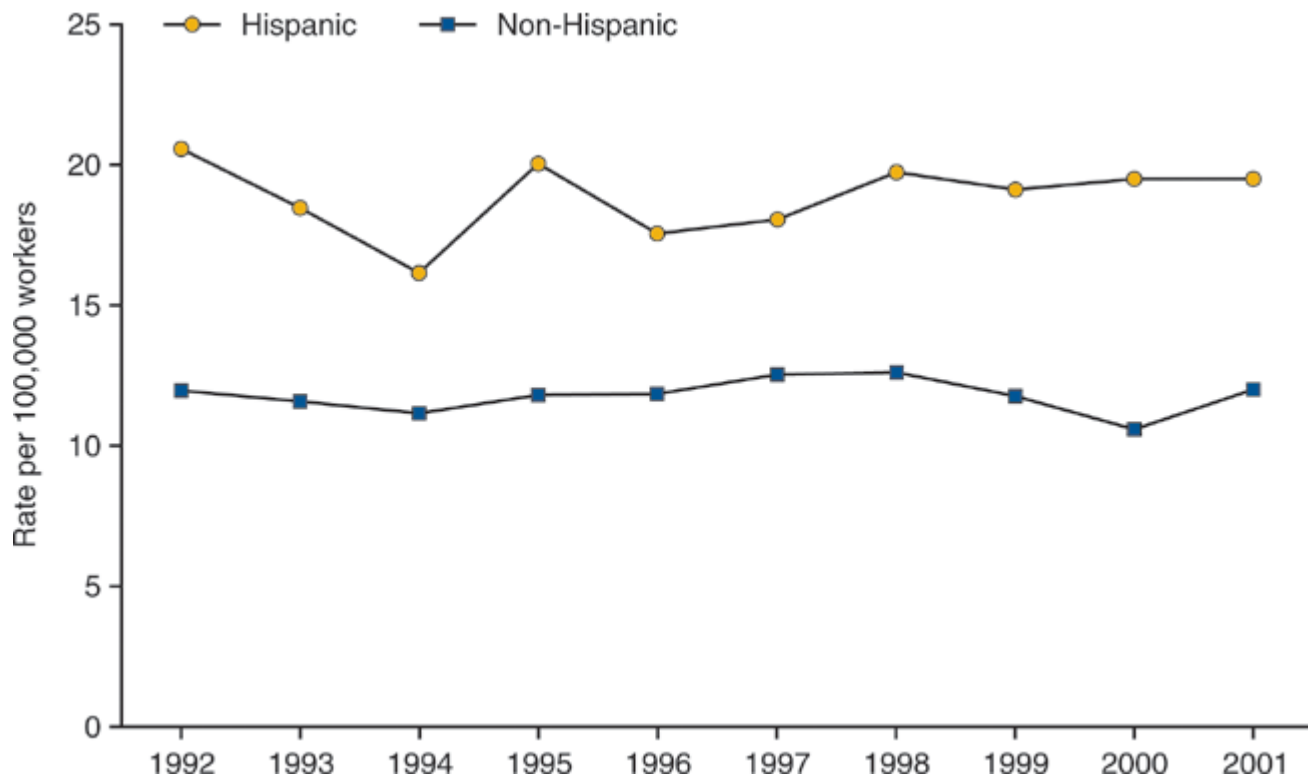
APPENDIX E: Interview Questions (Spanish)

Entrevistador: El propósito de esta investigación es tender un puente entre el espacio de trabajadores de construcción Latino y No-Latino así, definiendo las necesidades fundamentales creadas por un cruce de culturas en un ambiente de trabajo. Al contestar estas preguntas, Por favor sea lo mas honesto posiblemente así que el diseñador puede asegurar el mejor entrenamiento para los trabajadores de construcción Latinos y no Latinos.

Preguntas del calentamiento

Pregunta 1:
¿Cuanto tiempo usted ha estado trabando en construcción?
    Punta de prueba: ¿Por qué usted eligió entrar la construcción?

Pregunta 2:
¿Qué le gusta acerca del trabajo de construcción?
    Punta de prueba: ¿Qué no le gusta en el trabajo de construcción?

Pregunta 3:
¿Usted ha tenido entrenamiento formal en construcción?
    Punta de prueba: ¿Cómo usted aprendió a hacer lo que hace?

Interrumpa -- DEMUESTRE LA FIGURA

Pregunta 4:
¿Por qué usted piensa que accidentes son frecuentes en los lugares de construcción?
    Punta de prueba: ¿Por qué usted piensa que Latinos tienen más lesiones y fatalidades que otros grupos étnicos?

Pregunta 5:
¿Usted piensa que el entrenamiento ayudará a reducir el número de accidentes y de fatalidades en la industria de construcción?
    Punta de prueba: ¿Qué tipo de entrenamiento usted que piensa es necesario?
    Punta de prueba: ¿Quién debe participar en el entrenamiento?
    Punta de prueba: ¿Qué tipo de entrenamiento deben recibir los trabajadores?
    Punta de prueba: ¿Cuanto tiempo debe durar el entrenamiento?
    Punta de prueba: ¿Cuándo es le mejor momento para tener el entrenamiento?
    Punta de prueba: ¿Cual es buen lugar para el entrenamiento?

Pregunta 6:
¿Qué tipo de entrenamiento será provechoso en el lugar de trabajo?
    Punta de prueba: ¿Cómo usted describiría a buen entrenador?
    Punta de prueba: ¿Quién debe ser responsable del entrenamiento de ustedes los trabajadores?
        de este lugar de trabajo?
    Punta de prueba: ¿Qué tan a menudo el entrenamiento debe ocurrir?

Rate per 100,000 workers

25
20
15
10
5
0

Hispanic   Non-Hispanic

1992 1993 1994 1995 1996 1997 1998 1999 2000 2001

APPENDIX F: Screen Shots of Control Training Program (adapted from BuildIQ®, with permission)
(English)

Page 1: Course Introduction

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Jobsite Safety

Module 1 : Fall safety basics
Module Introduction
Click here for audio.

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Learning Objective: Know the major potential fall hazards on the jobsite, the primary fall protection systems, and for which types of work trades may use alternative fall protection.

Module 1

Click here for audio.

Falling is the leading cause of death in the residential construction industry. Almost all jobsites have scaffolds, precarious leading edges, and openings workers could fall through at some point during construction. If these edges and openings aren't guarded at the site, or if workers aren't wearing fall protection, workers can fall, sustaining injuries ranging from sprains and concussions to death. Framers, masons, roofers, stucco contractors, and other construction personnel who work in high areas all need fall protection.

Roofing, framing, mechanicals, and some other trades are allowed to use alternative fall protection instead of the three primary fall protection systems.

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Jobsite Safety

Module 1 : Fall safety basics
Lesson 1 : Fall hazards on the jobsite
Click here for audio.

Page: 2 of 3

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The Big Idea: Workers need fall protection when they're on working or walking surfaces 6 feet or more above a lower level, around openings into which they could fall 6 feet or more, and on scaffolds 10 feet or more above a lower level.

Click here for audio.

Construction jobsites are dangerous places. Without fall protection, workers can fall from roofs, second floors, concrete structures, and many other places. Don't let workers take risks with their own safety. Make them aware of fall hazards on the jobsite.

High levels
Click here for audio.

65% of construction professionals work on scaffolds and lifts frequently. OSHA has estimated that by keeping workers from falling off scaffolds, 4500 injuries and 50 deaths would be prevented every year. Scaffolds often don't have the essential fall protections. They aren't supported correctly, they aren't on stable ground, and they don't have the appropriate framing, planking, means of access, and guardrails.

Roofers have fallen to their deaths from open sides of the roof because they weren't wearing the right equipment. Framers can fall from unguarded walkways and from the open sides of the flooring while they're performing leading edge work or erecting exterior walls.

ZOOM
Scaffold

Excavations   Workers can be injured by falling into excavations. Protruding steel rebar, commonly installed in an

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Jobsite Safety

Module 1 : Fall safety basics
Lesson 2 : Fall safety

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Click here for audio.

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💡 **The Big Idea:** Workers should be protected from falls with PFAS, guardrails, or safety nets.

Click here for audio.

OSHA requirements for fall protection can be a bit confusing. In general, fall protection is required for working and walking surfaces 6 feet or more above lower levels, and for scaffold platforms 10 feet or more above lower levels. Stairways and ladders have their own specific fall protection requirements.

The three primary fall protection systems are guardrails, PFAS's, and safety nets.

Click here for audio.

Guardrails

A guardrail system provides a barrier that keeps workers from falling off a walking or working surface. The top edge of the guardrail system should be 42 inches, +/- 3 inches, above the level where workers are walking or working. The guardrail system should have a midrail to keep workers from falling between the top rail and the platform.

The guardrail system should be strong enough to support someone falling against it. Specifically, any guardrail must be able to withstand 200 pounds of force applied within 2 inches of the top edge in any outward or downward direction at any point along the top edge. It must do this without breaking or bending to a height less than 39 inches above the surface supporting the worker. The midrails must be capable of withstanding 150 pounds of inward or downward force.

ZOOM
Guardrail

Done

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Jobsite Safety

Module 2 : Stairways and ladders
Module Introduction

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Click here for audio.

← BACK   → NEXT

🎯 **Learning Objective:** Know how to ensure fall protection for workers on stairways and ladders.

Module 2

Click here for audio.

Stairways and ladders are a major source of accidents at construction jobsites. Workers are killed falling from stairways and ladders each year, and thousands are injured. It's easy to take safety for granted on stairways and ladders because they're simple to design, build, and use. A ladder that's resting on slippery surfaces or that is in poor condition might look acceptable to use when it's actually presenting a serious fall hazard.

It's important for you to know what stairways and ladders workers on your jobsite are using and how they're using them, and to make sure everyone moving up and down stairways and ladders on the jobsite can do it safely.

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APPENDIX F: Screen Shots of Control Training Program (adapted from BuildIQ®, with permission)
(Spanish)

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Curso de Eit

Jobsite Safety

Módulo 1: Seguridad básica contra caídas
Module Introduction

Chasque aquí para el audio.

Objetivo de aprendizaje: Reconocer los riesgos potenciales de caídas, entender los sistemas básicos de protección contra caídas, y conocer los tipos de trabajos que pueden ser realizados con protección alternativa contra caídas.

Page: 1 of 3

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Module 1

Chasque aquí para el audio.

Las caídas son la principal causa de muerte en la industria de la construcción residencial. Casi todas las obras tienen andamios, bordes salientes, excavaciones o huecos y otro tipo de áreas que presentan un alto riesgo de caída. Sin una protección adecuada contra caídas, los trabajadores pueden sufrir lesiones que van desde torceduras hasta contusiones o la muerte. Por trabajar en áreas altas, los carpinteros de estructura (freimeros), albañiles, techadores (ruferos) y contratistas para pintar el estuco, entre otros, necesitan protección contra caídas.

Está permitido que los trabajadores de techos (ruferos), estructura (freimeros) y algunos otros oficios específicos usen protección alternativa contra caídas en lugar de los sistemas convencionales de protección.

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Curso de Eit

Jobsite Safety

Módulo 1: Seguridad básica contra caídas
Lección 1. Peligros de caídas en la obra.

Chasque aquí para el audio.

Idea Principal: Los trabajadores necesitan protección contra caídas cuando trabajan o se desplazan sobre superficies que están a una altura superior a los 6 pies (1.8 metros), alrededor de aberturas de la superficie que puedan representar una caída de 6 pies (1.8 metros) o más, y sobre andamios que están a más de 10 pies de altura (3 metros) de la superficie.

Page: 2 of 3

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Chasque aquí para el audio.

Las obras de construcción son sitios peligrosos. Sin protección contra caídas, los trabajadores pueden caer de techos, segundos pisos, estructuras de concreto, y muchos otros lugares. No permita que los trabajadores tomen riesgos en contra de su propia seguridad. Adviértales de los peligros de caídas que existen en una obra de construcción.

Niveles altos
Chasque aquí para el audio.

ZOOM
Scaffold

Aproximadamente un 65% de los profesionales de la construcción trabajan en andamios y ascensores/elevadores frecuentemente. OSHA calcula que con el hecho de mantener a los trabajadores fuera de riesgos de caídas de andamios, se pueden prevenir 4,500 casos de lesiones y 50 muertes cada año. Los andamios frecuentemente carecen de medidas esenciales de protección contra caídas. En muchos casos, los andamios no están correctamente sostenidos o están ubicados sobre superficies inestables. Con frecuencia, además, los andamios carecen de un marco, tablones, sistemas de acceso o barandales que sean apropiados.

Muchos trabajadores de techos (ruferos) han muerto al caer desde las aberturas en el techo debido a que no portaban el equipo necesario para tal actividad. Los carpinteros de estructura (freimeros) pueden caer desde pasarelas que no tienen barandales, o desde aberturas en las áreas de trabajo cuando están realizando actividades como el

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Jobsite Safety

Módulo 1: Seguridad básica contra caídas
Lección 2. Seguridad contra caídas

Page: 3 of 3

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Idea Principal: Los barandales, armazones o PFAS, y redes de seguridad proporcionan seguridad contra caídas.

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Los requerimientos de OSHA para protección contra caídas pueden ser un poco confusos. En general, la protección contra caídas es un requisito para trabajar o caminar en superficies que están a 6 pies (1.8 metros) de altura o más, y para plataformas de andamios que están a 10 pies (3 metros) de altura o más sobre el nivel de la superficie. Las escaleras fijas o móviles tienen también requerimientos específicos para la protección contra caídas.

Los tres principales sistemas de protección contra caídas son los barandales, los armazones o PFAS, y las redes de seguridad.

Chasque aquí para el audio.

Barandales

Un sistema de barandales provee una barrera para evitar que los trabajadores caigan mientras trabajan o transitan sobre una superficie. El borde superior de un sistema de barandales debe estar a 42 pulgadas (106.68 centímetros), +/- 3 pulgadas (7.62 centímetros) sobre la superficie de trabajo o tránsito. El sistema debe tener un barandal intermedio que prevenga a los trabajadores de el riesgo de caer entre el barandal superior y la plataforma.

Un sistema de barandales debe ser lo suficientemente fuerte como para soportar a alguien que caiga. Específicamente, debe poder soportar 200 libras (90.71 kilos) sin doblarse o romperse, a una altura no menor de 39 pulgadas (99 centímetros) por encima de la superficie de trabajo o tránsito. El barandal

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Jobsite Safety

Módulo 2 : Escaleras fijas y móviles
Introducción del módulo

Page: 1 of 3

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Objetivo de aprendizaje: Saber cómo asegurar protección contra caídas para trabajadores en escaleras fijas o gradas y móviles.

Module 2

Chasque aquí para el audio.

Es importante saber qué tipo de escaleras fijas y móviles usan los trabajadores en su obra, y cómo las están utilizando. Asegúrese que todos quienes suben y bajan de escaleras lo hagan de una manera segura.

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Jobsite Safety

Módulo 2 : Escaleras fijas y móviles
Lección 1: Escaleras.

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Chasque aquí para el audio.
Idea Principal: Proporcionar protección contra caídas para trabajadores que utilizan escaleras.

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Asegúrese de que las escaleras en su sitio de trabajo tengan peldaños, barandales y plataformas que cumplen con las reglas de OSHA.

Chasque aquí para el audio.

Construcción de escaleras

ZOOM
Construcción de escaleras

Las escaleras deben construirse de tal forma que los trabajadores no puedan caerse de ellas. Estás son las recomendaciones para cualquier escalera en la obra:

♦ El ángulo de la escalera deberá estar entre los 30° y 50°. Las partes que componen cada peldaño deben tener siempre la misma altura y profundidad. Por cada 12 pies (3.6 metros) de altura que alcance una escalera, deberá tener un descanso de al menos 30 pulgadas (76.2 centímetros) de profundidad y 22 pulgadas (5.88 centímetros) de ancho.
♦ Las escaleras, barandales y descansos no deberán ser resbalosas por lluvia u otras condiciones del clima. Cualquier superficie suave deberá ser tratada para evitar que los trabajadores resbalen. Las escaleras deberá estar libre de partes saltadas o sueltas que puedan lastimar a los trabajadores o rasgarles la ropa.
♦ Las plataformas con puertas o accesos que dan directamente a una escalera deberán extenderse al menos 20 pulgadas (50.8 centímetros) mas allá de el espacio que la puerta requiere para abrirse.

Chasque aquí para el audio.   Las escaleras que tienen cuatro o más peldaños, o que tiene una altura

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Jobsite Safety

Módulo 2 : Escaleras fijas y móviles
Lección 2. Escaleras móviles

Chasque aquí para el audio.

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Idea Principal: Proporcionar protección contra caídas para los trabajadores que usan escaleras móviles.

← BACK   → NEXT

Chasque aquí para el audio.

Las escaleras móviles permiten a los trabajadores pasar de un nivel a otro. Asegúrese de que puedan llegar a su destino de manera segura.

Escala de la extensión

ZOOM
Escala de la extensión

A pesar de que las escaleras móviles son de simple construcción, no tome riesgos con las medidas de seguridad para escaleras móviles. Las escaleras móviles deberán:

♦ Tener superficies antiderrapantes
♦ Tener patas o bases antiderrapantes
♦ Tener espacio libre a su alrededor, desde la parte inferior hasta la parte superior
♦ Tener peldaños paralelos, nivelados y regularmente espaciados
♦ Estar ubicadas sobre superficies estables y niveladas
♦ Nunca estar atadas a otra escalera móvil para así ganar alcance
♦ Nunca ser movidas mientras haya un trabajador operando sobre ellas
♦ Nunca ser pintadas

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APPENDIX G: Screen Shots of Experimental Training Program (English)

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Exit Course

Jobsite Safety

Module 1 : Fall safety basics
Lesson 1 : Fall hazards on the jobsite
Click here for audio.

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The Big Idea: Workers need fall protection when they're on working or walking surfaces 6 feet or more above a lower level, around openings into which they could fall 6 feet or more, and on scaffolds 10 feet or more above a lower level.

Click here for audio.

Construction jobsites are dangerous places. Without fall protection, workers can fall from roofs, second floors, concrete structures, and many other places. Don't let workers take risks with their own safety. Make them aware of fall hazards on the jobsite.

High levels
Click here for audio.

65% of construction professionals work on scaffolds and lifts frequently. OSHA has estimated that by keeping workers from falling off scaffolds, 4500 injuries and 50 deaths would be prevented every year. Scaffolds often don't have the essential fall protections. They aren't supported correctly, they aren't on stable ground, and they don't have the appropriate framing, planking, means of access, and guardrails.

Roofers have fallen to their deaths from open sides of the roof because they weren't wearing the right equipment. Framers can fall from unguarded walkways and from the open sides of the flooring while they're performing leading edge work or erecting exterior walls.

ZOOM
Scaffold

Excavations   Workers can be injured by falling into excavations. Protruding steel rebar, commonly installed in an

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start   Dissertation_June14,...   Lesson 1 : Fall hazard...   4:11 PM

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Jobsite Safety

Module 1 : Fall safety basics
Lesson 2 : Fall safety
Click here for audio.

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The Big Idea: Workers should be protected from falls with PFAS, guardrails, or safety nets.

Click here for audio.

OSHA requirements for fall protection can be a bit confusing. In general, fall protection is required for working and walking surfaces 6 feet or more above lower levels, and for scaffold platforms 10 feet or more above lower levels. Stairways and ladders have their own specific fall protection requirements.

The three primary fall protection systems are guardrails, PFAS's, and safety nets.

Click here for audio.

Guardrails

A guardrail system provides a barrier that keeps workers from falling off a walking or working surface. The top edge of the guardrail system should be 42 inches, +/- 3 inches, above the level where workers are walking or working. The guardrail system should have a midrail to keep workers from falling between the top rail and the platform.

The guardrail system should be strong enough to support someone falling against it. Specifically, any guardrail must be able to withstand 200 pounds of force applied within 2 inches of the top edge in any outward or downward direction at any point along the top edge. It must do this without breaking or bending to a height less than 39 inches above the surface supporting the worker. The midrails must be capable of withstanding 150 pounds of inward or downward force.

ZOOM
Guardrail

Done

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Jobsite Safety

Module 2 : Stairways and ladders
Lesson 1 : Stairs

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Click here for audio.

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The Big Idea: Provide fall protection for workers using stairways.

Make sure the stairways on your jobsite have steps, rails, and platforms that comply with OSHA regulations.

Click here for audio.

Stair construction

ZOOM
Stair construction

Stairways should be built in such a way that workers can't fall from them. Here are the guidelines for any stairway on the jobsite.

- The angle of the stairway should be between 30° and 50°. The risers and treads should all have the same height and depth. In every 12 feet of stairway height, there should be a landing that's at least 30 inches deep and 22 inches wide.
- The stairs, rails, and landings shouldn't be slippery from rain or other weather conditions. Any smooth surfaces should be treated to keep workers from slipping. The stairway should be free of projections that could injure workers or snag clothing.
- Platforms with swinging doors or gates, where the doors or gates open directly onto the stairway, should extend at least 20 inches beyond the swing of the door.

Click here for audio.

Stair rails

Stairways with four or more steps or 30 inches tall or taller must have rails. There are two basic requirements for stair rails. The stairway must have both handrails and side rails.

Handrails should provide an adequate hand hold for workers to grasp, typically preventing a fall forward. Handrails must be 30 inches to 37 inches high. **Side rails** should keep a worker from falling from the stairway, and should be 36 inches to 37 inches from the tread to the top of the rail. To comply with both the handrail and the

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APPENDIX G: Screen Shots of Experimental Training Program (Spanish)

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Curso de Eit

Jobsite Safety

Seguridad en el Trabajo I
Curse la introducción

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Introduction

Hard hat
Safety glasses
Gloves
Boots
ZOOM
Safety gear

Chasque aquí para el audio.

El rápido crecimiento de la construcción residencial ha traído como resultado que un gran número de trabajadores necesiten entrenamiento sobre seguridad laboral. Como supervisor de obra, usted es responsable por el establecimiento de una cultura de seguridad en el sitio de trabajo.

Todos los trabajadores en la obra deben tener un casco de protección y otro Equipo Personal de Protección (PPE, por sus siglas en inglés) apropiado para las tareas que desempeñan. Los trabajadores deben estar protegidos contra caídas, golpes y aplastamiento. También deben estar protegidos en excavaciones y trabajos eléctricos. Este curso de Seguridad en el Trabajo le proporciona las herramientas necesarias para mantener a sus trabajadores seguros en su lugar de empleo. Seguridad en el Trabajo I cubre la protección contra caídas y contiene cuatro módulos:

Módulo 1. Seguridad básica contra caídas, cubre los peligros de caídas en la obra e introduce elementos para la protección contra caídas.

Módulo 2. Andamios, explica cómo asegurar que los trabajadores en andamios estén protegidos contra caídas.

Done

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Curso de Eit

Jobsite Safety

Módulo 1: Seguridad básica contra caídas
Module Introduction

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Objetivo de aprendizaje: Reconocer los riesgos potenciales de caídas, entender los sistemas básicos de protección contra caídas, y conocer los tipos de trabajos que pueden ser realizados con protección alternativa contra caídas.

Module 1

Chasque aquí para el audio.

Las caídas son la principal causa de muerte en la industria de la construcción residencial. Casi todas las obras tienen andamios, bordes salientes, excavaciones o huecos y otro tipo de áreas que presentan un alto riesgo de caída. Sin una protección adecuada contra caídas, los trabajadores pueden sufrir lesiones que van desde torceduras hasta contusiones o la muerte. Por trabajar en áreas altas, los carpinteros de estructura (freimeros), albañiles, techadores (ruferos) y contratistas para pintar el estuco, entre otros, necesitan protección contra caídas.

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Curso de Eit

Jobsite Safety

Módulo 1: Seguridad básica contra caídas
Lección 1. Peligros de caídas en la obra.

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Chasque aquí para el audio.

Idea Principal: Los trabajadores necesitan protección contra caídas cuando trabajan o se desplazan sobre superficies que están a una altura superior a los 6 pies (1.8 metros), alrededor de aberturas de la superficie que puedan representar una caída de 6 pies (1.8 metros) o más, y sobre andamios que están a más de 10 pies de altura (3 metros) de la superficie.

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Las obras de construcción son sitios peligrosos. Sin protección contra caídas, los trabajadores pueden caer de techos, segundos pisos, estructuras de concreto, y muchos otros lugares. No permita que los trabajadores tomen riesgos en contra de su propia seguridad. Adviértales de los peligros de caídas que existen en una obra de construcción.

Niveles altos
Chasque aquí para el audio.

Aproximadamente un 65% de los profesionales de la construcción trabajan en andamios y ascensores/elevadores frecuentemente. OSHA calcula que con el hecho de mantener a los trabajadores fuera de riesgos de caídas de andamios, se pueden prevenir 4,500 casos de lesiones y 50 muertes cada año. Los andamios frecuentemente carecen de medidas esenciales de protección contra caídas. En muchos casos, los andamios no están correctamente sostenidos o están ubicados sobre superficies inestables. Con frecuencia, además, los andamios carecen de un marco, tablones, sistemas de acceso o barandales que sean apropiados.

ZOOM
Scaffold

Muchos trabajadores de techos (ruferos) han muerto al caer desde las aberturas en el techo debido a que no portaban el equipo necesario para tal actividad. Los carpinteros de estructura (freimeros) pueden caer desde pasarelas que no tienen barandales, o desde aberturas en las áreas de trabajo cuando están realizando actividades como el

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Exit Course

Jobsite Safety

Módulo 1: Seguridad básica contra caídas
Lección 2. Seguridad contra caídas

Page: 3 of 3

Chasque aquí para el audio.

Idea Principal: Los barandales, armazones o PFAS, y redes de seguridad proporcionan seguridad contra caídas.

BACK   NEXT

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Los requerimientos de OSHA para protección contra caídas pueden ser un poco confusos. En general, la protección contra caídas es un requisito para trabajar o caminar en superficies que están a 6 pies (1.8 metros) de altura o más, y para plataformas de andamios que están a 10 pies (3 metros) de altura o más sobre el nivel de la superficie. Las escaleras fijas o móviles tienen también requerimientos específicos para la protección contra caídas.

Los tres principales sistemas de protección contra caídas son los barandales, los armazones o PFAS, y las redes de seguridad.

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Barandales

Un sistema de barandales provee una barrera para evitar que los trabajadores caigan mientras trabajan o transitan sobre una superficie. El borde superior de un sistema de barandales debe estar a 42 pulgadas (106.68 centímetros), +/- 3 pulgadas (7.62 centímetros) sobre la superficie de trabajo o tránsito. El sistema debe tener un barandal intermedio que prevenga a los trabajadores de el riesgo de caer entre el barandal superior y la plataforma.

Un sistema de barandales debe ser lo suficientemente fuerte como para soportar a alguien que caiga. Específicamente, debe poder soportar 200 libras (90.71 kilos) sin doblarse o romperse, a una altura no menor de 39 pulgadas (99 centímetros) por encima de la superficie de trabajo o tránsito. El barandal

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Page 5: Module 1, Lesson 2

Page 6: Feedback

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build IQ

Exit Course

Jobsite Safety

Módulo 2 : Escaleras fijas y móviles
Lección 1: Escaleras.

Page: 2 of 3

Chasque aquí para el audio.

Idea Principal: Proporcionar protección contra caídas para trabajadores que utilizan escaleras.

← BACK   → NEXT

Asegúrese de que las escaleras en su sitio de trabajo tengan peldaños, barandales y plataformas que cumplen con las reglas de OSHA.

Chasque aquí para el audio.

Construcción de escaleras

ZOOM

Construcción de escaleras

Las escaleras deben construirse de tal forma que los trabajadores no puedan caerse de ellas. Estás son las recomendaciones para cualquier escalera en la obra:

- El ángulo de la escalera deberá estar entre los 30° y 50°. Las partes que componen cada peldaño deben tener siempre la misma altura y profundidad. Por cada 12 pies (3.6 metros) de altura que alcance una escalera, deberá tener un descanso de al menos 30 pulgadas (76.2 centímetros) de profundidad y 22 pulgadas (5.88 centímetros) de ancho.
- Las escaleras, barandales y descansos no deberán ser resbalosas por lluvia u otras condiciones del clima. Cualquier superficie suave deberá ser tratada para evitar que los trabajadores resbalen. Las escaleras deberá estar libre de partes saltadas o sueltas que puedan lastimar a los trabajadores o rasgarles la ropa.
- Las plataformas con puertas o accesos que dan directamente a una escalera deberán extenderse al menos 20 pulgadas (50.8 centímetros) mas allá de el espacio que la puerta requiere para abrirse.

Chasque aquí para el audio. Las escaleras que tienen cuatro o más peldaños, o que tiene una altura

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Exit Course

Jobsite Safety

Módulo 2 : Escaleras fijas y móviles
Lección 2. Escaleras móviles

Page: 3 of 3

Chasque aquí para el audio.

Idea Principal: Proporcionar protección contra caídas para los trabajadores que usan escaleras móviles.

← BACK   → NEXT

Chasque aquí para el audio.

Las escaleras móviles permiten a los trabajadores pasar de un nivel a otro. Asegúrese de que puedan llegar a su destino de manera segura.

Escala de la extensión

ZOOM
Escala de la extensión

A pesar de que las escaleras móviles son de simple construcción, no tome riesgos con las medidas de seguridad para escaleras móviles. Las escaleras móviles deberán:

- Tener superficies antiderrapantes
- Tener patas o bases antiderrapantes
- Tener espacio libre a su alrededor, desde la parte inferior hasta la parte superior
- Tener peldaños paralelos, nivelados y regularmente espaciados
- Estar ubicadas sobre superficies estables y niveladas
- Nunca estar atadas a otra escalera móvil para así ganar alcance
- Nunca ser movidas mientras haya un trabajador operando sobre ellas
- Nunca ser pintadas

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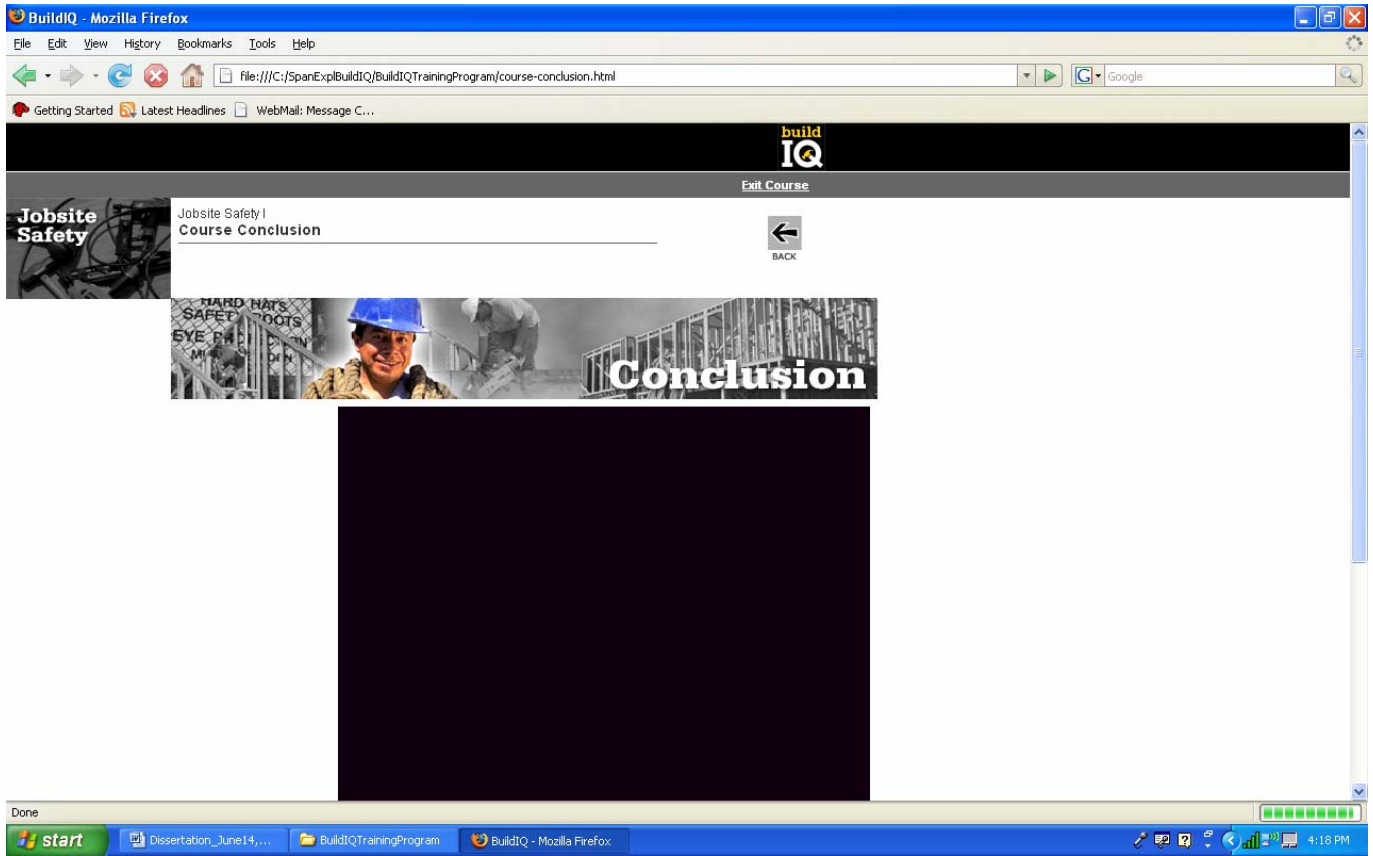
Page 10: Course Conclusion Video

APPENDIX H: Training Evaluation Questionnaire (English)

Instructions: Please respond to the following statements by putting an "X" in the block that most accurately represents your opinion concerning the training program you just completed. There are no 'correct' responses; it is your own views that are important.

6. This training provided me with feedback to help me understand how to apply this information.	1 = Strongly disagree	2 = Disagree	3 = Neither agree or disagree	4 = Agree	5 = Strongly agree
Please give examples of the feedback provided in the training.					
Do you think more feedback is needed? *circle one* Yes No					
If yes, please provide examples.					

7. A supervisor was involved with this training.	1 = Strongly disagree	2 = Disagree	3 = Neither agree or disagree	4 = Agree	5 = Strongly agree
How was the supervisor involved?					
Do you think more supervisor involvement is needed? *circle one* Yes No					
If yes, please provide examples.					

8. There was a reward for completing this training.	1 = Strongly disagree	2 = Disagree	3 = Neither agree or disagree	4 = Agree	5 = Strongly agree
What type of reward(s) was/were given?					
Do you think more rewards need to be given? *circle one* Yes No					
If yes, please provide examples.					

9. Completing the training will help me keep my job.	1 = Strongly disagree	2 = Disagree	3 = Neither agree or disagree	4 = Agree	5 = Strongly agree

How will completing the training help you keep your job?

10. Completing the training will help me get promoted.	1 = Strongly disagree	2 = Disagree	3 = Neither agree or disagree	4 = Agree	5 = Strongly agree

How will completing the training help you get promoted?

APPENDIX H: Training Evaluation Questionnaire (Spanish)

Evaluadores del programa de entrenamiento

Instrucciones: Por favor responda a las declaraciones siguientes poniendo una "X" en el cuadro que represente, lo más exactamente posible, la probabilidad de su comportamiento una vez que usted vuelta a su lugar de trabajo. No hay ninguna respuesta "correcta"; sus propias opiniones son las más importantes.

1. Este entrenamiento proveyó realimentación para ayudarme a entender cómo aplicar esta información.	1 = Fuertemente en desacuerdo	2 = Desacuerdo	3 = Ni de acuerdo o desacuerdo	4 = De acuerdo	5 = Fuertemente de acuerdo

Por favor de ejemplos de la realimentación proveída en el entrenamiento.

¿Usted piensa que más realimentación es necesario? *circule uno*   Sí   No

Si sí, por favor proporcione los ejemplos.

2. Un supervisor participo en este entrenamiento.	1 = Fuertemente en desacuerdo	2 = Desacuerdo	3 = Ni de acuerdo o desacuerdo	4 = De acuerdo	5 = Fuertemente de acuerdo

¿Cómo el supervisor estuvo implicado?

¿Usted piensa que mas participación de los supervisor es necesaria? *circule uno*   Sí   No

Si sí, por favor proporcione los ejemplos.

3. Había una recompensa por terminar este entrenamiento.	1 = Fuertemente en desacuerdo	2 = Desacuerdo	3 = Ni de acuerdo o desacuerdo	4 = De acuerdo	5 = Fuertemente de acuerdo

¿Qué tipo de recompensas era/ fue dado?

¿Usted piensa que más recompensas necesitan ser dado? ? *circule uno*   Sí   No

Si sí, proporcione por favor los ejemplos.

4. Terminar el entrenamiento me ayudará a mantener mi trabajo.	1 = Fuertemente en desacuerdo	2 = Desacuerdo	3 = Ni de acuerdo o desacuerdo	4 = De acuerdo	5 = Fuertemente de acuerdo
¿Cómo al terminar el entrenamiento, le ayudará a mantener su trabajo?					
5. Terminar el entrenamiento me ayudará a ser promovido.	1 = Fuertemente en desacuerdo	2 = Desacuerdo	3 = Ni de acuerdo o desacuerdo	4 = De acuerdo	5 = Fuertemente de acuerdo
¿Cómo al terminar el entrenamiento le ayudará a ser promovido?					

APPENDIX I: Perceived Organizational Support for Training Questionnaire (English)

Instructions: Please respond to the following statements by putting an "X" in the block that most accurately represents your opinion concerning the training you just completed. There are no 'correct' responses; it is your own views that are important.

	1 = Strongly disagree	2 = Disagree	3 = Neither agree or disagree	4 = Agree	5 = Strongly agree
21. Providing training shows that my supervisor values my contribution to the company I work for.					
22. The training strongly considers my goals and values.					
23. The training will give me help when I have a question about safety at work.					
24. Providing training shows that my supervisor cares about my well-being.					
25. The training will help me move up in the company I work for.					
26. Providing training shows that my supervisor cares about my satisfaction at work.					
27. Providing training shows that my supervisor has very little concern for me.					
28. Providing training shows that my supervisor cares more about me than making a profit.					
29. My supervisor tried to make the training as interesting as possible.					
30. This training provided me feedback to help me understand how to apply this safety information to my job.					
31. My supervisor was involved with this training.					

	1 = Strongly disagree	2 = Disagree	3 = Neither agree or disagree	4 = Agree	5 = Strongly agree
32. There was a reward for completing this training.					
33. Receiving a reward made me pay more attention to the information in the training.					
34. Completing the training will help me keep my job.					
35. Completing the training will help me get promoted.					
36. Receiving feedback during the training motivates me to apply what I learn during the training to my job.					
37. My supervisor being involved with the training motivates me to apply what I learn during the training to my job.					
38. Receiving a reward at the end of the training motivates me to apply what I learn during the training to my job.					
39. Knowing that completing the training will help me keep my job motivates me to apply what I learn during the training to my job.					
40. Knowing that completing the training will help me get promoted motivates me to apply what I learn during the training to my job.					

APPENDIX I: Perceived Organizational Support for Training Questionnaire (Spanish)

Instrucciones: Por favor responda a las declaraciones siguientes poniendo una "X" en el cuadro que represente, lo más exactamente posible, la probabilidad de su comportamiento una vez que usted vuelta a su lugar de trabajo. No hay ninguna respuesta "correcta"; sus propias opiniones son las más importantes.

	1 = Fuertemente desacuerdo	2 = Desacuerdo	3 = Ni de acuerdo o desacuerdo	4 = De acuerdo	5 = Fuertemente de acuerdo
1. El proporcionar entrenamiento demuestra que mi supervisor valora mi contribución a la compañía para la cual trabajo.					
2. El entrenamiento considera fuertemente mis metas y valores.					
3. El entrenamiento me dará ayuda cuando tenga una pregunta sobre seguridad en el trabajo.					
4. El proporcionar entrenamiento demuestra que mi supervisor cuida sobre mi bienestar.					
5. El entrenamiento me ayudará a progresar en la compañía para la cual trabajo.					
6. El proporcionar entrenamiento demuestra que mi supervisor le importa mi satisfacción en el trabajo.					
7. El proporcionar entrenamiento demuestra que mi supervisor tiene muy poca preocupación por mí.					
8. El proporcionar entrenamiento demuestra que mi supervisor cuida más sobre mí que hacer dinero.					
9. Mi supervisor intentó hacer el entrenamiento lo mas interesante posible.					
10. Este entrenamiento me proporcionó crítica positiva que me ayudara a entender cómo aplicar esta información de seguridad a mi trabajo.					
11. Mi supervisor estuvo implicado con este entrenamiento.					

	1 = Fuertemente en desacuerdo	2 = Desacuerdo	3 = Ni de acuerdo o desacuerdo	4 = De acuerdo	5 = Fuertemente de acuerdo
12. Había una recompensa por terminar este entrenamiento.					
13. La recepción de una recompensa hizo que prestara más atención a la información en el entrenamiento.					
14. Terminar el entrenamiento me ayudará a mantener mi trabajo.					
15. Terminar el entrenamiento me ayudará a ser promovido.					
16. Recibiendo una retroalimentación durante el entrenamiento me motiva para aplicar lo que aprendí durante el entrenamiento en mi trabajo.					
17. La participación de mi supervisor en el entrenamiento me motiva a aplicar lo que aprendí durante el entrenamiento en mi trabajo.					
18. Recibiendo una recompensa al final del entrenamiento me motiva para aplicar lo que aprendí durante el entrenamiento a mi trabajo.					
19. Saber que terminar el entrenamiento me ayudará a mantener mi trabajo, me motiva para aplicar lo que aprendí durante el entrenamiento en mi trabajo.					
20. Sabiendo que al terminar el entrenamiento me ayudará a ser promovido, me motiva para aplicar lo que aprendí durante el entrenamiento en mi trabajo.					

APPENDIX J: Pre-Knowledge Assessment Questionnaire (English)

Instructions: Please respond to the following statements by shading in the circle that that most accurately represents your answer to the question.

1. The roofing contractor foreman is using an extension ladder to get to roof. Which of the following is true?

☐ A. He should maintain three points of contact with the ladder.

☐ B. Because the ladder extends 2 feet above the edge of the roof, according to the OSHA standard, he can land on the roof safely.

☐ C. The ladder can be moved while he's using it.

2. Which of the following is one way that roofers using alternative fall protection can limit their risk of falling from the roof?

☐ A. Limit the amount of time they're on the roof ridge.

☐ B. Stay on the roof ridge during the entire framing process.

☐ C. Investigate all accidents.

3. A member of the framing crew is on the second floor deck. He opens a door leading directly onto a stairway. At least how far should the floor decking he's standing on extend beyond the swing of the door?

☐ A. 8 inches

☐ B. 3 inches

☐ C. 20 inches

4. To comply with OSHA standards, stairway landings must be at least how deep and wide?

☐ A. 30 inches deep and 22 inches wide

☐ B. 20 inches deep and 14 inches wide

☐ C. 25 inches deep and 18 inches wide

5. Which of the following is true about a PFAS?

☐ A. A PFAS shouldn't allow a worker to free fall more than 6 feet.

☐ B. A body belt is a PFAS.

☐ C. A PFAS doesn't include an anchorage.

6. Which of the following is true?

☐ A. Stairways with four risers don't need rails.

☐ B. Stairways 35 inches high don't need rails.

☐ C. Stairways with four or more risers must have rails.

APPENDIX J: Pre-Knowledge Assessment Questionnaire (Spanish)

Preguntas del Conocimiento Previo

Instructions: Por favor responda a las declaraciones siguientes sombreando en el círculo que representa lo más exactamente posible su respuesta a la pregunta.

1. El contratista de techos está utilizando una escala de extensión para llegar hasta el techo. ¿Cuáles de lo siguiente es verdad?

A. Él debe mantener tres puntos de contacto con la escala.

B. Porque la escala se extiende 2 pies sobre el borde el borde del techo, según el estándar del OSHA, él puede alcanzar al techo con seguridad.

C. La escalera puede ser movida con seguridad mientras el la utiliza.

2. ¿Cuál de las siguientes es la manera como los trabajadores de techos que usan protección alternativa de caídas pueden limitar su riesgo de caer del techo?

A.   Limitando la cantidad de tiempo que están en el canto del techo.

B.   Permanezca en el canto del techo durante todo el proceso de enmarcamiento.

C.   Investige todos los accidentes.

3. Un miembro del equipo que enmarca está en la segunda cubierta del piso. Él abre una puerta que conduce directamente a las escaleras. ¿Por lo menos, hasta dónde debe ser extendió más allá de la oscilación de la puerta, el piso de cubierta el cual él está parado?

A.   8 pulgadas

B.   3 pulgadas

C.   20 pulgadas

4. ¿para cumplir con estándares del OSHA, los aterrizajes de la escalera deben ser por lo menos cómo de profundos y de ancho?

A. 30 pulgadas de profundo y 22 pulgadas de ancho

B. 20 pulgadas de profundo y 14 pulgadas de ancho

C. 25 pulgadas de profundo y 18 pulgadas de ancho

5. ¿Cuál de los siguiente es verdad acerca de PFAS?

A.   Un PFAS no debe permitir que un trabajador caíga libere más de 6 pies.

B.   Una correa del cuerpo es un PFAS.

C.   Un PFAS no incluye un ancladero.

6. ¿Cuál de los siguiente es verdad?

A.   Las escaleras con cuatro escalones no necesitan baranda.

B.   Las escaleras de 35 pulgadas de alto no necesitan baranda.

C.   Las escaleras con cuatro o más escalones deben tener baranda.

APPENDIX K: Post-Knowledge Assessment Questionnaire (English)

Instructions: Please respond to the following statements by shading in the circle that that most accurately represents your answer to the question.

1. Does OSHA recognize any fall protection other than PFAS's, safety nets, or guardrail systems?

- ☐ A. No, OSHA doesn't recognize any fall protection other than conventional fall protection.

- ☐ B. OSHA doesn't require fall protection for residential construction workers.

- ☐ C. Yes, OSHA recognizes alternative fall protection.

2. If the workers on a 4:12-pitch roof aren't using conventional fall protection, which of the following is true?

- ☐ A. Workers aren't allowed to use slide guards as alternative fall protection.

- ☐ B. If they're using a warning line, a safety monitor isn't required.

- ☐ C. They should have either a safety monitor and warning line or 2x6 slide guards.

3. A window opening on the second floor has a bottom sill that's 24 inches high. Should the opening have a temporary guardrail?

- ☐ A. Yes, unless the opening has a chute attached to it

- ☐ B. No, unless the window opening is more than 3 feet wide

- ☐ C. Yes, unless all the workers on that level are wearing PFAS's

4. Which of the following is part of an alternative fall protection plan?

- ☐ A. A PFAS and a guardrail system

- ☐ B. A safety net

- ☐ C. A controlled access zone

5. The angle of any stairway on the jobsite should be within which of the following ranges?

- ☐ A. 30° and 50°

- ☐ B. 55° and 70°

- ☐ C. 50° and 75°

6. Which of the following is true?

- ☐ A. Stairways with four risers don't need rails.

- ☐ B. Stairways 35 inches high don't need rails.

- ☐ C. Stairways with four or more risers must have rails.

APPENDIX K: Post-Knowledge Assessment Questionnaire (Spanish)
Preguntas de evaluación del conocimiento previo

Instructions: Por favor responda a las declaraciones siguientes sombreando en el círculo que representa lo más exactamente posible su respuesta a la pregunta.

1. ¿ El OSHA reconoce protección de la caída con excepción de PFAS, redes de seguridad, o de sistemas de la barandilla?
A. No, OSHA no reconoce ninguna protección de caída con excepción de la protección convencional de la caída.
B. El OSHA no requiere la protección de caída para los trabajadores de la construcción residencial.
C. Sí, el OSHA reconoce la protección alternativa de la caída.

2. ¿Si los trabajadores en 4:12 - techo de la echada no está utilizando la protección convencional de caída, cual de los siguientes es verdad?
A. A los trabajadores no se les permite utilizar protectores de corredera como protección alternativa de caída.
B. Si están utilizando una cuerda de advertencia, un monitor de seguridad no se requiere.
C. Deben tener un monitor de seguridad y protectores de la cuerda de advertencia o protectores de corredera de 2x6.

3. Una abertura de la ventana en el segundo piso tiene un travesaño inferior de 24 pulgadas de alto. ¿Debe la abertura tener una barandilla temporal?
A. Sí, a menos que la abertura tenga un canal inclinado unido a ella
B. No, a menos que la abertura de la ventana tenga más de 3 pies de ancho
C. Sí, a menos que todos los trabajadores en ese nivel estén usando PFAS

4. ¿Cuál del los siguientes es parte de un plan alternativo de protección de caída?
A. Un PFAS y un sistema de la barandilla
B. Una red de seguridad
C. Una zona controlada del acceso

5. ¿ El ángulo de cualquier escalera en el sitio de trabajo debe estar dentro de cuáles de las siguientes gamas?
A. 30° y 50°
B. 55° y 70°
C. 50° y 75°

6. ¿Cuál del siguiente es verdad?
A. Las escaleras con cuatro escalones verticales no necesitan los baranda.
B. Las escaleras 35 pulgadas de alto no necesitan baranda.
C. Las escaleras con cuatro o más escalones deben tener escalones.

APPENDIX L: Reaction Questionnaire (English)

Instructions: Please respond to the following statements by putting an "X" in the block that most accurately represents your opinion concerning the training you just completed. There are no 'correct' responses; it is your own views that are important.

	1 = Strongly disagree	2 = Disagree	3 = Neither agree or disagree	4 = Agree	5 = Strongly agree
1. The information covered in the training was relevant to my job.					
2. The information was presented in an interesting way.					
3. I will be able to apply much of the information to my job.					
4. New information was presented during this program.					
5. The information presented will help me identify where safety hazards exist in my workplace.					
6. The information presented will help me to make changes in my workplace.					
7. The information was presented clearly.					
8. The examples were presented clearly.					
9. I was able to identify the hazards in the examples.					
10. The examples helped me understand the information presented.					
11. The assessments helped me remember the information presented.					
12. The audio helped me understand the information presented.					
Overall, how would you rate this training? (Circle one)	Excellent	Good	Average	Fair	Poor
What would you do to improve the training program?					

APPENDIX L: Reaction Questionnaire (Spanish)

Cuestionario de Reaccion (Evaluacion Nivel 1)

Instrucciones: Por favor responda a las declaraciones siguientes poniendo una "X" en el cuadro que represente, lo más exactamente posible, la probabilidad de su comportamiento una vez que usted vuelta a su lugar de trabajo. No hay ninguna respuesta "correcta"; sus propias opiniones son las más importantes.

	1 = Fuertemente en desacuerdo	2 = Desacuerdo	3 = Ni de acuerdo o desacuerdo	4 = De acuerdo	5 = Fuertemente de acuerdo
1. La información tratada en el entrenamiento era relevante a mi trabajo.					
2. La información fue presentada de una manera interesante.					
3. Yo podré aplicar mucha de la información a mi trabajo.					
4 Información nueva fue presentada durante este programa.					
5. La información presentada me ayudará a identificar donde los peligros de seguridad existen en mi lugar de trabajo.					
6. La información presentada me ayudará a realizar cambios en mi lugar de trabajo.					
7. La información fue presentada claramente.					
8. Los ejemplos fueron presentados claramente.					
9. Yo podía identificar los peligros en los ejemplos.					
10. Los ejemplos me ayudaron a entender la información presentada.					
11. La evaluación me ayudaron a recordar la información presentada.					
12. El audio me ayudó a entender la información presentada.					
¿Total, cómo usted clasificaría este entrenamiento? (Círcule uno)	Excelente	Bueno	Promedio	Justo	Pobre
¿Qué haría usted para mejorar el programa de entrenamiento?					

APPENDIX M: Informed Consent Form – Phase Three (English)

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
GRADO DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING
MACROERGONOMICS AND GROUP DECISION SYSTEMS LABORATORY

Informed Consent for Participants of Investigative Projects

Title of Project: Comparing Latino and Non-Latino Construction Workers: The Effects of
Training on Social Exchange and Safety
(Phase 3)

Principal Investigator: Sharnnia Artis, Graduate Student, ISE

Faculty Advisors: Dr. Tonya Smith-Jackson, Associate Professor, ISE
Dr. Brian Kleiner, Professor, ISE

PURPOSE OF THIS RESEARCH

The purpose of this research is to bridge the gap between Latino and non-Latino construction workers by defining the fundamental needs created by a cross-cultural work environment and understanding why Latino construction workers have more injuries, accidents, and fatalities than their non-Latino counterparts.

PROCEDURES

The procedures for the study are as follows. First, you will be asked to read and sign the informed consent form for the experiment. The researcher will also read the informed consent aloud. Once the form is completed, the researcher will provide you a questionnaire to collect background information about your experience in construction. After completing the questionnaire, you will be asked to participate in a computer-based training program. At the completion of the training program, you will be asked to complete four questionnaires about the training program and your training experience, perceived organizational support, and behavioral intent. After completing the questionnaire, you will be asked to participate in a one-on-one interview with the researcher. The interview will be taped using a digital recorder.

The session will last about 2-3 hours.

RISKS

Participation in this project does not place you at more than minimal risk of harm.

BENEFITS OF THIS RESEARCH

Your participation in this research will be used to help reduce the number of accidents and injuries construction workers, especially Latino workers, experience and improve the safety of the construction environment. Your participation will also contribute to the efforts to developing a training program to bridge the gap between Latino and non-Latino workers in construction.

BENEFITS AND COMPENSATION

The benefits to you are an opportunity to help improve the safety conditions of the construction workforce.   Additionally, for your participation, you will be compensated $7.50/hour at the completion of the study.

EXTENT OF CONFIDENTIALITY/ANONYMITY

The results of this research will be kept strictly confidential. At no time will the researchers release the results of the study to anyone other than the individuals working on the project without your written consent. The information you provide will have your name removed and only a participant number will identify you during analyses and any written reports of the research.

FREEDOM TO WITHDRAW

You are free to withdraw from this study at anytime without penalty.

APPROVAL OF THIS RESEARCH

This research project has been approved, as required, by the Institution Review Board for projects involving human participants at Virginia Polytechnic Institute and State University and the Grado Department of Industrial and Systems Engineering. You will receive a copy of this from to take with you.

PARTICIPANTS RESPONSIBILITY

I voluntarily agree to participate in this study and know of no reason in which I would not be able to participate. As a participant in this study, I have the following responsibility: Answer each question as honestly as possible.

_____
Signature of Participant

PARTICIPANT'S PERMISSION

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent to participate in this project, with the understanding that I may discontinue participation at any time if I choose to do so.

Please place your initials next to the appropriate statement of consent.

_____ I **consent** to be audio taped as a part of my participation in this study.

_____ I **do no consent** to be audio taped as a part of my participation in this study.

Signature: _____

Printed Name: _____

Date: _____

If you have any questions about this research or its conduct, you may contact:

Principal Investigator: Sharnnia Artis   Phone: (540) 951-8160
                        Graduate Student, Grado Department of Industrial and Systems
                        Engineering
                        Email: sartis@vt.edu

Faculty Advisor: Dr. Tonya Smith-Jackson   Phone: (540) 231-4119
                        Associate Professor, Grado Department of Industrial and
                        Systems Engineering
                        Email: smithjack@vt.edu

                        Dr. Brian Kleiner   Phone: (540) 231-4926
                        Professor, Grado Department of Industrial and
                        Systems Engineering
                        Email: bkleiner@vt.edu

If you feel you have not been treated accordingly to the descriptions in this form, or your rights as a participant have been violated during the course of this project, you may contact Dr. David Moore, Chair of the Institution Review Board Research Division at (540) 231-4991.

APPENDIX M: Informed Consent Form – Phase Three (Spanish)

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
DEPARTAMENTO DE GRADO DE INGENIERÍA INDUSTRIAL Y SISTEMAS
MACROERGONOMICS Y GRUPO DE DECISIONES DEL LABORATORIO DE SISTEMAS.

Consentimiento Informado para los Participantes en el Proyecto de Investigación.

<u>Título del proyecto:</u> Comparar trabajadores de Construcción Latinos y No-Latinos: Los Efectos de

Entrenamiento en Intercambio Social y Seguridad.
(Fase 3)
<u>Investigador Principal:</u> Sharnnia Artis, Estudiante graduado, ISE

<u>Consejeros de la facultad:</u> Dr. Tonya Smith-Jackson, Profesor Asociado, ISE
Dr. Brian Kleiner, Profesor, ISE

PROPÓSITO DE ESTA INVESTIGACIÓN

El propósito de esta investigación es tender un puente entre el espacio de trabajadores de construcción Latino y No-Latino así, definiendo las necesidades fundamentales creadas por un cruce de culturas en un ambiente de trabajo y entendiendo porqué los trabajadores Latino tienen más lesiones, accidentes, y fatalidades que sus contrapartes del non-Latino.

PROCEDIMIENTOS

Los procedimientos para el estudio son los siguientes. Primero, le pedirán leer y firmar la forma informativa del consentimiento para el experimento. El investigador también leerá el consentimiento informado en voz alta. Una vez que se llene el formulario, el investigador le proporcionará tres cuestionarios para recoger la información de antecedentes (edad, género, educación) sobre usted y la información sobre su experiencia en la construcción (entrenamiento, seguridad), la relación con los trabajadores en su lugar de trabajo, y la información sobre el clima de seguridad en su trabajo.

La sesión durará cerca de 1 hora.

RIESGOS

La participación en este proyecto no le coloca en el riesgo más mínimo riesgo de maltrato.

VENTAJAS DE ESTA INVESTIGACIÓN

Su participación en esta investigación será utilizada para ayudar a reducir el número de los accidentes y de los trabajadores de la construcción de lesiones, especialmente trabajadores Latinos, expertos y a mejorar la seguridad del ambiente de la construcción. Su participación también contribuirá en los esfuerzos para desarrollar un programa de entrenamiento para tender un puente entre trabajadores de construcción Latino y No-Latino

VENTAJAS Y REMUNERACIÓN

Las ventajas para usted son la oportunidad de ayudar a mejorar las condiciones de seguridad de la mano de obra de la construcción. Además, por su participación, usted recibirá $7.50/hora al terminar el estudio.

GRADO DE CONFIDENTIALITY/ANONIMIDAD

Los resultados de esta investigación serán mantenidos terminantemente confidenciales. En ningún momento los investigadores darán su resultado del estudio a cualquier persona a excepción de los individuos que trabajan en el proyecto sin su consentimiento escrito. La información que usted proporciona tendrá se le quitara su nombre y solamente un número del participante lo identificará durante análisis y cualquier informe escrito de la investigación.

LIBERTAD A RETIRARSE

Usted está libre de retirarse de este estudio a toda hora sin ninguna penalidad.

APROBACIÓN DE ESTA INVESTIGACIÓN

Este proyecto de investigación ha sido aprobado, como requerimiento, por el comité examinador de la institución para los proyectos que implicaban a participantes humanos en el instituto de Virginia Polythechnic Institute and State University y el departamento de Grado de Ingeniería Industrial y de Sistemas. Usted recibirá una copia de esto para usted mantenga.

RESPONSABILIDAD DE LOS PARTICIPANTES

Yo voluntariamente acorde en participar en este estudio y no se ninguna razón por la cual no podría participar. Como participante en este estudio, tengo la siguiente responsabilidad. Contestar a cada pregunta tan honesta como sea posible.

_____
Firma del participante

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PERMISO DEL PARTICIPANTE

Yo he leído y entiendo el consentimiento y las condiciones informadas de este proyecto. He hecho todas mis preguntas claras. Reconozco por este medio el antedicho y doy mi consentimiento voluntario para participar en este proyecto, con la comprensión que puedo no continuar la participación en cualquier momento si elijo hacer tal.

Firma: _____

Nombre impreso: _____

Fecha: _____

Si usted tiene algunas preguntas sobre esta investigación o su conducta, usted puede entrar en contacto con:

Investigador principal: Sharnnia Artis   Teléfono: (540) 951-8160
                                  Estudiante graduado, Departamento de Grado de Ingeniería Industrial y de Sistemas
                                  Email: sartis@vt.edu

Consejero de la facultad: Dr. Tonya Smith-Jackson   Teléfono: (540) 231-4119
                                  Profesor de asociado, departamento de Grado de Ingeniería Industrial y de Sistemas
                                  Email: smithjack@vt.edu

                                  Dr. Brian Kleiner   Teléfono: (540) 231-4926
                                  Profesor, departamento de Grado de Ingeniería Industrial y de Sistemas
                                  Email: bkleiner@vt.edu

Si usted siente que no a sido tratado de acuerdo a las descripciones en esta forma, o sus derechos como participante se han violado durante el curso de este proyecto, usted puede entrar en contacto con Dr. David Moore, Director de la división de investigación del comité examinador de la institución al (540) 231-4991.

VITA

Sharnnia Artis graduated from Virginia Polytechnic Institute and State University with a Bachelor's of Science degree in Industrial and Systems Engineering in August 2002. She directly continued her education at Virginia Tech in the Human Factors Option of the Industrial and Systems Engineering Department and received her Master's of Science degree in May 2005 under the direction of Dr. Brian Kleiner (Thesis: The Effects of Age, Computer Self-Efficacy, and the Design of Web-Based Training on Computer Task Performance). She received the American Association of University Women's (AAUW) Selected Professions Fellowship to fund her master's studies. Sharnnia went on to pursue a PhD. at Virginia Tech in the same area. She also received the Southern Regional Education Board (SREB) Doctoral Scholar Fellowship, which fully funded her doctoral studies for three years. Sharnnia is an active member of the American Society of Safety Engineers (ASSE), the Human Factors and Ergonomics Society (HFES), the Institute of Industrial Engineers (IIE), and the National Society of Black Engineers (NSBE).