DISSERTATION

PREDICTORS OF WORK INJURIES: A QUANTITATIVE EXPLORATION OF LEVEL OF ENGLISH PROFICIENCY AS A PREDICTOR OF WORK INJURIES IN THE CONSTRUCTION INDUSTRY

Submitted by

C. William McConnell

School of Education

In partial fulfillment of the requirements

for the degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Fall 2004

UMI Number: 3160098

COLORADO STATE UNIVERSITY

SEPTEMBER 24, 2004

WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY C. WILLIAM McCONNELL ENTITLED PREDICTORS OF WORK INJURIES: A QUANTITATIVE EXPLORATION OF LEVEL OF ENGLISH PROFICIENCY AS A PREDICTOR OF WORK INJURIES IN THE CONSTRUCTION INDUSTRY BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

Committee on Graduate Work

____

____

____
Adviser

____
Co-Adviser

____
Department Head/Director

ABSTRACT OF DISSERTATION

PREDICTORS OF WORK INJURIES: A QUANTITATIVE EXPLORATION OF LEVEL OF ENGLISH PROFICIENCY AS A PREDICTOR OF WORK INJURIES IN THE CONSTRUCTION INDUSTRY

As evidenced by the literature review, there are both labor shortages and language barriers present in some areas of the construction industry. These issues translate into the higher than average accident and death rates seen among workers of Hispanic origin. Because of the increase in the Hispanic portion of the workforce, as indicated by reviewing census data, many Spanish-speaking individuals are taking jobs where they may not understand job hazards.

In order to address these concerns, an instrument was developed to identify level of English proficiency. This was then linked to the injuries sustained on the job in the last 30 days as indicated by the body diagram. Participants were ranked on their level of English proficiency, and then divided into two groups. The middle group of predominately bilingual individuals was removed in order to maximize the differences between the two groups. There were a total of 191 participants in this study. The two groups were then compared based on the different independent variables identified in the research questions, as well as other possible relationships of interest as identified in the auxiliary findings section.

The overall findings of this research indicate that there is not a significant difference in work injuries when based on level of English proficiency. In fact, in relation to this study, the more English proficient individuals were, the more likely they were to experience more injuries. This finding contradicts some areas in the literature that identify Spanish speaking individuals as having a higher accident rate than their more English speaking counterparts.

Although no significant difference was identified between the two groups, based on level of English proficiency, there were many significant findings in both the primary research questions, as well as the auxiliary findings. Additionally, qualitative data obtained by the instrument provided insight into concerns that workers had relating to air quality that were not identified by looking just at the quantitative data. The body diagram also provided valuable information regarding frequency and location of injuries which will be beneficial in taking proactive actions toward reducing work injuries.

C. William McConnell
School of Education
Colorado State University
Fort Collins, CO 80523
Fall 2004

ACKNOWLEDGMENTS

I would like to acknowledge my committee members: Dr. Jerry Gilley, Dr. Gene Gloeckner, Dr. Ann Gilley, and Dr. Robert Schwebach. This dissertation, and my schooling, have benefited greatly from their input and mentoring. I would also like to acknowledge the participating construction company. This entire project would not have been possible without the assistance offered by the many individuals who helped me carry out this project. From the initial meeting to present my thoughts on a possible research project, to the support in interpreting and setting up the dates and lunches; I would like to express my gratitude to each person who helped me. I would also like to thank Randi Fuller and Sherry Neb for all of their help in navigating the many rules and processes during my time in the School of Education. They were always available to help me know the proper channels to get things accomplished. Additionally, I would like to thank Dawn Watson, in the testing center, for her help in developing the final instrument. Being able to electronically enter the data was a lifesaver.

DEDICATION

More than anything, I want to dedicate this dissertation to my wife and children. Without them, this journey would not have been nearly as rewarding. The support and encouragement from my wife kept me going, even through the many trials this degree presented. I truly believe that her name should accompany mine on the diploma. I would also like to dedicate this to my two children who helped provide me with perspective and balance. Their smiles and unconditional love brought me so much joy, even with this dissertation weighing heavily on my mind. They could always make me forget some of the stress with their laughter. Finally, I would like to thank my family and friends for their words of encouragement and support. This has been an amazing process, and it has been great to share it with so many people.

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

Chapter 1: Introduction

Introduction and Background

Occupational health and safety (OHS) has been defined as "a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment" (www.lectlaw.com/def2/o004.htm, Retrieved 4/22/03). According to Lin and Mills (2001), most of the research being done in the occupational health and safety field has demonstrated that inadequate or non-existing occupational health and safety programs are the primary cause for high rates of injury on the job.

Lin and Mills (2001) state "the provision of safety equipment alone does not improve construction site safety, there also needs to be a corporate culture that encourages its use" (p. 132). Clarke (2000) feels that safe behavior in general, is supported when a positive safety culture is present (Clarke, 2003, p. 41). Describing what an organizational culture entails, as it relates to safety, Clarke (2003, p. 42) synthesizes the following from reviews of Mearns and Flin (1999), and Clarke (2000):

> An organization's safety culture relates to the core assumptions and beliefs that organizational members hold concerning safety issues; it is expressed through the beliefs, values and behavioral norms of its managers, supervisors and workforce, and is evident in company safety policy, rules and procedures.

In an article by Harvey, Bolam, Gregory, and Erdos (2001, p. 617), they list themes, cited by other authors, which are present when defining factors necessary for a positive safety culture. Those themes are "commitment by management and workforce, leadership style and communication, individual responsibility, management responsibility, risk awareness and risk-taking" (Cox & Cox, 1991; IAEA, 1991; Ryan, 1991; ACSNI, 1993; IOSH, 1994; Diaz & Cabrera, 1997; Cheyne et al., 1998; Harvey et al., 2001).

Donald and Canter (1994) found that there was a significant correlation between safety attitudes and accident rates. Harvey et al. (2001) then went on to say that, "it is therefore argued that attitudes may change behavior and thus directly and indirectly affect safety culture and accident rates" (p. 616). Poor work-related attitudes can have implications on safety performance, morale and productivity (Clarke, 2003). Some empirical studies have shown that there is a significant correlation between low job satisfaction and high accident involvement rates, and between safety culture and satisfaction with work (Holcum et al., 1993; Lee, 1998).

Nishgaki (1994) believes that there are several main causes of occupational health and safety failure. Those failures include: "inadequate safety education, inadequate instruction, poor housekeeping and 'willful transgression'" (Lin & Mills, 2001, p. 132). Inadequate safety education and inadequate instruction are two factors directly related to safety training. In order to provide effective training, several issues need to be taken into account. These issues relate to problems surfacing from the evaluation of safety training programs. Those issues that need addressing are, according to Harvey et al. (2001):

a. establishing what constitutes safety culture,
b. safety attitudes,
c. attitudes to and perception of risk,

d. whether the training is attempting to change behavior or attitudes or both,

e. the links between attitudes and behavior in a safety context,

f. the training methods,

g. evaluation methods and measures (p. 615)

By addressing these issues, safety programs can be tailored to fit a company's needs. Harvey et al. (2001) also site other authors (Fishbein & Ajzen, 1975; Ajzen, 1991; HSE, 1991; Donald & Canter, 1994; Lee, 1994) who believe attitude measurement has some validity when applied to safety.

There are several ways to evaluate if a safety program has been effective. According to Clegg (1987, as discussed in Harvey 2001), changes in job performance are the best indicators of training program effectiveness. In this way it can be seen if the training has been owned by the employees. Harvey et al. (2001) believe that teams are an important part of safety program effectiveness. These teams help to eliminate cultural division within organizations that can hinder safety program effectiveness.

Another way to deal with cultural issues, either organizational or cross-cultural, is to have an individual who identifies with the culture involved provide the training. If the individuals being trained identify with the trainer, it is more likely that behavior will change (Kurtz et al., 1997, as discussed in Harvey et al., 2001, p. 620). The key is that misunderstandings between cultures must be dealt with in order for accidents to decline. For safety to be improved, empathy and understanding, between the cultures involved, must be present (Dake, 1992; Vlek, 1995; Sauer, 1996, as discussed in Harvey et al., 2001, p. 620).

There are two main schools of thought relating to safety programs: (1) Behavior-based safety programs, and (2) incentive based safety programs. According to Geller (1998, as discussed in Miozza & Wyld, 2002, p. 23), behavior-based safety programs work by promoting safe behavior and attempting to decrease unsafe or risky behaviors. These types of programs are "generally embraced by management, but frowned upon by labor. Labor feels that when management engages in a behavior-based safety program, they are, in essence, shifting responsibility for safety to the employees" (Miozza & Wyld, 2002, p. 23).

As Lawrence and Flanders (2000) describe, OSHA classifies incentive-based safety programs in two ways; traditional and non-traditional. Traditional programs reward employees when the company goes a certain period of time with no lost-workday accidents. In contrast, non-traditional programs give rewards for "attending safety meetings, identifying hazards, [and] making suggestions" (p. 30). Sacks (2000, as discussed in Miozza & Wyld, 2002, p. 30), believes there are two main problems with incentive programs. One, workers will not report injuries for fear of not receiving the prize; and two, reduction in accidents over the long term is more important than fewer lost-time accidents over a short period.

Safety training programs must adapt to the diverse employees of today's workforce. Martel and Kelter (2000) state that due to labor force expansion "the Hispanic labor force has grown by 38 percent" (p. 13). Although part of this expansion is attributed to population growth, the authors assert that "employment grew faster for minority workers than for whites in 1999. The number of employed persons increased by about 2.0 percent for blacks, to 15.2 million; 6.0 percent for Hispanics, to 14.0 million; and 1.2

percent for whites, to 112.7 million" (2000, p. 15). In a projection of the labor force for 2008, Fullerton (1999) projected that "the 2008 labor force is expected to have a greater proportion of women and Hispanics than the 1998 labor force" (p.32).

In the construction industry, the increase of Hispanic employees seems to have a negative effect on safety. There are alarming statistics among the Spanish-speaking community in this sector, "that statistic is the ever-growing number of deaths occurring with Hispanic individuals in the workplace" (Flory, 2001). In the same article, Flory (2001) states that "a great amount of the problem is related to communication: Language barriers in the Spanish-speaking only community, lack of proper training, and no training at all contribute to the extreme condition."

One of the reasons that so many Hispanic workers are being seen in the construction industry is due to a labor shortage.

> Undocumented workers are entering the United States, especially from Mexico, because of the availability of work at a much higher rate of pay than they could ever receive in their homeland. These workers are welcomed because of their strong work ethic and because of labor shortages in certain industries. (Flory, 2001)

According to Fullerton (1999) in a study of projected labor in 2008, "minority groups that have grown the fastest in the past, Asians and others and Hispanics, are projected to continue to grow much faster than white non-Hispanics" (p. 20). Fullerton continues, "although growth of these groups is expected to slow from 1998–2008, the projected growth rates for these groups are nevertheless much faster than for other groups" (1999, p. 22). According to Nixon and Dawson (2002), "by the end of this decade, Hispanic Americans are expected to be the largest minority in US industry and commerce" (p. 189).

With this ever-increasing number of Hispanic workers entering the labor force, the workforce in general is becoming more culturally diverse. Because of this issue, how to effectively train workers, especially relating to safety, has become a greater concern. "Prior policies attempted to treat everyone the same – but everyone is not alike. Personnel policies and management techniques must change to deal with the diverse workforce" (Allen, 1992, as cited in Nixon & Dawson, 2002, p. 185). According to the Associated Press (2003), "in Tennessee, manufacturing and retail employers say they would hire more Hispanic immigrants but cannot adequately train or relay job safety requirements to non-English speakers." The success of any training program hinges on the understanding of the culture involved. Other factors "depend largely upon credibility of the manager, how the material is presented, and the manager's understanding of the Hispanic culture" (Nixon & Dawson, 2002, p. 189).

In the findings of Fullerton (1999) and Cattan (1993), the Hispanic percentage of the labor force will continue to grow well into the year 2008. With Spanish speakers in the work force, it may pose a problem in the safety sector. In an article written by Hopkins (2003), it was stated that in the year 2000, about 815 Hispanics died. Those deaths occurred mostly in the construction trades, often due to language barriers, or gaps, that impeded communication between supervisors and immigrant workers. According to Flory (2001):

> The United States has become an ever-growing multicultural society, especially in large metropolitan areas. The U.S. Census Bureau projected that by year 2000's end; almost 12 percent of the country's population was of Hispanic origin. A high number will land jobs in the construction industry, and this is where many of the fatalities and injuries are occurring. (p. 37)

Relating to the high number of fatalities among Hispanics in the construction industry, the following data from Hopkins (2003), adapted from the Bureau of Labor Statistics, show the disparity between race and workplace fatalities. Workplace fatalities decreased for every race on the list from 1992-2000, except for Hispanics, which increased 53 percent.

Table 1.1

Change in Workplace Fatalities, By Race, From 1992 to 2000

Race	Percent Change
Whites	-10%
Native Americans	-8%
Blacks	-7%
Asians	-4%
Hispanics	53%

Statement of the Problem

As indicated by the review of literature, there are issues in the construction industry, relating to safety, that need to be addressed. One key issue centers on the higher than average accident rates among Hispanic workers, and the possibility of a language barrier contributing to that problem. Language barriers have been documented in other areas, such as agriculture and health care (mainly relating to quality of care received in hospitals), but literature is difficult to find relating to predictors of work injuries in the construction industry. Additionally, no articles were encountered attempting to compare two groups, such as groups separated on their level of English proficiency, on those predictor factors (i.e., job tenure, impulsivity, safety knowledge, physical hazards, etc.

(Frone, 1998)). This study will attempt to identify if a difference in level of English proficiency can be a predictor of work injuries and accidents.

Research Questions

It is hypothesized that there is a difference between the construction workers in this study relating to predictors of work injuries and level of English proficiency. In order to address this issue, construction workers will be compared on the basis of level of English proficiency as identified by the instrument used in this study. To document the relationship between level of English proficiency and predictors of work injuries, the following research questions will be addressed:

1. Based on the body diagram, where are construction workers most likely to be injured?
2. Is there a difference between level of English proficiency and safety knowledge?
3. Is there a difference between level of English proficiency and impulsivity?
4. Is there a difference between level of English proficiency and job tenure?
5. Is there a difference between level of English proficiency and job hazards?
6. Is there a difference between level of English proficiency and work injuries?
7. Is there an association between impulsivity and work injuries?
8. Is there an association between job tenure and work injuries?
9. Is there an association between safety knowledge and work injuries?
10. Is there an association between physical hazards and work injuries?
11. Is there an association between level of English proficiency and work injuries?

12. Is there a combination of impulsivity, job tenure, physical hazards, and safety knowledge that predicts work injuries better than any one predictor variable in isolation?
13. Is there a combination of impulsivity, job tenure, physical hazards, and safety knowledge, based on limited English proficient workers, that predicts work injuries better than any one predictor variable in isolation?
14. Is there a combination of impulsivity, job tenure, physical hazards, and safety knowledge, based on workers that are not limited English proficient that predicts work injuries better than any one predictor variable in isolation?

Additional information generated centers around location and severity of work injuries. These data came as a result of participants indicating type of pain and location of injuries on the survey instrument. Data were useful in documenting location and types of injuries which could indicate areas for further research in preventative measures.

Significance of the Study

This study is significant in that it determines if there is a difference in work injury patterns between employees of different English proficiency levels. If it is found that one group is more susceptible to injuries than another, further research can be done in an attempt to isolate those factors. By so doing, greater emphasis can be placed on these areas to reduce factors that contribute to injuries. "Although many studies have examined the predictors of physical and mental health among employed individuals, much less research has focused on behavior health outcomes such as work accidents and injuries" (Jex & Beehr, 1991). "Moreover, even fewer studies of work injuries have simultaneously examined an extensive set of predictor variables" (Veazie, Landen, Bender, & Amandus, 1994).

Another area of significance is that through the body diagram, an indication of where construction workers, regardless of level of English proficiency, are being injured will be given. Through this, precautions can be taken to prevent these types of injuries from occurring. Additional relationships between behavior and work injuries may also provide areas for further research.

Limitations and Assumptions

As in the study by Frone (1998), even though the relationship between work injuries and the predictor variables may appear to be causal, the nature of correlation statistics does not permit causal inferences. Generalizability may be limited due to sample selection being one of convenience, from one national construction company. Results could also be affected by who chose to participate in the study. The relationships found in the study might be affected due to the nature of self reported data; participants may not answer questions truthfully. Also, this study will focus on level of English proficiency among Hispanics, since the literature identifies this population as being most affected by the possible existence of a language barrier. Although other ethnic groups work in the construction industry, instruments and interpreters will only be available for Spanish speaking individuals.

Additionally, although an attempt was made to study many relevant factors relating to work injuries, some relevant predictors were omitted. Some of those predictors left out of the study are identical to those omitted in the study by Frone (1998), such as safety training and management's attitude towards safety. The main reason for the omission was that the participants had a limited time in which to complete the study. Therefore, the length of the instrument had to be appropriate for completion during a lunch break.

Delimitations

The study will be delimited to one National Construction Company. The study will also be delimited to two construction sites.

Chapter 2: Literature Review

Occupational Health and Safety in Construction

Occupational health and safety (OHS) has been defined as "a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment" (www.lectlaw.com/def2/o004.htm, Retrieved 4/22/03). According to Lin and Mills (2001), most of the research being done in the occupational health and safety field, has demonstrated that inadequate, or non-existing, occupational health and safety programs are the primary cause for high rates of injury on the job.

In a study of large and small construction companies in Australia, Lin and Mills (2001) found that there is considerable pressure, in the way of safety regulations, for those companies to provide the necessary protection for the construction workforce. Their research showed that "small firms [did] not seem to have the ability or motivation to achieve high levels of OHS when benchmarked against larger firms. This calls into the question the notion that OHS performance can be achieved by simply raising government OHS regulations" (Lin & Mills, 2001, p. 138).

A major finding of research by Lin and Mills (2001) related to the significant influence of size on any one company's performance relative to OHS. This finding is not surprising, in that "smaller companies lack the resources to perform at a high level of OHS performance" (p. 135). When respondents were asked to rank the factors of project success, they selected client satisfaction as the highest priority, "followed by quality, profit, schedule, and lastly safety" (Lin & Mills, 2001, p. 137). Essentially, safety was deemed to be the least important factor when it came to the overall success of a project. This finding supports research by Jaselskis (1996), which showed the same rank order for project success factors. Jaselskis (1996) speculated that the reason safety was ranked the lowest was that contractors do not make a profit from OHS. Additionally, it was considered that safety does not improve construction time or quality (Lin & Mills, 2001, p. 137).

"Holmes (1999) commented that small businesses did not feel the need to focus on OHS in their management systems, instead they often believe that the control of risk is the responsibility of employees" (Lin & Mills, 2001, p. 132). Larger firms indicated that "OHS should be integrated into their entire management system across all projects within the company" (Lin & Mills, 2001, p. 132).

Hinze (1988) found that competitively bid projects tend to have higher injury rates. Many contractors bid low, or discount their bids, in an attempt to land the job. Occupational health and safety often suffers as a result of the cut bid. Safety is often the first place finances are cut because of the belief that safety system implementation will cost more money. When projects run over budget, safety often experiences the cut because it is believed that it does not do anything to help in the overall production of the building (Lin & Mills, 2001).

Organizational Culture

According to Lin and Mills (2001), "the provision of safety equipment alone does not improve construction site safety, there also needs to be a corporate culture that encourages its use" (p. 132). Clarke (2000) feels that safe behavior in general, is supported when a positive safety culture is present. Describing what an organizational culture entails, as it relates to safety, Clarke (2003, p. 42) synthesizes the following from reviews of Mearns and Flin (1999), and Clarke (2000):

> An organization's safety culture relates to the core assumptions and beliefs that organizational members hold concerning safety issues; it is expressed through the beliefs, values and behavioral norms of its managers, supervisors and workforce, and is evident in company safety policy, rules and procedures.

In an article by Harvey, Bolam, Gregory, and Erdos (2001, p. 617), they list themes, cited by other authors, which are present when defining factors necessary for a positive safety culture. Those themes are "commitment by management and workforce, leadership style and communication, individual responsibility, management responsibility, risk awareness and risk-taking" (Cox & Cox, 1991; IAEA, 1991; Ryan, 1991; ACSNI, 1993; IOSH, 1994; Diaz & Cabrera, 1997; Cheyne et al., 1998).

Continuing the discussion of positive safety cultures, Pidgeon (1991) states that good safety cultures are represented by the perceptions and safety attitudes of the workforce (Clarke, 2003, p. 42). Cox and Cox (1991) believe that the most critical aspect of a good safety culture is the attitudes that workers have towards safety (Clarke, 2003, p. 42). One last attitude that relates to positive safety cultures is job satisfaction. A study by Lee (1993, 1998) of safety in the nuclear industry, found 17 factors that differentiated between accident groups (lost work time of less than three days) and non-accident groups. Of those 17 factors, "the most significant differentiator involved satisfaction and discontentment" (Harvey et al., 2001, p. 617).

In addition to attitudes, there are personality characteristics that can contribute either positively or negatively to organizational safety cultures. Those characteristics are locus of control and sensation seeking (Lee, 1994). This is important to note in that attitudes may be changed, but personality (behavioral) traits may not be. As it relates to locus of control, Harvey et al. (2001), believe "externals may take less preventative behavior, as Lee suggests, and we would argue that this characteristic is relatively unchangeable and thus training to increase preventative behaviors would be less effective" (p. 617). They go on to state, "however, it is implicit in attitude theory that attitudes can be changed" (Harvey et al., 2001, p. 617). This theory would make investment in attitude training a more feasible option.

Donald and Canter (1994) found that there was a significant correlation between safety attitudes and accident rates. Harvey et al. (2001) asserts, "it is therefore argued that attitudes may change behavior and thus directly and indirectly affect safety culture and accident rates" (Harvey et al., 2001, p. 616). Poor work-related attitudes can have implications on safety performance, morale and productivity (Clarke, 2003). Some empirical studies have shown that there is a significant correlation between low job satisfaction and high accident involvement rates, and between safety culture and satisfaction with work (Holcum et al., 1993; Lee, 1998).

Safety Training

Nishgaki (1994) believes that there are several main causes of occupational health and safety failure. Those failures include: "inadequate safety education, inadequate instruction, poor housekeeping and willful transgression" (Lin & Mills, 2001, p. 132).

Inadequate safety education and inadequate instruction are two factors directly related to safety training that could also be compounded by a language barrier. In order to provide effective training, several issues need to be taken into account. These issues relate to problems surfacing from the evaluation of safety training programs. Those issues that need addressing are, according to Harvey et al. (2001):

a. establishing what constitute safety culture,
b. safety attitudes,
c. attitudes to and perception of risk,
d. whether the training is attempting to change behavior or attitudes or both,
e. the links between attitudes and behavior in a safety context,
f. the training methods,
g. evaluation methods and measures (p. 615)

By addressing these issues, safety programs can be tailored to fit a company's needs. Harvey et al. (2001) also site other authors (Fishbein & Ajzen, 1975; Ajzen, 1991; HSE, 1991; Donald & Canter, 1994; Lee, 1994) who believe attitude measurement has some validity when applied specifically rather than generally.

According to Howe (2000), exposure to any type of hazard is what causes an illness or injury. When work methods, which are designed by the employers, put employees at risk, the methods are what need to be changed (Miozza & Wyld, 2002, p. 25). When it comes to these types of hazards, Lin and Mills (2001) believe that "employees tend to be more aware of hazards in the work place than employers and therefore should be involved in the safety program" (p. 133).

In an article by Harvey et al. (2001), it is suggested by Weidner et al. (1998) that safety training should emphasize demonstrations and hands-on practices, health and safety from a technical standpoint. These practices, especially hands-on training, result in better retention of the knowledge, the transfer of that knowledge and satisfaction from the part of the end user (Simon et al., 1996; Weidner et al., 1998). Another important aspect of training programs is that of communication (Vlek, 1995; Sauer, 1996; Simonet & Wilde, 1997; Cohen, 1998, as discussed in Harvey, 2001).

The downfall of some training programs is due, in part, to the expense as it relates to production and wages of employees involved in the training. Because of this, it is crucial that training is effective (Prais, 1995). Many times money is wasted on training because a real learning environment is not present and many people attending do not fully understand why they are there. Managers may not be truly interested in helping to implement changes and follow-up may be neglected (Lorriman & Kenjo, 1994; Cole & Brown, 1996, as discussed in Harvey et al., 2001).

There are several ways to evaluate if a safety program has been effective. According to Clegg (1987, as discussed in Harvey et al., 2001) changes in job performance are the best indicators of training program effectiveness. In this way it can be seen if the training has been owned by the employees. Harvey et al. (2001) believe that teams are an important part of safety program effectiveness. These teams help to eliminate cultural division within organizations that can hinder safety program effectiveness.

Another way to deal with cultural issues, either organizational or cross-cultural, is to have an individual who identifies with the culture involved provide the training. If the individuals being trained identify with the trainer, it is more likely that behavior will change (Kurtz et al., 1997, as discussed in Harvey et al., 2001, p. 620). The key is that misunderstandings between cultures must be dealt with in order for accidents to decline. For safety to be improved, empathy and understanding between the cultures involved must be present (Dake, 1992; Vlek, 1995; Sauer, 1996, as discussed in Harvey et al., 2001, p. 620).

Behavior-based safety programs. There are two main schools of thought relating to safety programs: (1) Behavior-based safety programs, and (2) Incentive-based safety programs. The behavior-based approach will be discussed here, and the incentive-based will be discussed in the following section. According to Geller (1998, as discussed in Miozza & Wyld, 2002, p. 23), behavior-based safety programs work by promoting safe behavior and attempting to decrease unsafe or risky behaviors. These types of programs are "generally embraced by management, but frowned upon by labor. Labor feels that when management engages in a behavior-based safety program, they are, in essence, shifting responsibility for safety to the employees" (Miozza & Wyld, 2002, p. 23).

In a behavior-based safety program, each level of the company or organization does the following:

a. defines exactly what behaviors are required,
b. measures whether or not these behaviors are present, and
c. regularly reinforces the behaviors that are desired (Miozza & Wyld, 2002, p. 24)

In this way, every level of the company has ownership of the program. There are many different types of behavior-based programs, and those programs "focus almost entirely on modifying the behavior of workers, in order to prevent occupational injuries and illnesses. “It is a means of involving workers in defining the ways they are most likely to be injured on the job” (Miozza & Wyld, 2002, p. 24). Miozza & Wyld (2002) go on to state, “behavior-based safety programs require a total commitment by senior management. Often times, this requires a change in culture, as a successful program invariability means employee involvement and empowerment” (p. 40).

One of the major downfalls of the behavior-based program is that they often feature a reward offered for accident reduction. This can encourage non-reporting of accidents and injuries. Howe (2000, as discussed in Miozza & Wyld, 2002, p. 26) believes that companies use the low accident numbers generated by their program to show that the program worked, when in reality the organization may still have the same number of accidents, they are just not being reported.

Incentive-based safety programs. As Lawrence and Flanders (2000) describe, OSHA classifies incentive-based safety programs in two ways. Traditional programs reward employees when the company goes a certain period of time with no lost-workday accidents. In contrast, non-traditional programs give rewards for “attending safety meetings, identifying hazards, [and] making suggestions” (Miozza & Wyld, 2002, p. 33). Sacks (2000, as discussed in Miozza & Wyld, 2002, p. 31) believe there are two main problems with incentive programs. “First, workers will not report injuries for fear of not receiving the prize, and two, reduction in accidents over the long term is more important than fewer lost-time accidents over a short period.”

According to Miozza and Wyld (2002), “incentive-based safety programs are designed to reward employees for working injury-free over a set period of time” (p. 23) they go on to state that "labor and [the] Occupational Safety and Health Administration (OSHA) usually take a dim view of safety incentive programmers, while employers and employees typically view them favorably" (pp. 23-24). The problem with incentive-based programs is that OSHA believes they lead to under-reporting. These programs also create fear among laborers due to accidents costing them, and their peers, incentives (Miozza & Wyld, 2002). In the same article, the authors state that "most high-ranking union officials believe that safety incentive programs have no real impact on incident rates, only serving to drive incident rates underground" (p. 28).

Cooper (2001, as discussed in Miozza & Wyld, p. 29) suggested that the largest problem with incentive based programs is that the sole focus is on outcomes. The programs are not concerned with modifying behaviors or attitudes that relate to those accidents. In the words of Miozza and Wyld (2002),

> An organization will achieve desired performance outputs if it reinforces and rewards desired performance inputs. If a company rewards production quantity, it will get high production quantity. Alternatively, if the firm is geared toward producing quality goods or delivering quality service (and rewards workers for it), it will be able to do so. (p. 29)

Because of poor decisions relating to incentive-based safety programs, labor believes incentive programs are another ploy by management to place responsibility on the workers instead of on management. More responsibility should be taken by managers who control the workplace and the conditions in which labor works (Miozza & Wyld, 2002).

In a study by Glendinning (2001), the author found that, according to some individuals surveyed, "safety incentives create a hostile work environment in which a legitimately injured [individual] is harassed by team members because his/her injury prevents the group from receiving an incentive" (p. 23). Additionally, some individuals feel that incentive-based safety actually trivializes workplace safety importance. Other participants believed that incentive-based safety programs lead to individuals not reporting accidents because it might prevent them, or their team, from receiving the reward for reaching the incentive-based goal.

According to Glendinning (2001), in order for any incentive-based safety program to succeed, there must be several components that go into the overall strategy. Those inputs are:

a. communication
b. education
c. training
d. monitoring
e. active participation, and
f. accountability

Demographics: Growth in the Hispanic Workforce

It has been hypothesized that a labor shortage is one contributing factor to the increase of Hispanic workers in the construction industry. This section of the literature review attempts to define what a labor shortage entails, in addition to addressing the indication of a labor shortage in the construction industry. According to Veneri (1999):

> Shortages occur in a market economy when the demand for workers for a particular occupation is greater than the supply of workers who are qualified, available, and willing to do that job. Jobs remain vacant as employers seek to hire more workers than are willing to work at the prevailing wage or salary. (p. 15)

On the other side of this issue lie the effects that occur when a job market tightens. As can be seen by the trends among the various industries, the effects stated by Veneri (1999) lead one to believe that there is a labor shortage, not a tightening of the job market. A tightening of the job market would entail:

> When the labor market tightens, the number of job applicants is likely to shrink, and employers may have difficulty finding that same caliber of candidates. The employers may be able to fill positions by offering higher wages; otherwise, they may have to settle for candidates who do not match their notion of "ideal." Under these labor market conditions, the issue becomes one of the *quality* of job candidates, not necessarily *quantity* of people willing and able to do that job. (p. 15)

In terms of being socially acceptable, "the social demand model" is often used. "This model assumes there is a shortage of members of a specific profession if the number of available workers is less than the number needed, as established by some social criterion or goal" (Veneri, 1999, p. 16). In another model, "the quantity of the labor services in question that is demanded is greater than the quantity supplied at the prevailing wage" (Veneri, 1999, p. 16). The presence of Hispanic laborers in the construction industry seems to be supported by the social demand model.

In the study done by Veneri (1999), some quantitative methods, as well as the descriptive methods noted above were used. These quantitative methods were used to define the rate of growth that allows an occupation to be considered in Veneri's study. The following was stated:

> For this analysis, occupations were evaluated to determine whether, for the 1992–97 period (for which data were available when the analysis was conducted), the occupation's employment growth rate was at least 50 percent faster than average employment growth, the wage increase was at least 30 percent faster than average, and the occupation's unemployment rate was at least 30 percent below average (in each case, "average" was defined by the total for all workers). This somewhat arbitrary set of criteria was established to eliminate any occupation that

> could be considered a "borderline" case in terms of what the data might show if less stringent criteria were used. (p. 18)

In this way, it could be determined if there was in fact a labor shortage in the construction industry. If there was a labor shortage, that could account for the large number of Hispanic workers in various construction trade positions.

According to the National Center for Construction Education and Research, "in 1997, shortages were most severe in three specific regions of the country: the West, the East, and 'a chunk of middle America'" (Veneri, 1999, p. 30). Veneri attributed these shortages to several different factors. There is a "low unemployment rate nationwide, which contributed to a dwindling pool of workers" (1999, p. 30). Another factor is the problem of workers receiving higher pay from a competitor, and therefore leaving for that higher pay. The evidence designated by other sources shows a shortage of construction laborers with the proper qualifications (Veneri, 1999). "In particular, the National Center for Construction Education and Research mentioned electricians and carpenters" (1999, p. 30).

Martel and Kelter (2000) discuss the realm of labor market growth. This growth, combined with shortages at some trade positions, left the door wide open for large numbers of Hispanic workers to enter the labor market. In 1999, "job growth in construction also was healthy, buoyed by low interest rates and strong consumer confidence" (p. 3). They go on to say that:

> Employment in many construction-related industries posted continued growth during 1999, but the building boom eventually resulted in shortages, not only of labor, but also of materials. Most of the job growth in construction supported residential building and the contracting of specialized trades such as plumbing, painting, and carpentry services. (Martel & Kelter, 2000, p. 9)

As can be seen by the following data, there have been large expansions in the labor force for Hispanics, as well as others, in 1999. This is due, in part, to the increase in the Hispanic population as a whole over the past decade. According to 2000 census data, the following minority groups have shown increases in their percentage of the population from 1990 (table adapted from www.bls.com):

Table 2.1

Percent Population Increase, by Race, from 1990

Race	Percent of Population	Percent Increase
African American	12.3	15.6
Asian-Americans	3.6	48.3
Hispanic Americans	12.5	57.9

Since the first quarter of 1991 (the final quarter of the 1990–91 recession, as officially defined), the Hispanic labor force has grown by 38 percent, largely a reflection of the group's strong population growth. This increase compares with a 20-percent increase in the size of the black labor force and a 9-percent increase in the white labor force. In 1999, the labor force participation rates were 67.9 percent for Hispanics, 67.2 percent for whites, and 66.0 percent for blacks. (Martel & Kelter, 2000, p. 13)

According to Martel and Kelter (2000):

> Employment grew faster for minority workers than for whites in 1999. The number of employed persons increased by about 2.0 percent for blacks, to 15.2 million; 6.0 percent for Hispanics, to 14.0 million; and 1.2 percent for whites, to 112.7 million. The number of persons employed as a percentage of the population reached record highs for whites, blacks, and Hispanics during 1999 and ended the year strong: 64.9 percent, 60.6 percent, and 63.7 percent, respectively. Since the beginning of the current expansion, the employment-population ratio has grown more for blacks and Hispanics than for whites. (p. 15)

In the year 2000, the numbers in population, percentage of the labor force, and employment were still increasing for the Hispanic population. “Of the new entrants into the US workforce, 85 percent will be minorities, women, and immigrants” (Nixon & Dawson, 2002, p. 184). In the labor force study for the year 2000, Martel and Kelter (2001) assert the following:

> Among the race and ethnic groups, employment grew fastest for Hispanics. The number of employed Hispanics aged 16 and older grew by 5.1 percent; this compares with increases of 2.0 percent for blacks and 0.8 percent for whites. Part of the strong employment growth for Hispanics reflects population growth. The Hispanic population grew by 3.5 percent in 2000, while the black and white populations grew 1.6 percent and 0.8 percent, respectively. However, the increase in employment for Hispanics also reflects an increase in the percentage of their population that was employed. Their employment population ratio reached an all-time high of 64.9 percent. (p. 18)

In a study targeting the year 2000, Martel and Kelter (2001) saw the same trend as in 1999, “the labor market situation improved for minority workers in 2000. The employment-population ratio reached record highs for both blacks and Hispanics. Also, blacks and Hispanics slightly closed the unemployment rate gap between whites, and blacks slightly closed the earnings gap between whites” (p. 26).

Hispanic percentage of the U.S. workforce. The preceding section and this one are linked. They involve Hispanics as part of the U. S. labor force. This section goes into the growth of Hispanic workers and the upsurge being seen within the labor force. According to Fullerton (1999), in a study of projected labor in 2008, “minority groups that have grown the fastest in the past, Asians and others and Hispanics, are projected to continue to grow much faster than white non-Hispanics” (1999, p. 20). Fullerton continues that “although growth of these groups is expected to slow from 1998–2008, the projected growth rates for these groups are nevertheless much faster than for other groups” (1999,

p. 22). According to Nixon and Dawson (2002, p. 189), "by the end of this decade, Hispanic Americans are expected to be the largest minority in US industry and commerce."

Shown below is an indication of the rank certain groups hold in their rate of labor force participation. As can be seen, the Hispanic men, as of 1999, are the highest participators in the labor force. Therefore, the issue of the language barrier (discussed later) must be taken into account. The table is modified from an article by Fullerton (1999, p. 25):

Table 2.2

Rank, by Race, In Labor Force Participation

Men	Women	Rank
Hispanic	Black	1
Asian and other	White non-Hispanic	2
White non-Hispanic	Asian and other	3
Black	Hispanic	4

While the Hispanic portion of the labor force is supposed to have 6.8 million new entrants, only 1.5 million are estimated to be leaving the labor force between 1998 and 2008. This will represent a growth of almost 5.5 million individuals. With this increase, it is projected that the Hispanic influence in the labor force will exceed that of the black non-Hispanic labor force. In respect to the labor force of 1998, the labor force of 2008 is projected to have larger numbers of women and Hispanics then before (Fullerton, 1999). As can be seen in the bar charts on the next page, Hispanics are, and will continue to be, a large portion of the United States labor force.

In an earlier study by Cattan (1993), it was found that "persons of Hispanic origin make up one of the fastest growing worker groups in the United States. Their number—

10.1 million in 1992—has increased 65 percent since 1980, a rate growth 4 times that for the non-Hispanic work force" (p. 3). Speaking of the ethnic distribution of Hispanics in the United States relating to immigration, Cattan (1993) goes on to say that:

> Over the past six years, the number of Central and South American workers in the United States grew 61 percent—far outstripping the other Hispanic groups. The number of Mexican workers also grew rapidly—28 percent. These increases were almost entirely the result of rapid population growth, which was attributed, in turn, to large waves of immigration. Overall, Hispanics accounted for approximately one of every three legal immigrants to the United States. Mexican Americans are, by far, the largest single Hispanic group, accounting for 63 percent of all Hispanics in the U.S. labor force in 1992. (p. 3)

In conclusion, Cattan (1993) believes that "the number of Hispanic workers will continue to increase at a rapid pace well into the next century" (p. 13). The data indicate that as the white non-Hispanic portion of the labor force should drop by six points between 1990 and 2005, the Hispanic portion of the same labor force will have grown three points. These additional three points will boost the Hispanic portion of the labor force to 11 percent by the year 2005 (Cattan, 1993).

Also contributing to the Hispanic portion of the labor force are the large numbers of illegal immigrants. According to an article written by Hopkins (2003), nearly 620,000 individuals are illegal immigrants working in the construction industry. Many of these immigrants do not report unsafe work conditions because they are afraid of being deported. In addition to this increase, Hispanic workers are taking more dangerous jobs. According to Hopkins (2003), Hispanics make up about 11 percent of the labor force. They hold 17.4 percent of all construction jobs. This number is up from the 9.6 percent share of construction jobs that Hispanics held in 1990. In the article by Hopkins (2003), it is mentioned that the construction industry accounts for nearly 20 percent of workplace fatalities. This makes the construction industry the leader in this area.

With this ever-increasing number of Hispanic workers entering the labor force, the workforce in general is becoming more culturally diverse. Because of this issue, how to effectively train workers, especially relating to safety, has become a greater concern. "Prior policies attempted to treat everyone the same – but everyone is not alike. Personnel policies and management techniques must change to deal with the diverse workforce (Allen, 1992, as cited in Nixon & Dawson, 2002, p. 185). According to the Associate Press (2003), "in Tennessee, manufacturing and retail employers say they would hire more Hispanic immigrants but cannot adequately train or relay job safety requirements to non-English speakers." The success of any training program hinges on the understanding of the culture involved. Other factors "depend largely upon credibility of the manager, how the material is presented, and the manager's understanding of the Hispanic culture" (Nixon & Dawson, 2002, p. 189).

As a result of these issues, the Clinton administration tried to help this issue by demanding that federal agencies, specifically those agencies that receive federal funding, have systems in place to provide services for persons who have limited English proficiency. In this way, all employees could have access to the necessary systems, whether they are training based or otherwise (AP, 2003).

Accidents related to language barriers. In the findings of Fullerton (1999) and Cattan (1998), the Hispanic percentage of the labor force will continue to grow well into the year 2008. With Spanish speakers in the work force, it may pose a problem in the safety sector. In an article written by Hopkins (2003), it was stated that in the year 2000 about 815 Hispanics died. Those deaths occurred mostly in the construction trades, often due to language barriers, or gaps, that impeded communication between supervisors and immigrant workers. According to Flory (2001):

> The United States has become an ever-growing multicultural society, especially in large metropolitan areas. The U.S. Census Bureau projected that by year 2000's end, almost 12 percent of the country's population was of Hispanic origin. A high number will land jobs in the construction industry, and this is where many of the fatalities and injuries are occurring. (p. 37)

Relating to the high number of fatalities among Hispanics in the construction industry, the following data from Hopkins (2003), adapted from the Bureau of Labor Statistics, show the disparity between race and workplace fatalities. Workplace fatalities decreased for every race on the list from 1992-2000, except for Hispanics which increased 53 percent.

Table 2.3

Change in Workplace Fatalities, by Race, from 1992 to 2000

Race	Percent Change
Whites	-10%
Native Americans	-8%
Blacks	-7%
Asians	-4%
Hispanics	53%

In a speech by Henshaw, a member of the National Safety Congress, the following was stated, "the language barrier has serious consequences in many areas, not the least of which is safety and health practice. In fact, we know that construction fatalities among Hispanic workers have risen significantly" (2001, p. 5). Flory, agreeing with Henshaw, reveals that "there are numbers being presented in safety circles today that are astonishingly easy to document. That statistic is the ever-growing number of deaths occurring with Hispanic individuals in the workplace. A great amount of the problem is related to communication" (2001, p. 37)

The U.S. Department of Labor, working with the Occupational Safety and Health Administration (1990), found that there are four types of fatal accidents that occur more frequently than all other accidents. "Falls from elevation represent the largest cause, 33 percent, of all construction fatalities. Struck by, caught in/between and electrical shocks, in that order, represent the next three largest causes. These four causes, or types of accidents, represent 90 percent of the total."

In a statement about these causes, Flory (2001) asserts the following, "among Hispanic workers, these four causes are related to not understanding the hazards they are around" (2001, p. 38). Among Hispanic workers, where these four causes of death are occurring, Hispanic workers may speak only limited English. This contributes to a communication, or language, barrier.

An example of an injury that can happen in a caught in-between type accident, compounded by a language barrier, is stated in this news release:

> OSHA FINES DUBLIN, GA., COMPANY $49,000 FOLLOWING ACCIDENT AT HOUSTON COUNTY JOB SITE
>
> Finney explained that the accident happened on Sept. 13 when a motorized compactor turned over catching the operator under its rollover protection system and amputating his left leg.
>
> Following an inspection of the accident, OSHA cited the company for one willful safety violation with a fine of $49,000. Finney stated, "Due to a language

barrier, an employee was allowed to operate a large motorized compactor without proper training."

OSHA found that the injured worker was of Hispanic origin and spoke no English, while his supervisors spoke no Spanish. In addition, all safety instructions for the equipment were in English only. "As a result," said Finney, "the worker entered a sloped area that was too steep for the compactor to remain upright" (Dierks, 2000, p.1).

In a study of Texas fatalities by Richardson and Reyes (1995), they found the following information relating to construction fatalities:

> Of the 276 construction workers who died on the job between 1991 and 1993, all but 2 were male. Hispanic workers accounted for over 40 percent of the fatalities in construction, somewhat above their one-third share of all construction workers. (p. 34)

In the construction industry there are three main trades that account for the majority of fatalities. The distributions of those fatalities are as follows (table adapted from Richardson & Reyes, 1995, p. 34):

Table 2.4

Trades Accounting for the Majority of Workplace Fatalities

Trade	Percent
Building Construction (SIC 15)	55%
Heavy construction other than building construction (SIC 16)	33%
Special trade contractors (SIC 17)	12%

The statistics noted above show the danger within the construction industry. That danger is compounded when an individual does not speak English, or speaks only limited

English. “Not only do many managers lack the necessary FL (foreign language) skills, but the company workforce as a whole has little or no expertise in this area, thus creating predictable communication problems at every customer/client interface” (Rees & Rees, 1996, p. 8). According to Windau (1997), “almost half the fatal work injury victims born in other countries were of Hispanic origin” (p. 40). Continuing with their study, Richardson and Reyes (1995) state:

> Nearly 7 out of 10 of the 75 construction laborers who died on the job during the 3-year period were Hispanic. Hispanic workers also suffered 37 percent of the fatal injuries in the construction trade occupations and 31 percent of the fatal injuries in the transportation and material moving occupations. Available employment data indicate that the percentage of fatalities involving Hispanic construction workers is higher than their share of employment. In 1991, for example, Hispanic workers comprised about 40 percent of the employed workforce in the handlers, equipment cleaners, and laborers occupational group, but were involved in over 60 percent of the fatalities reported for that group. Over all, Hispanic workers accounted for about 34 percent of the employed workforce in construction in 1991 but were involved in 41 percent of the fatal work injuries. (1995, p. 35)

Language Training

With so many individuals entering the workforce with diverse linguistic backgrounds, it is imperative to provide the necessary training. In an article in USA Today, by the Associated Press (2002), it is stated:

> The 2000 census found 11% of U.S. residents age 5 and older, or about 28 million people, spoke Spanish at home, up from 8% in 1990, or about 17 million. And among those Spanish-speakers in 2000, roughly half spoke English less than ‘very well,’ about the same percentage as a decade earlier.

The data provided by the Bureau of Labor Statistics from 1990 show that “while nearly two in three Hispanic residents of the USA were born in this country, about half the nation's Hispanic population say they still speak Spanish at home and do not speak

English well" (Mcgorry, 1999, p. 191). As a result of the number of individuals not speaking English "very well," companies may need to take a little extra time to make sure language barriers are not contributing to accident rates in their industries.

"Lack of English language and literacy skills is clearly a barrier to many kinds of employment. Hence, many programs have been established to prepare adults for the workplace, or to help workers already on the job" (McGroarty & Scott, 1993, p.2). The authors continue, "the nonnative English speaker is rarely the recipient of training, except in new-hire education. Support is often short term and comes from a complex combination of public agency, private employer, union, and community-based organizations, and is realized in a variety of forms" (McGroarty & Scott, 1993, p. 5). Hull (1993, as discussed in McGroarty & Scott, 1993, p.3) asserts, "observers have noted that, too often, workplace education programs treat workers as skills deficient rather than as multifaceted individuals with strengths to be built on and perspectives that enrich workplace activity." McGroarty and Scott (1993) go on to state that "some programs are aimed specifically at training workers for a certain job area or occupational cluster, such as manufacturing or custodial positions. Much of the course material comes directly from the jobs learners expect to do" (p. 3).

According to Flory (2001), "there are several initiatives underway to help educate workers about their rights and also to train them about various safety compliance issues. One of the most recent proactive efforts was established in a partnership among private industry, OSHA, and a construction association" (p. 38). In this partnership, free classes on safety, taught in Spanish, were offered. This came about after a meeting between various safety directors of the construction companies involved (Flory, 2001). Other programs that have been implemented are like those in Texas and Florida. In Texas, a "buddy system" type program was developed. In this system an experienced individual is paired with a newly hired, Spanish speaking, individual for three months. "If at the end of those 90 days there were no accidents, the trainer gets $100. The rookie, upon completing six months of work and earning a safety award, can become a trainer" (Garrison, 1998, p. 3). In this way, a worker who does not speak English at all, or very well, can have someone there to make sure they understand how to do things correctly and safely.

In Florida a slightly different approach is taken. "To combat the language barrier, the Associated Builders and Contractors' educational institute launched a pilot program to teach apprentices in Spanish for the first of their four years of training" (De Lollis, 2000, p. 2). By doing this, the Spanish-speaking employee receives the same benefit of having someone to make sure everything goes correctly. They also have that supervision for a bit longer which enables them to learn more English. In programs in Florida and Texas, the employee is the focus. Companies are willing to spend a bit more to insure that their employees are safe.

In a speech for the National Safety Congress, Henshaw stated the continuing dedication to reaching even the "hard to reach Hispanic workers." In awarding various grants and scholarships to further the advancement of safety programs, Henshaw states, "Included among them is a grant to the National Safety Council to translate training materials on highway work-zone hazards into Spanish for the hard-to-reach immigrant Hispanic workers" (2001, p. 6).

In another training method, the English as a second language (ESL) method, several factors are taken into consideration when developing a program. Among them are: needs assessment, time required to conduct a comprehensive needs assessment, assessment measures, participant attitudes and expectations, the recruitment and retention of students, language choice, financial and organizational support, and the creation of a successful coalition among the many parties involved (McGroarty & Scott, 1993).

Relating to how the actual students participate in curriculum development, McGroarty & Scott (1993) state the following:

> The language structures, functions, and vocabulary are drawn from the work life of the participants and can range from discrete study of specialized vocabulary items, to the more abstract and often convoluted language used in procedures manuals or benefits packets, to the language needed to communicate with co-workers. (p.3)

According to McGroarty and Scott (1993), the “development of ESL instructional programs for the workplace is a complex and long-term process” (p. 6). It is not something just done on a whim. It takes careful planning and dedication to see that it is carried out.

In describing the trend that has been seen of reaching out to these Hispanic workers, Flory (2001) mentioned the following:

> Actions like these are a positive step in the right direction. But they are only a beginning. The real answer is a mandate by every company's chief executive officer to "do the right thing" and provide their Spanish-speaking or other bilingual workers the best safety training programs available. This form of commitment to solving the problem will reduce a company's liability cost and its worker's compensation costs. More important, it allows the organization's most valuable resource to return home safely every night. (p. 38)

Communication. Because so many individuals in the labor force have a language other than English as their first language, it is important to learn how to communicate with one another. According to Nixon and Dawson (2002), “with ethnic and racial minority populations in the USA expected to grow at a rate seven times faster than the population as a whole, effective communication between co-cultures is a necessity" (p. 185).

Nixon and Dawson (2002) go on to say "in communications between co-cultures, the assignment of meaning to symbols requires the interpretation of those messages and adapting to the social aspect of each individual co-culture" (p. 184). When there is miscommunication between the dominant culture and the other culture involved, effective communication suffers. When barriers arise to effective communication, misunderstandings and misinterpretations can lead to accidents in the workplace.

There are several factors to take into account when attempting to communicate cross-culturally. They are:

a. differences in decision making,
b. status protocol,
c. social aspects; perceptions of time,
d. and personal relationships (Herbig and Kramer, 1992, as discussed in Nixon & Dawson, 2002, p. 185)

In addition to these factors, "training can reduce hesitancy, help people from different co-cultures relate to each other, and improve the effectiveness of communication across co-cultures" (Nixon & Dawson, 2002, p. 185).

Conclusion

As evidenced by the literature review, there are both labor shortages and language barriers present in some areas of the construction industry. These issues translate into the higher than average accident and death rates seen among workers of Hispanic origin.

Because of the increase in the Hispanic portion of the workforce, as indicated by reviewing census data, many Spanish-speaking individuals are taking jobs where they may not understand the hazards they are around. This lack of understanding could be due to limited English proficiency. Different safety programs have been discussed; as have organizational cultures, in order to understand safety and safety training. The next step is to determine if a language barrier exists in the construction industry that may contribute to the higher than average accident and death rates among Hispanic workers.

For the purpose of this study, it was decided to use a large, national, construction company, with an established safety and health program, in order to attempt to control for the higher accident rates among smaller companies (Lin & Mills, 2001). If Level of English proficiency is a factor, it will be easier to identify in an established safety culture where inadequate, or non-existing, occupational health and safety programs are not the primary cause for high rates of on the job injury (Lin & Mills, 2001).

Chapter 3: Methods

Research Design and Methods

Frone (1998) studied the predictors of work injury among adolescents and compared much of the data to adult employment literature. Because of this comparison, many of the instruments that Frone (1998) used were adapted for use in this study. This study consisted of several predictor variables that are believed to influence job injuries. Based on prior research, Frone (1998) chose the following general predictor categories: demographics, personality, health, substance abuse, and employment. Each of those categories was broken up into several sub categories. Combinations of those categories were used in this study in an attempt to determine the predictors of work injuries among adults, and if there was a difference between ESL and non-ESL employees when it came to those predictors. In an attempt to reduce the length of the instrument developed by Frone (1998), several predictor variables were eliminated from this study.

Demographics

In addition to age and gender, both addressed in the study by Frone (1998), ethnicity and first language were examined. Although age was very important to the adolescent study, the first language and level of English proficiency were the most important in this study. Little research has been done on accident and injury predictors (Frone, 1998), and no research regarding first language as a predictor of work injuries was identified. This study examined if there was a difference in accident predictors based on first language.

Personality

Because of impulsive behavior, some employees "may rush to complete a task without adequate consideration of following safe operating procedures, resulting in increased risk of injury" (Frone, 1998, p. 567). Although prior research has not "directly examined this relation, indirect evidence for it exists among adults" (Frone, 1998, p. 567). Frone (1998) hypothesized that impulsivity would be positively related to work injuries. That same hypothesis was used in this study. Additionally, for the purpose of this study, it was hypothesized that there could be a significant difference in the predictors of work injuries between ESL and non-ESL employees.

Employment Characteristics

The variables in this category studied by Frone (1998) were extensive. For the purpose of this study the following predictor variables were examined: job tenure, number of hours worked, and physical hazards. An additional predictor variable attempting to identify level of English proficiency was also added. Frone (1998) stated, "employment characteristics are the most fundamental for understanding the occurrence of work injuries" (p. 576).

Relating to job tenure, Iverson and Erwin (1997) found no correlation to work injuries. Frone (1998), owing to the inconclusive nature of the study by Iverson and Erwin, along with several other studies, presented no hypothesis for the direction of the relationship. It should be noted that Iverson and Erwin (1997) believed that the longer a person worked a job, the more responsibility they had. Consequently, they would be assigned higher risk jobs because they knew what they were doing.

For work experience, the same inconsistencies were found as in job tenure. According to Frone (1998), “because of potential conceptual inconsistencies and lack of empirical research regarding work hours and injuries...no hypothesis is offered regarding its direction” (p. 567). The same rational was used in this study; no direction was given for the relationship between work hours and injuries.

According to Frone (1998), prior research carried out by Harrell (1990), Macdonald (1995), and Savery and Wodden (1994) “supports a positive relation between physical hazards and work injuries” (p. 567). On the issue of workload, Frone (1998), despite the lack of prior research, believes there would be a positive relationship between workload and work injuries.

One additional variable was added from a study by Probst and Brubaker (2001), that of safety knowledge. Although this study focused on the effects of job insecurity on safety outcomes and compliance, the questions used by the authors were good indicators of safety knowledge. In addition to the three questions taken from the Probst and Brubaker (2001) study, several additional questions were developed for this study and added to the already developed questions.

Participants and Site

Employees of a national commercial construction company, in addition to subcontractors working for that company, were used in this study. The total population of construction workers surveyed was about 200 out of a possible 700. The total population was sorted for analysis based on level of English proficiency. The study took place at the construction site in order to limit the impact on the work in progress.

Participants were selected on a volunteer basis. Twice a week, over a period of about one month, groups of about 25 employees participated in the study. There were a total of about 700 employees on the job site, and 191 individuals participated in the study. Of those that participated, 52 were more Spanish speaking and 102 were more English speaking. The remaining 37 were classified as bilingual, and removed from many of the analyses to maximize the group differences. The instrument was administered during the employee's scheduled lunch break. The company provided lunch on the days that the study took place. The study was administered by the researcher and carried out by an employee of the company who was bilingual.

Data Collection, Instrument and Procedures

The data was gathered using several Likert scales (see Appendix D), the body diagram, the faces of pain scale (developed by Wong and Baker), and questions relating to general demographic information. The faces of pain scale and the body diagram were both used in several agricultural studies targeting migrant agricultural workers (Faucett et al., 2001). Little modification to these instruments took place due to their previous use among Spanish speaking populations, and the fact that they were pictorial rather than written. The overall injury score that was generated from the body diagram provided "an overall evaluation of symptoms that can be readily compared among populations" (Faucett et al., 2001). The Likert scales, adapted from Frone (1998), were originally used in a study among employed adolescents looking at predictors of work injuries. Although none of the instruments were copyrighted, written permission was obtained from Frone and Faucett. There were no restrictions on using the faces of pain scale developed by Wong and Baker in a non-copyrighted publication.

The Likert scale portion of the instrument, previously developed by Frone (1998), was modified in order to address methodological issues when administered to Hispanic respondents. The scale anchors from the original Likert and response scales were modified and translated into Spanish. The reasoning is that "Likert type anchors typically have no meaningful equivalent in Spanish" (Lange, 2002, p. 412). In a study by Bernal, Wooley, and Schensul (1997), it was discovered that anchors like "I don't feel sure, I feel a little sure, I feel more or less sure, and I feel very sure" were much more meaningful. When using Likert scales among Hispanic Americans, Lange (2002) asserts that values must be reassigned so that larger numbers correspond to the positive responses.

The following table, Table 3.1, indicates the Coefficient alpha for each of the instruments used from the study conducted by Frone (1998), on predictors of work injuries among employed adolescents:

Table 3.1

Coefficient Alpha of Instrument Variables

Predictor Variable	Coefficient Alpha
Impulsivity	0.75
Job Tenure	0.79
Work Hours	0.79
Physical Hazards	0.79

When the instrument was administered, some steps were taken in order to assure that participants unfamiliar with Likert scales were able to answer appropriately. A brief presentation with examples and instructions was given in English and Spanish to assure that all participants understand how to correctly fill out the instrument. An example, such as "I like to eat candy" might be given, with the responses of agree or disagree available for answers. Once answered, the participant might be asked if they agree a little or a lot. If an example is needed, questions from the survey will not be used. Due to low literacy rates among some populations involved in the study, the researcher, or an interpreter, was available to assist participants in the completion of the instrument. Although there was a potential to influence responses, that risk was taken in order to attain more meaningful responses overall (Lange, 2002).

In addition to the quantitative information obtained from the instrument, there was one qualitative question. This question was open ended and focused on other aspects of workers' jobs that they believe could cause injury. This was done to try and capture other aspects of how working for the participating national construction company could affect their health.

Instrument Development

The final methodological issue to be addressed is the development of the instrument (see Appendix D). The instrument was translated into Spanish for participants who were limited English proficient. To begin with, the instrument was modified so that it was in the present tense, in the active voice, and at a sufficiently low reading level for all populations involved. Meaning was stressed more than attempting to keep the exact wording.

Once translated into Spanish, the instrument was back-translated into English by another translator not associated with the initial translation. Constructs from the original English version were compared to the constructs that emerged from the back-translation and corrections were made as needed to assure congruency between the Spanish and English version of the instrument (Lange, 2002).

The instrument was pilot tested among Spanish and English speaking subgroups to assure that the instrument was clear and easy to understand. During this test, length of the instrument was noted and some issues relating to appropriate completion were found. For one, the body diagram was placed as the first page of the instrument so that the oral instructions were still fresh in the participant's minds when they completed the instrument. Another change resulting from the pilot test was that the final version of the instrument was not printed on the front and back of the page because some sections on the backs of pages were missed in the pilot. Feedback from the participants in the pilot test was obtained to assure that perceived meaning matched the intended message (Marin & Marin, 1991). Several minor revisions of Spanish words, resulting from the pilot test, contributed to a clearer understanding of the research instrument.

Through the use of funding given to the researcher by the construction company, the biggest change in the instrument was the use of Colorado State University's testing center in developing the final instrument. Through the use of a computer software program, Design Expert, the previous instrument was adapted into a form that could be scanned electronically upon completion. This was of great help in the data entry phase. The new instrument was also much neater and easier to follow.

Data Analysis

Once all the data were gathered, statistics were run looking for significant differences between levels of English proficiency and work injuries. Based on question four of the instrument, groups were sorted based on their level of English proficiency. This was done to identify if level of English proficiency contributed to the higher than average accident rates among Hispanic workers in construction. Additionally, each research question was tested by correlation statistics in order to find if positive relationships existed between the predictor variables and work injuries. Results of zero order correlations were presented in a correlation matrix. Effect size was reported for statistically significant relationships to further emphasize statistical significance.

The predictor variables were analyzed one at a time using linear regression. After that, multiple regression were the last step of data analysis, as all independent variables were introduced into the equation to understand the interaction on the dependent variable. It was important to understand how the variables interacted independently and together when comparing predictors of work injuries to level of English proficiency. The research questions are as follows:

1. Based on the body diagram, where are construction workers most likely to be injured?
2. Is there a difference between level of English proficiency and safety knowledge?
3. Is there a difference between level of English proficiency and impulsivity?
4. Is there a difference between level of English proficiency and job tenure?
5. Is there a difference between level of English proficiency and job hazards?
6. Is there a difference between level of English proficiency and work injuries?
7. Is there an association between impulsivity and work injuries?
8. Is there an association between job tenure and work injuries?
9. Is there an association between safety knowledge and work injuries?
10. Is there an association between physical hazards and work injuries?

11. Is there an association between level of English proficiency and work injuries?

12. Is there a combination of impulsivity, job tenure, physical hazards, and safety knowledge that predicts work injuries better than any one predictor variable in isolation?

13. Is there a combination of impulsivity, job tenure, physical hazards, and safety knowledge, based on limited English proficient workers, that predicts work injuries better than any one predictor variable in isolation?

14. Is there a combination of impulsivity, job tenure, physical hazards, and safety knowledge, based on workers that are not limited English proficient, which predicts work injuries better than any one predictor variable in isolation?

Human Subjects Protection

In order to afford the highest level of human subjects protection possible (see Appendix B), the following precautions were taken:

1. Participants will receive an envelope containing the instrument, consent form, red, yellow and blue crayon, and pencil (all necessary for correct completion of the instrument).

2. They will be asked to read and sign the cover letter, which will be the informed consent and instructions for completing the instrument, before filling out the instrument. Participants who might be illiterate will have the help of a bilingual interpreter to assist in proper completion of the instrument.

3. Instructions and direction will be given in English and Spanish.

4. Completed surveys will be placed back in the original envelope and sealed before returning them to the administrator. Sealed packets will then be given to the researcher.

Chapter 4: Results

Overview

The main variables identified by the research questions are level of English proficiency, safety knowledge, impulsivity, job tenure, overall injury score, and job hazards. Only the data provided in response to the actual research questions will be discussed here. Analyses involving questions raised while analyzing the data, or other areas of interest allowed by further data obtained by the research instrument, will be discussed in chapter 5, auxiliary findings.

Issues that arose while analyzing the data were solved as they surfaced. In order to account for some incomplete survey instruments, it was decided to use the mean function in SPSS, which enabled the researcher to use survey instruments where some questions were left blank. In the case of the age and years questions, written responses were taken over the filled in bubbles. It was deemed that it was less likely to error in writing the person's age, than by filling in the corresponding bubbles. On the questions to identify level of English proficiency, where two bubbles were filled in for the same question, the higher of the two responses were used.

For level of education, when a range was identified by methods other than filling in the corresponding bubbles, for example, 1 through 6, the highest part of the range was used. If the range was identified in the bubbles as 7 through 9, and filled in as 79, the higher of the two grades was used for data analyses. In the instances where a face was filled in instead of a bubble for the faces of pain scale, the corresponding number was entered for data analyses. If two bubbles were filled in for the faces of pain question, the lower of the two scores was used. If any responses were too light for the computer to detect, or were filled in with crayon instead of pencil, the corresponding information was entered manually. If yes and no were identified for the company safety questions, the area was left blank for purposes of data analyses.

Examination of the Research Questions

Research question one involves descriptive statistics of the data collected to address frequency and location of work injuries. Additional descriptive statistics obtained from the research instrument are also presented here. Relating to gender of the participants, of the 191 completed surveys, 160 identified themselves as male, and 10 identified themselves as female. The remaining 21 surveys were not marked. Table 4.1 lists many of the descriptive statistics for the study, and Figure 4.1 identifies the area and frequency of injuries experienced in the last 30 days. An underlined number (blue in the instrument) indicates pain that is sore, heavy or tiring. A **bold** number (red in the instrument) indicates sharp pain. An *italicized* number (yellow in the instrument), indicates pain that is numb or tingling.

Table 4.1a

Descriptive Statistics

	Age	Level of Schooling	Years Working Const.	Recode of Hours Worked Last Day	Faces of Pain Scale	Sum of Level of English Prof.
Mean	34.09	12.00	11.36	9.03	1.50	14.04
Median	32.00	12.00	9.00	8.00	1.00	17.00
Std. Deviation	11.19	2.98	9.19	1.49	1.17	6.28
Skewness	0.88	-0.83	1.41	1.05	0.98	-0.43
Std. Error of Skewness	0.18	0.18	0.18	0.18	0.18	0.18
Minimum	18.00	1.00	1.00	6.00	0.00	0.00
Maximum	66.00	19.00	46.00	13.00	6.00	20.00
N=Valid	188.00	182.00	182.00	190.00	187.00	191.00
=Missing	3.00	9.00	9.00	1.00	4.00	0.00

Table 4.1b

Descriptive Statistics

	Mean Impulse Score	Mean Safety Knowledge	Mean Physical Hazard	Mean of Company Safety Questions	Sum of Overall Injury Score
Mean	2.52	5.14	3.18	0.16	6.35
Median	2.50	5.50	3.14	0.20	5.00
Std. Deviation	0.95	1.20	0.73	0.19	6.31
Skewness	0.44	-2.19	0.10	1.33	2.50
Std. Error of Skewness	0.18	0.18	0.18	0.18	0.18
Minimum	1.00	1.00	1.57	0.00	0.00
Maximum	5.33	6.00	5.00	0.80	47.00
N=Valid	190.00	189.00	181.00	186.00	188.00
=Missing	1.00	2.00	10.00	5.00	3.00

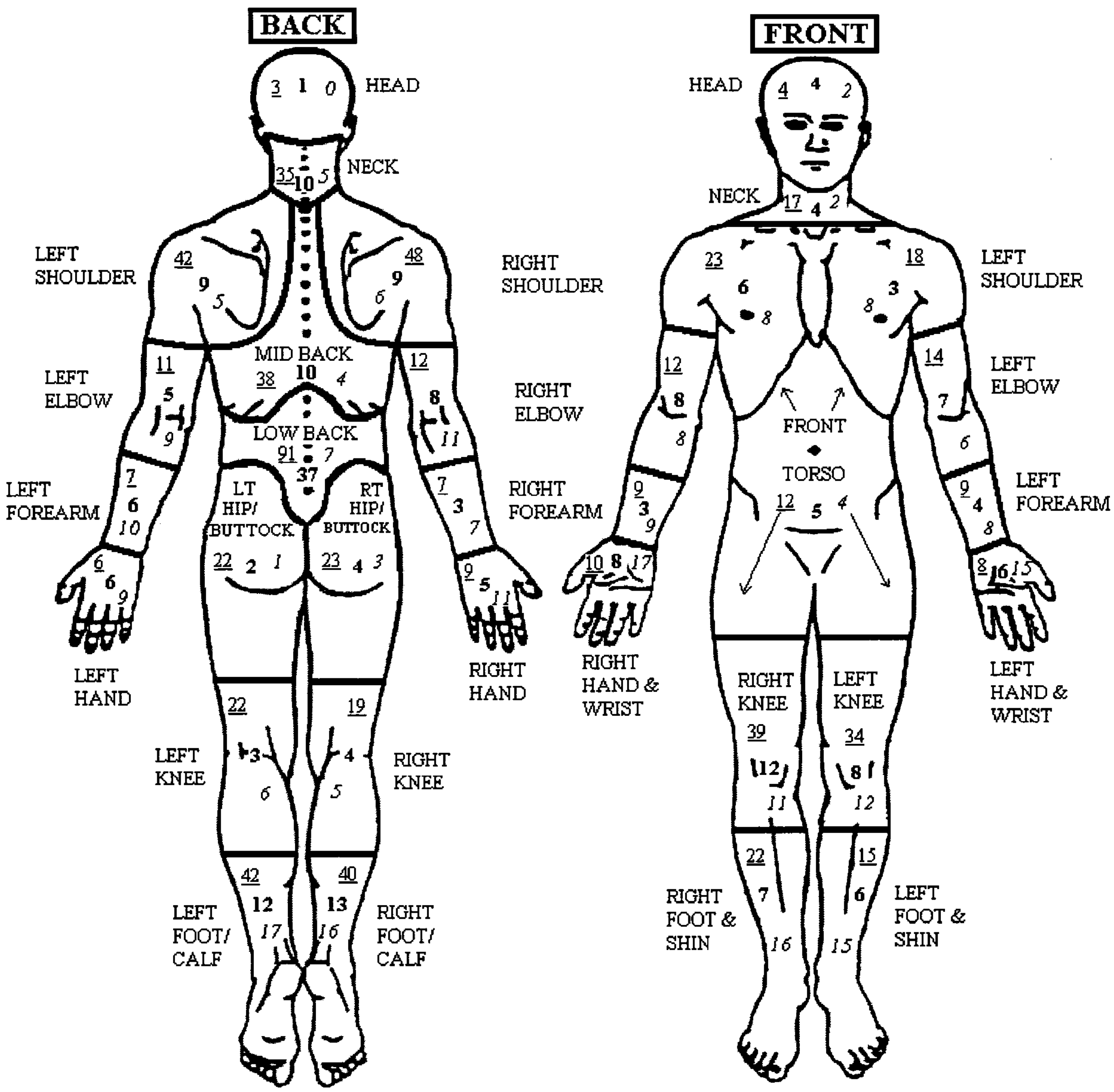


Figure 4.1. Frequency, location and injury type (Blue = heavy/tired, Red = sharp, & Yellow = numb/tingle).

The overall number of surveys obtained was 191 out of a possible 200. Those participants were comprised of 160 men and 10 women, as identified in Table 4.2. Of those that participated, 52 were more Spanish speaking and 102 were more English speaking. The remaining 37 were classified as bilingual, and removed from many of the analyses to maximize the group differences. Out of the completed surveys, 21 were left blank in relation to the gender question. Additionally, out of the 191 surveys, several were not completed in their entirety, resulting in varying numbers of useable surveys depending on the variable being used.

Table 4.2

Gender Breakdown of Population

	Frequency
Male	160
Female	10
Total	170
Missing	21
Total	191

The age ranged from 18 to 66 with a mean of 34.09 years and a standard deviation of 11.19. One hundred and eighty-eight surveys were usable in the age category. Out of 183 useable surveys for level of schooling, the mean was 12, indicating completion of high school, with a standard deviation of 2.979. A bar chart can be seen in Figure 4.2.

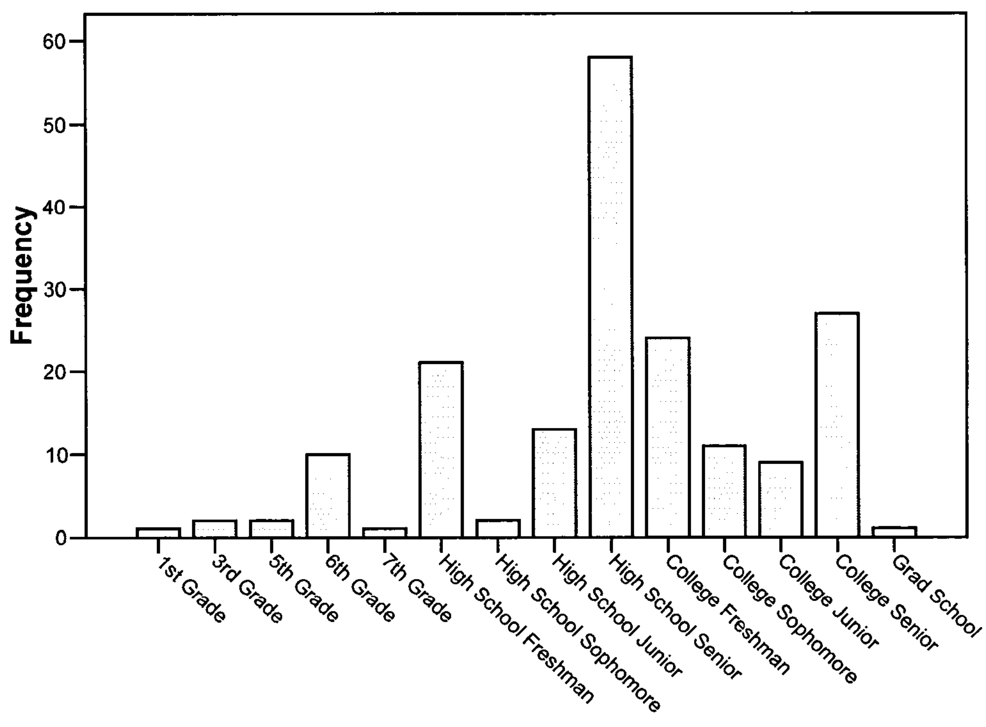


Figure 4.2. Frequency distribution of level of schooling.

The mean years of working construction, Figure 4.3, was 11.36 with a range from 1 to 46 years and a standard deviation of 9.19.

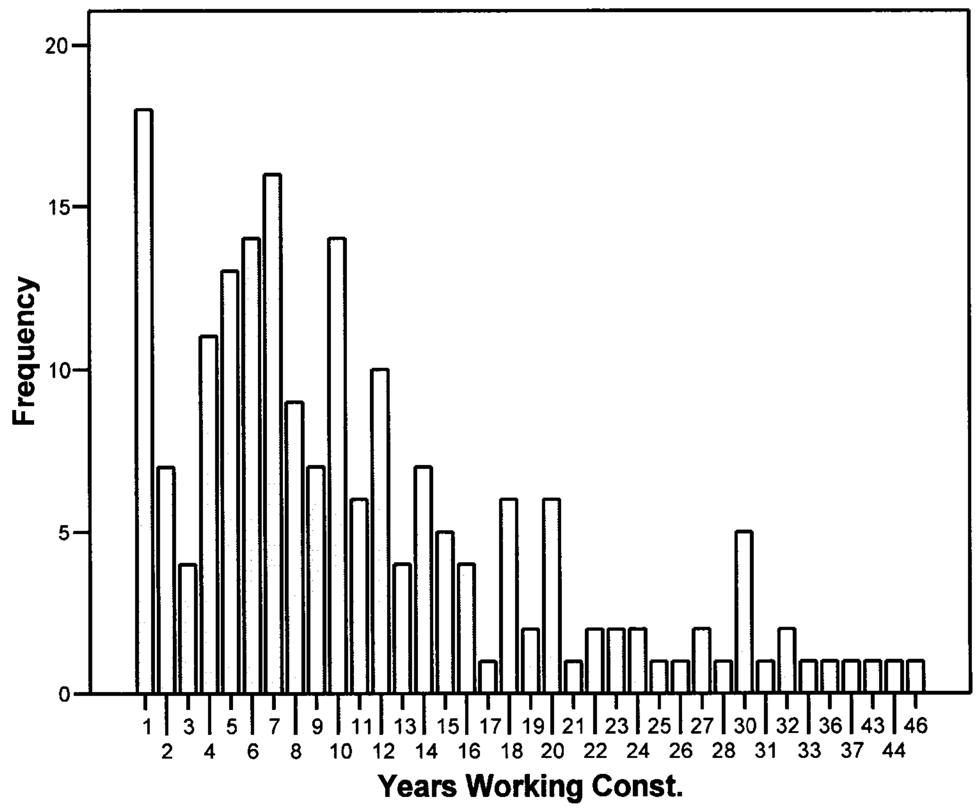


Figure 4.3. Frequency distribution of years working construction.

Mean hours worked on the last day of work was 9.03 with a range from 6 to 13 and a standard deviation of 1.49. The mean for the faces of pain scale was 1.5, which was midway between a little pain and a little more pain. A bar chart can be seen depicting the frequencies of the responses for the faces of pain scale in Figure 4.4. The standard deviation was 1.17.

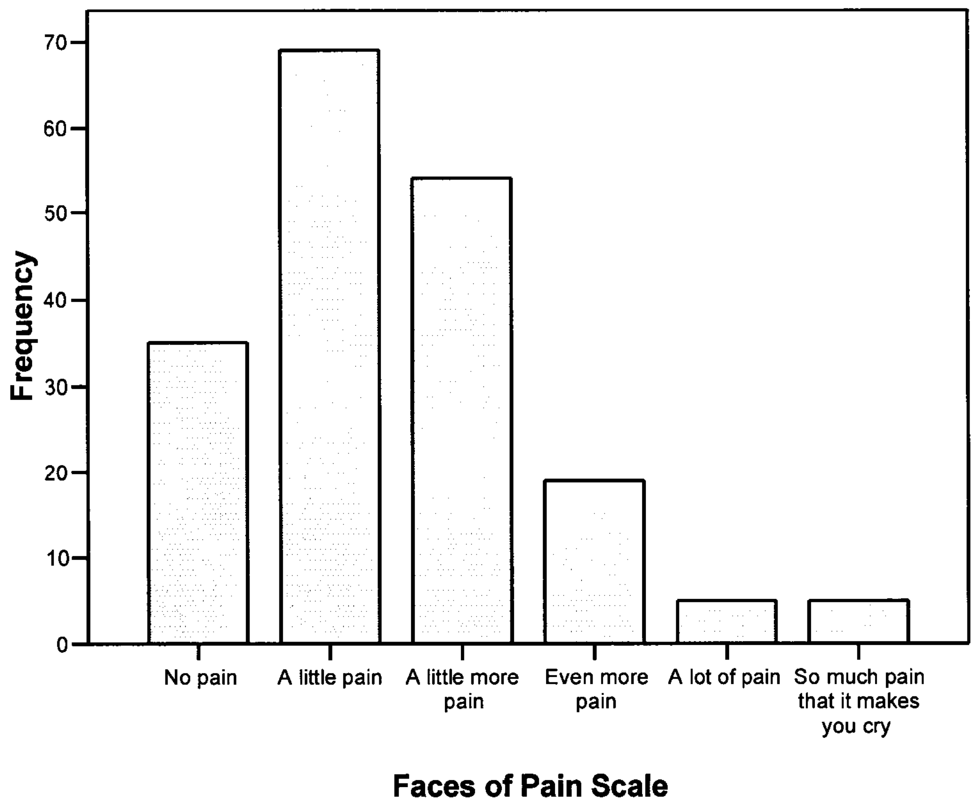


Figure 4.4. Frequency distribution on the faces of pain scale.

The mean for level of English proficiency was 14.04. A score of 12 would have been completely bilingual, identifying 14.04 as slightly more English proficient (bar chart displayed as Figure 4.5). The standard deviation was 6.28.

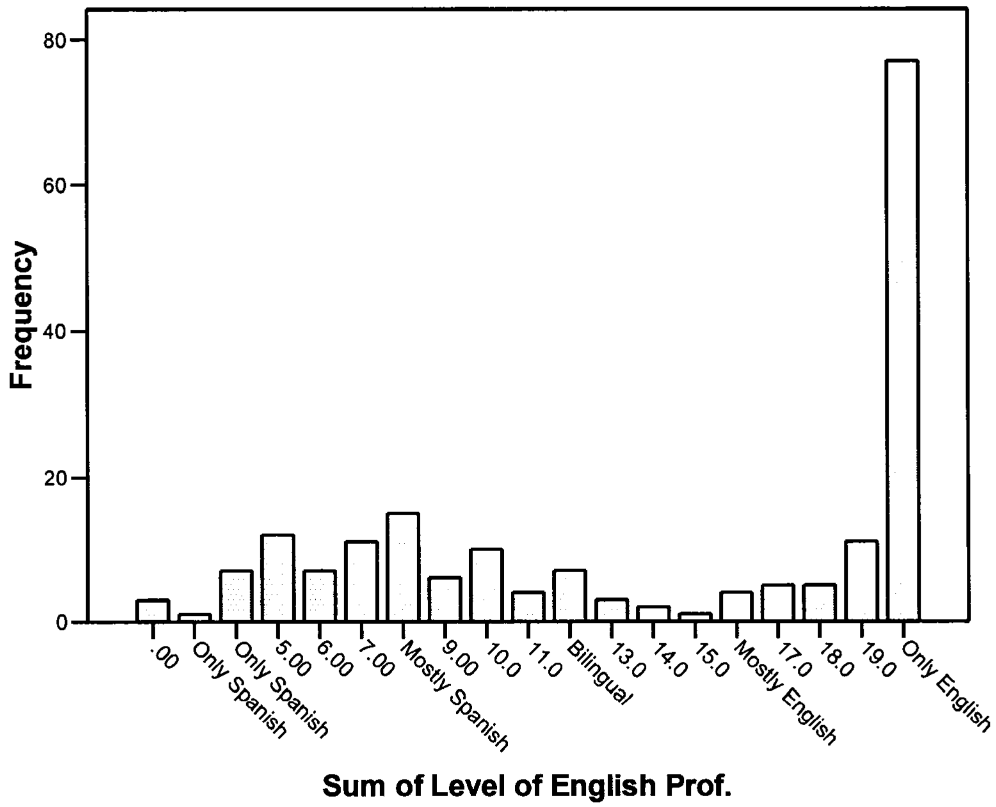


Figure 4.5. Frequency distribution of sum of level of English proficiency.

The mean for impulsivity was 2.52 with one being the least impulsive and six the most impulsive. The standard deviation was 0.95. The bar chart in Figure 4.6 displays the frequencies for the impulsivity variable.

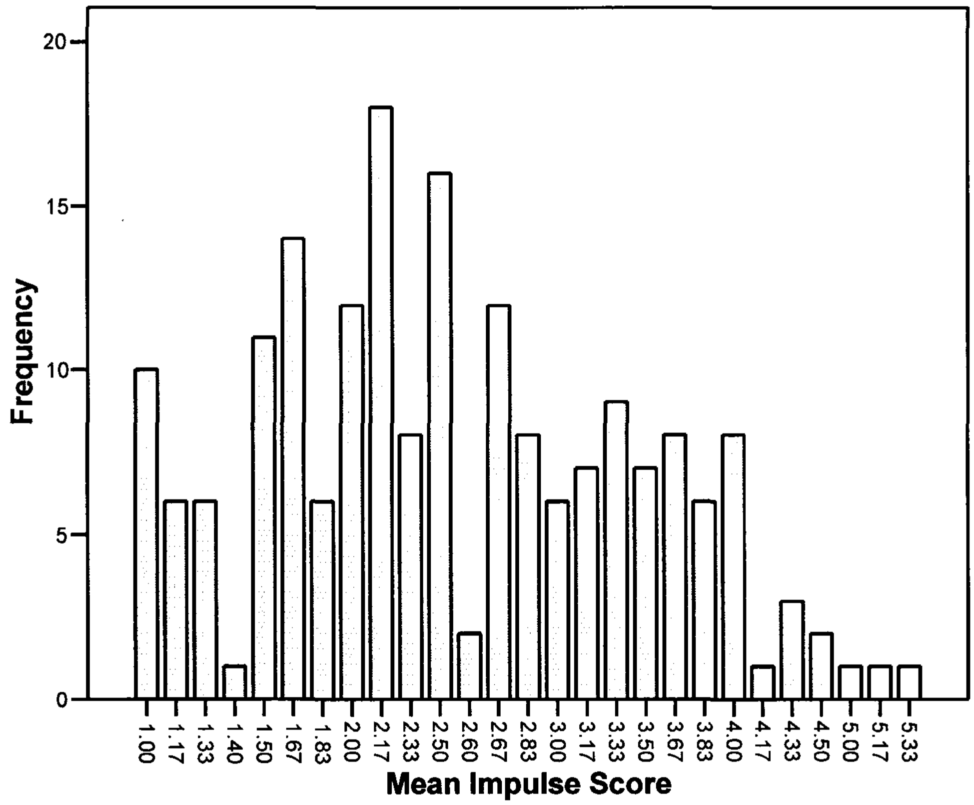


Figure 4.6. Frequency distribution on mean impulse score.

Mean safety knowledge displayed a mean of 5.14, and is depicted in Figure 4.7 as a bar chart. One indicated the lowest level of safety knowledge and six was the highest. The standard deviation was 1.20.

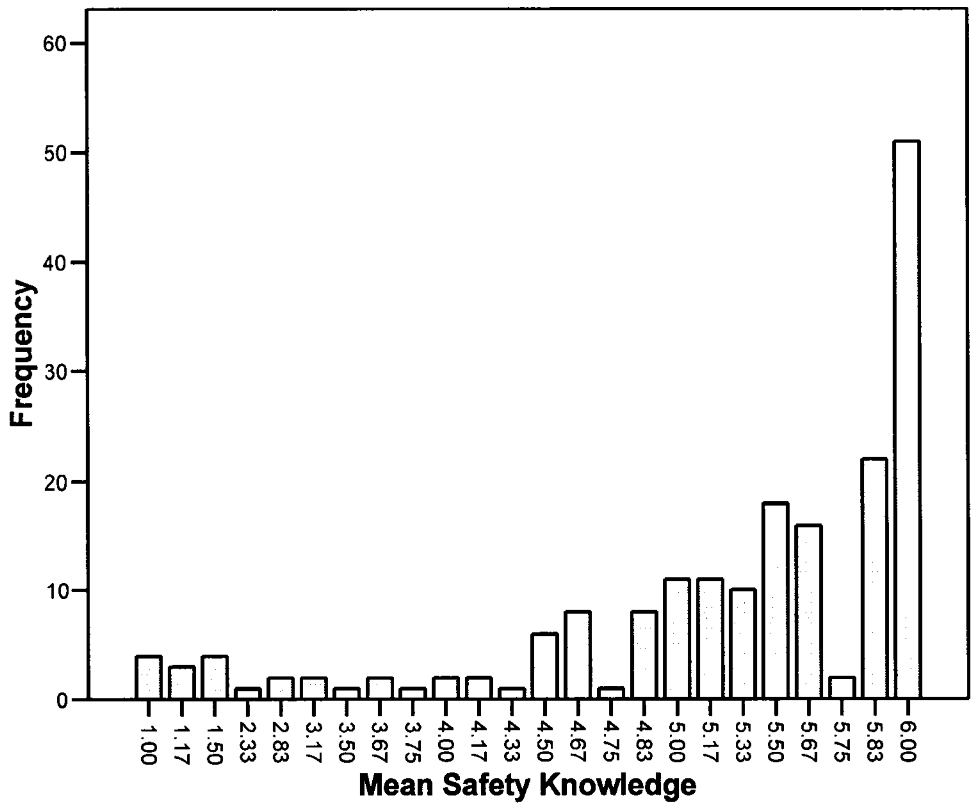


Figure 4.7. Frequency distribution on mean safety knowledge.

The mean for physical hazard was 3.18 with a standard deviation of 0.73. A bar graph can be seen in Figure 4.8. The low for mean physical hazard was 1.57, which indicated a low perception of physical hazards on the construction site. The high was five out of a possible six.

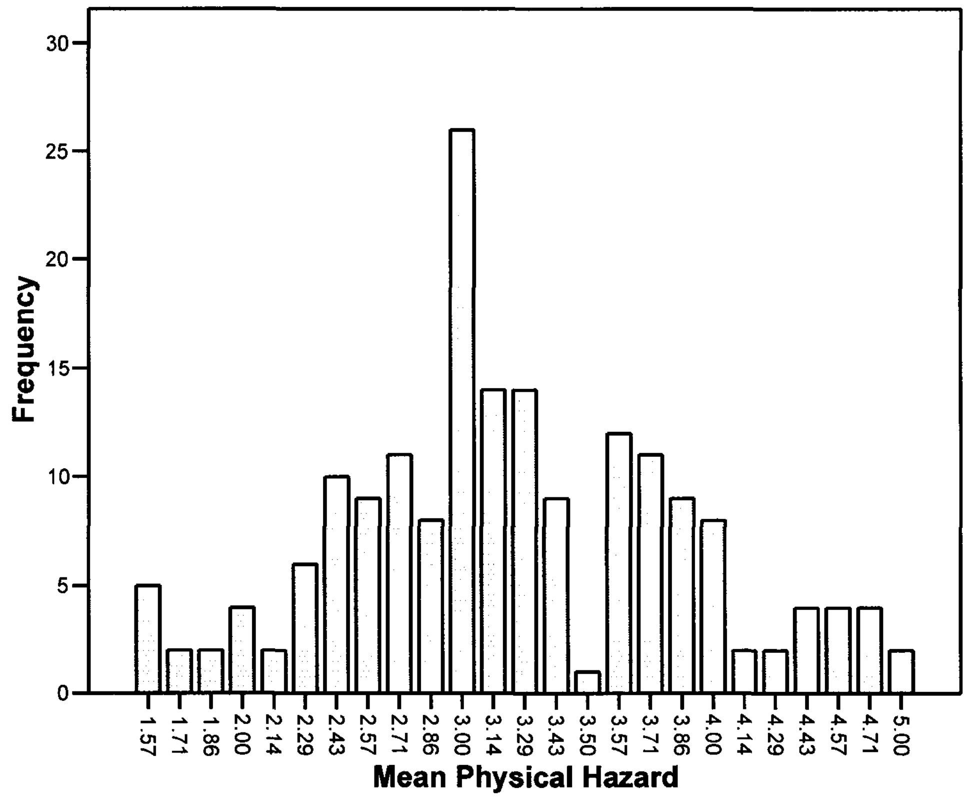


Figure 4.8. Frequency distribution of mean physical hazard.

The overall injury mean was 6.35, indicating that the average construction worker identified about six areas of the body as having an injury over the last 30 days. Figure 4.9 depicts the distribution in a bar chart. The high was 47 and the low was zero injuries sustained in the last 30 days.

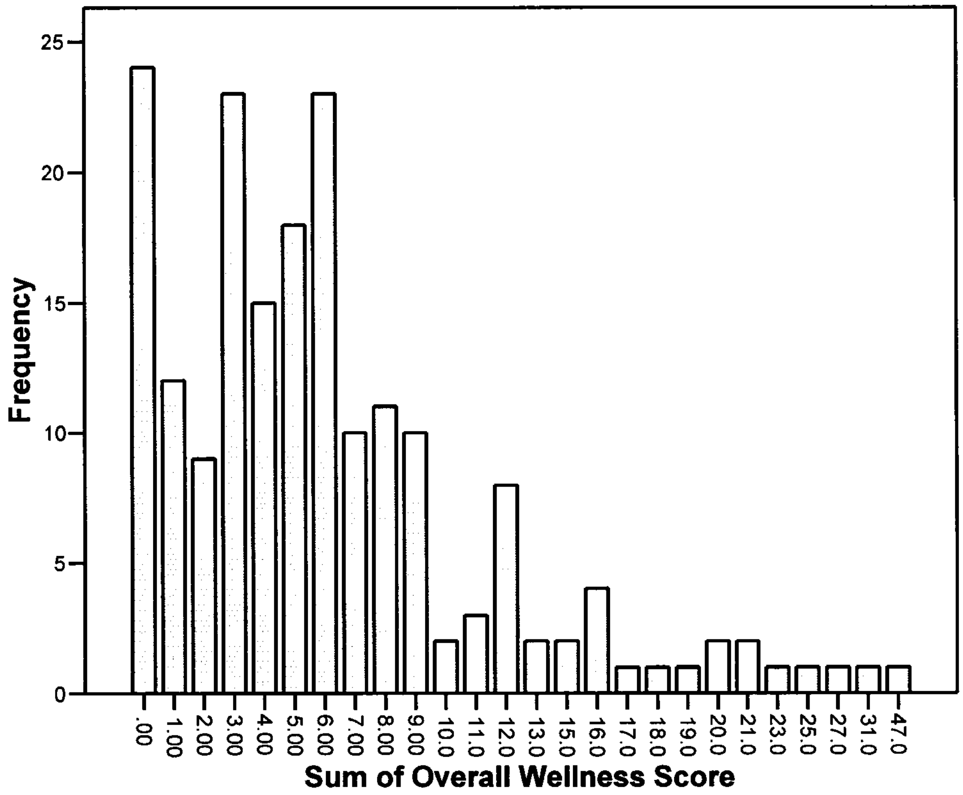


Figure 4.9. Frequency distribution on sum of overall injury score.

Skewness statistics were identified on the variables to determine whether nonparametric statistics were necessary. Of the variables of interest in the study, faces of pain scale, sum of level of English proficiency, mean impulse score, and mean physical hazard were below the plus or minus one used as the cutoff for a normally distributed variable (Morgan, Griego, & Gloeckner, 2001). These were the main variables of interest as they related to the actual research questions for the study. Safety knowledge, job tenure, and job hazards were all above the cutoff and nonparametric statistics were used to analyze relationships containing these variables. Level of English proficiency was the dependent variable for many of the questions and was normally distributed with a skewness statistic of -0.43. The sum of overall injuries was also used frequently in data analyses, but was not normally distributed as evidenced by a skewness statistic of 2.50.

Research questions two, four, and six, were not normally distributed and were analyzed using the Mann-Whitney U test, and will be discussed later in chapter four. Due to the normal distribution of the variables in research questions three and five, the research questions were analyzed using t-tests.

Research question three tested the difference between level of English proficiency and impulsivity. Question three was normally distributed and once the two groups were separated based on their level of English proficiency, the independent samples t-test was run. Table 4.3 indicates that there were 52 participants identified as more Spanish speaking and 102 participants identified as more English speaking based on their level of English proficiency.

Table 4.3

Descriptive Statistics for level of English Proficiency in Two Groups

Mean Impulse Score	N	Mean	Std. Deviation	Std. Error Mean
More Spanish	52	2.6301	1.06912	0.14826
More English	102	2.3971	0.82888	0.08207

Mean impulse score was used as the independent variable. The mean for the more Spanish group was 2.63, which was slightly higher than their more English-speaking counterparts with a mean of 2.397. In Table 4.4, the resulting independent samples t-test indicated first, by way of the Levene's statistic, that equal variances cannot be assumed which gives the t-test a two tailed significance value of 0.173. Based on the .05 cutoff, there is not a significant difference between the mean of the impulse score for the more Spanish-speaking group and the mean impulse score of the more English-speaking group.

Table 4.4

Independent Samples t-test for Research Question Three

	t	*df*	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances not assumed	1.375	83.105	0.173	0.23307	0.16946

Research question five tested if there was a difference between level of English proficiency and job hazards. The group statistics for the independent t-test are identified in Table 4.5.

Table 4.5

Group Statistics for Research Question Five

Mean Physical Hazard	*N*	Mean	Std. Deviation	Std. Error Mean
More Spanish	46	3.127	0.828	0.122
More English	102	3.226	0.652	0.065

Two groups were separated by their level of English proficiency. The middle group of participants on the level of English proficiency scale was removed in order to magnify the difference between the groups based on their level of English proficiency. The more Spanish group, N=46, was made up of scores ranging from two – eight (the lowest possible score was four, so the two indicates that the survey was only partially filled out). The more English group, N=102, was comprised of scores ranging from 16 – 20. Based on these two groups, there was a slight difference in the mean score based on mean physical hazard. The more English group, with a mean of 3.226, perceived that the worksite and conditions contained more physical hazards than did their more Spanish-speaking counter parts.

The resulting t-test, Table 4.6, indicates by the Levene statistic that equal variances can be assumed, and that there is not a significant difference between mean physical hazards as perceived by the two groups. With a two tailed significance of 0.435, it would not have been identified as significant even if a one-tailed test of significance had been used.

Table 4.6

Independent Samples t-test for Research Question Five

	t	*df*	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	-0.783	146.00	0.435	-0.099	0.126

Due to high levels of skewness for mean safety knowledge, job tenure and overall injury score, the Mann-Whitney U test, a non-parametric test, had to be used to compare differences in means. The grouping based on level of English proficiency was fairly consistent with an N of 51, 53, and 52 for more Spanish and an N of 102, 102, and 101 for their more English-speaking counterparts. Table 4.7 shows that the mean rank for each variable was higher among the more English-speaking group.

Table 4.7

Mean Ranks for Research Question Two, Four and Six

	Sum of English Proficiency 2 Groups	*N*	Mean Rank	Sum of Ranks
Mean Safety Knowledge	More Spanish	51	64.47	3288
	More English	102	83.26	8493
	Total	153		
Job Tenure	More Spanish	53	69.08	3661
	More English	102	82.64	8429
	Total	155		
Sum of Overall Injury Score	More Spanish	52	68.70	3572.5
	More English	101	81.27	8208.5
	Total	153		

The Mann-Whitney test, as seen in Table 4.8, shows the test for significance for research questions two, (Is there a difference between level of English proficiency and safety knowledge?) four, (Is there a difference between level of English proficiency and job tenure?) and six, (Is there a difference between level of English proficiency and job hazards?). The test identified a significant difference between the mean for each group as it relates to mean safety knowledge. With a significance value of .012, this difference is significant at the .05 level. Both job tenure and overall injury scores were not significant at the two-tailed level.

Table 4.8

Mann-Whitney U Test for Research Questions Two, Four and Six

	Mean Safety Knowledge	Job Tenure	Sum of Overall Injury Score
Mann-Whitney U	1962	2230	2194.5
Asymp. Sig. (2-tailed)	0.012	0.074	0.095

The following results are based on nonparametric correlations, Spearman's Rho, due to the dependent variable, sum of overall injury score, being to highly skewed to warrant the Pearson correlation statistic. For research question seven, testing an association between impulsivity and work injuries, there is not a significant correlation, as evidenced by Table 4.9, between mean impulse score and overall work injuries. A p value of .342 is well outside of the .05 necessary to indicate statistical significance.

Table 4.9

Spearman's Rho Correlation for Research Question Seven

		Sum of Overall Injury Score
Mean Impulse Score	Correlation Coefficient	-0.07
	Sig. (2-tailed)	0.342
	N	187

For research question eight, the test to identify an association between job tenure and work injuries, Table 4.10 indicates that there was not a significant correlation between job tenure and overall injury score. The significance score was .109, and there were 187 useable surveys out of the total of 191.

Table 4.10

Spearman's Rho Correlation for Research Question Eight

		Job Tenure
Sum of Overall Injury Score	Correlation Coefficient	0.118
	Sig. (2-tailed)	0.109
	N	187

For research question nine, the test of association between safety knowledge and work injuries, Table 4.11 indicates that there was not a significant correlation between mean safety knowledge and overall injury score. The significance score was .352, and there were 186 useable surveys out of the total of 191.

Table 4.11

Spearman's Rho Correlation Research Question Nine

		Mean Safety Knowledge
Sum of Overall Injury Score	Correlation Coefficient	0.069
	Sig. (2-tailed)	0.352
	N	186

The data presented in Table 4.12, for research question ten, tested an association between physical hazards and work injuries. The table indicates that there is a significant correlation between the two variables. With a significance value of .004, this correlation is significant at the .01 level. When the correlation coefficient of .216, indicating a small to medium effect size, is squared, the resulting value is .0467. This means that one can predict 4.67% of injury scores based on an individual's mean physical hazard score. The correlation also indicates that as the mean physical hazard score goes up, meaning the more participants believe their working conditions are not safe, so does the number of overall injuries.

Table 4.12

Spearman's Rho Correlation for Research Question Ten

		Mean Physical Hazard
Sum of Overall Injury Score	Correlation Coefficient	.216(**)
	Sig. (2-tailed)	0.004
	N	178

Note. ** Correlation is significant at the 0.01 level (2-tailed)

The results of research question 11 are shown in Table 4.13, and tested the association between level of English proficiency and work injuries. The table identifies a significant correlation between the level of English proficiency, and the overall injury score. With a significance value of .018, the relationship of the two variables is statistically significant at the .05 level. Squaring the correlation coefficient of .172, indicating a small effect size, yields an r squared value of .0296. This value means that by knowing an individual's level of English proficiency, one can predict 2.96% of their overall injury score. This association indicates that level of English proficiency increases, so does the number of overall injuries.

Table 4.13

Spearman's Rho Correlation for Research Question Eleven

		Sum of Level of English Prof.
Sum of Overall Injury Score	Correlation Coefficient	.172(*)
	Sig. (2-tailed)	0.018
	N	188

Note. * Correlation is significant at the 0.05 level (2-tailed)

Research question 12 tested whether a combination of impulsivity, job tenure, physical hazards, and safety knowledge predicts work injuries better than any one predictor variable in isolation. The dependent variable for this question is the overall injury score. From Table 4.14, it can be seen that there are three significant correlations within the regression model. The first is between mean physical hazard and overall injury score. This correlation was examined in research question ten. The Pearson correlation is .209, with a computed r square value of .0437 and a significance value of .003. As mean physical hazard scores increase, so does the overall injuries score. Mean physical hazard is also correlated with mean impulse score displaying a Pearson correlation of .179, a significance value of .008, and a computed r square statistic of .032. In this instance, as mean physical hazard scores increase, so does the mean impulse score. Both correlations indicate a small to medium effect size (Morgan, Griego, & Gloeckner, 2001).

The third correlation found in this regression model is the correlation between mean safety knowledge and mean impulse score. The negative sign in front of the Pearson correlation statistic of -.296 indicates that as impulse scores increase, the corresponding safety knowledge score decreases. The significance statistic is .000, indicating significance in the correlation of these two variables. The r square statistic is .0876 and the effect size for this correlation is considered medium. By knowing the mean impulse score of an individual, one can predict with 8.76% accuracy the associated mean safety knowledge score.

Table 4.14

Regression Statistics for Research Question Twelve

		Sum of Overall Injury Score	Mean Impulse Score	Years Working Const.	Mean Physical Hazard	Mean Safety Know.
Pearson Correlation	Sum of Overall Injury Score	1.000				
	Mean Impulse Score	-0.086	1.000			
	Years Working Const.	0.062	0.033	1.000		
	Mean Physical Hazard	0.209	0.179	0.068	1.000	
	Mean Safety Knowledge	0.019	-0.296	-0.008	0.039	1.000
Sig. (1-tailed)	Sum of Overall Injury Score	-				
	Mean Impulse Score	0.127	-			
	Years Working Const.	0.206	0.330	-		
	Mean Physical Hazard	0.003	0.008	0.183	-	
	Mean Safety Knowledge	0.399	0.000	0.455	0.303	-

Note. N=177

Table 4.15 identifies the overall model correlation statistics. The overall R for the model is .251. The effect size is small to medium, and the adjusted r square statistic is .041, indicating that by knowing the score for mean safety knowledge, job tenure, mean physical hazard, and mean impulse, one can predict the number of overall injuries 4.1% of the time.

Table 4.15

Model Summary for Research Question Twelve

R	R Square	Adjusted R Square	Std. Error of the Estimate
.251[a]	0.063	0.041	6.25865

[a] Predictors: (Constant), Mean Safety Knowledge, Job Tenure, Mean Physical Hazard, Mean Impulse Score

The resulting ANOVA table, Table 4.16, shows that F = 2.887, and is statistically significant at the .05 level with a significance value of .024. The statistical significance indicates that one or more of the variables are significant predictors of the dependent variable, overall injury score (Morgan, Griego, & Gloeckner, 2001).

Table 4.16

ANOVA(b) Table for Research Question Twelve

	Sum of Squares	*df*	Mean Square	*F*	Sig.
Regression	452.379	4	113.095	2.887	.024[a]
Residual	6737.361	172	39.171		
Total	7189.74	176			

[a] Predictors: (Constant), Mean Safety Knowledge, Years Working Const., Mean Physical Hazard, Mean Impulse Score

[b] Dependent Variable: Sum of Overall Injury Score

Table 4.17 further identifies the effect of the different coefficients on the overall correlation coefficient. As can be seen by the significance value of .003 for mean physical hazard, the majority of the predictability can be explained by the effect of mean physical hazard on the regression model. Also contributing slightly to the overall correlation coefficient is mean impulse score with a significance statistic of .081, not significant at the .05 level, but adding to the overall correlation coefficient nonetheless.

Table 4.17

Regression Coefficients(a) of Research Question Twelve

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	2.121	3.146	-	0.674	0.501
Mean Impulse Score	-0.579	0.331	-0.138	-1.753	0.081
Years Working Const.	0.035	0.051	0.051	0.685	0.495
Mean Physical Hazard	2.013	0.657	0.232	3.067	0.003
Mean Safety Knowledge	-0.166	0.427	-0.030	-0.388	0.698

[a] Dependent Variable: Sum of Overall Injury Score

Research question 13, Table 4.18, looks at the same combination of impulsivity, job tenure, physical hazards, and safety knowledge to predict work injuries to predict work injuries as did research question twelve, but further specifies that combination by only looking at individuals in the more Spanish group based on level of English proficiency. In this regression model, there were two statistically significant correlations. One between mean physical hazard and mean impulse, and the other between mean physical hazard and years working construction.

With a significance value of .044, the correlation between mean physical hazard and mean impulse is barely in the .05 range for significance. Although the significance statistic is barely there, the effect size of this correlation is small to medium with a Pearson correlation statistic of .257. The other statistically significant correlation is

Table 4.18

Regression Statistics for Research Question Thirteen

		Sum of Overall Injury Score	Mean Impulse Score	Years Working Const.	Mean Physical Hazard	Mean Safety Know.
Pearson Correlation	Sum of Overall Injury Score	1.000				
	Mean Impulse Score	-0.122	1.000			
	Years Working Const.	0.035	0.234	1.000		
	Mean Physical Hazard	0.081	0.257	0.253	1.000	
	Mean Safety Knowledge	-0.011	-0.219	-0.016	0.233	1.000
Sig. (1-tailed)	Sum of Overall Injury Score	-				
	Mean Impulse Score	0.213	-			
	Years Working Const.	0.409	0.061	-		
	Mean Physical Hazard	0.299	0.044	0.047	-	
	Mean Safety Knowledge	0.472	0.074	0.458	0.062	-

[a] Selecting only cases for which Sum of English Proficiency = More Spanish

between mean physical hazard and years working construction. This had a small to medium effect size also, as evidenced by the Pearson correlation of .253. As mean physical hazard scores went up, so did the corresponding levels of mean impulse and job tenure.

As can be seen in Table 4.19, the R for the overall model is .190, with an adjusted r squared of -0.06. Both identify this model as a poor predictor of work injuries. Table 4.20, shows no statistical significance in the ANOVA table. To further reiterate this, none of the coefficients shown in Table 4.21 are flagged as contributing significantly to the overall model.

Table 4.19

Model Summary for Research Question Thirteen

R Sum of English Proficiency = More Spanish	R Square	Adjusted R Square	Std. Error of the Estimate
.190[a]	0.036	-0.06	5.30544

[a] Predictors: (Constant), Mean Safety Knowledge, Years Working Const., Mean Impulse Score, Mean Physical Hazard

Table 4.20

ANOVA Table (b, c) for Research Question Thirteen

	Sum of Squares	*df*	Mean Square	*F*	Sig.
Regression	42.003	4	10.501	0.373	.826[a]
Residual	1125.908	40	28.148		
Total	1167.911	44			

[a] Predictors: (Constant), Mean Safety Knowledge, Years Working Const., Mean Impulse Score, Mean Physical Hazard

[b] Dependent Variable: Sum of Overall Injury Score

[c] Selecting only cases for which Sum of English Proficiency = More Spanish

Table 4.21

Regression Coefficients (a ,b) of Research Question Thirteen

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	*t*	Sig.
(Constant)	5.427	3.81	-	1.424	0.162
Mean Impulse Score	-0.369	0.34	-0.185	-1.085	0.284
Years Working Const.	0.032	0.121	0.043	0.262	0.795
Mean Physical Hazard	0.841	1.062	0.137	0.792	0.433
Mean Safety Knowledge	-0.299	0.606	-0.083	-0.494	0.624

[a] Dependent Variable: Sum of Overall Injury Score

[b] Selecting only cases for which Sum of English Proficiency 2 Groups = More Spanish

Research question 14, shown in Table 4.22, identifies the same combination of variables as research questions 12 and 13 to predict work injuries, but looks solely at individuals identified by their level of English proficiency as more English. In the initial correlation statistics, three correlations are identified as statistically significant. The correlation between mean physical hazard and overall injury scores has a Pearson correlation of .295 indicating a medium effect size. This correlation is statistically significant at the .01 level as evidenced by the significance score of .001.

The correlation between mean safety knowledge and mean impulse was also significantly correlated at the .01 level, as indicated by the significance statistic of .000. With a Pearson correlation of -.365, this would be considered a medium to large effect size. The negative sign indicates that as mean impulse score increases, an individual becomes more impulsive. This impulsivity results in the score relating to mean safety knowledge going down. The third and final significant correlation is between mean physical hazard and mean safety knowledge. With a correlation coefficient of -.179, a small effect size is present. The correlation is significant at the .05 level with a

Table 4.22

Correlations (a) for Research Question Fourteen

		Sum of Overall Injury Score	Mean Impulse Score	Years Working Const.	Mean Physical Hazard	Mean Safety Know.
Pearson Correlation	Sum of Overall Injury Score	1.000				
	Mean Impulse Score	-0.072	1.000			
	Years Working Const.	0.027	0.043	1.000		
	Mean Physical Hazard	0.295	0.091	0.031	1.000	
	Mean Safety Knowledge	-0.011	-0.365	-0.05	-0.179	1.000
Sig. (1-tailed)	Sum of Overall Injury Score	-				
	Mean Impulse Score	0.237	-			
	Years Working Const.	0.393	0.334	-		
	Mean Physical Hazard	0.001	0.182	0.381	-	
	Mean Safety Knowledge	0.457	0.000	0.311	0.036	-

[a] Selecting only cases for which Sum of English Proficiency 2 Groups = More English

significance statistic of .036. The negative sign indicates that as safety knowledge increases, the level of mean physical hazards decreases.

The model summary for research question 14, shown in Table 4.23, indicates an R of .312, a medium effect size. The adjusted r square statistic is .06 indicating that the combination of independent variables in this model can predict overall injury score 6% of the time. As evidenced in the ANOVA table (Table 4.24), the significance of the model, even with the medium effect size, is .041, which is significant at the .05 level.

Table 4.23

Model Summary for Research Question Fourteen

R Sum of English Proficiency = More English	R Square	Adjusted R Square	Std. Error of the Estimate
.312[a]	0.097	0.06	7.01135

[a] Predictors: (Constant), Mean Safety Knowledge, Years Working Const., Mean Physical Hazard, Mean Impulse Score

Table 4.24

ANOVA (b,c) Table for Research Question Fourteen

	Sum of Squares	*df*	Mean Square	*F*	Sig.
Regression	509.294	4	127.323	2.59	.041[a]
Residual	4719.261	96	49.159		
Total	5228.554	100			

[a] Predictors: (Constant), Mean Safety Knowledge, Years Working Const., Mean Physical Hazard, Mean Impulse Score
[b] Dependent Variable: Sum of Overall Injury Score
[c] Selecting only cases for which Sum of English Proficiency = More English

Table 4.25 further breaks down the coefficients and identifies mean physical hazard, with a statistical significance of .003, as the primary contributor to the overall significance of the model. No other coefficients are significant contributors on their own.

The significance of the mean physical hazard, based on the dependent variable of overall injuries, would indicate that perception of hazards around the worksite contributes to higher overall injury scores. The more apparent hazards are, the more likely someone is to be injured.

Table 4.25

Regression Coefficients (a,b) of Research Question Fourteen

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	-2.067	6.895	-	-0.300	0.765
Mean Impulse Score	-0.847	0.905	-0.098	-0.936	0.352
Years Working Const.	0.016	0.067	0.023	0.233	0.816
Mean Physical Hazard	3.370	1.091	0.305	3.090	0.003
Mean Safety Knowledge	0.071	0.806	0.009	0.088	0.930

[a] Dependent Variable: Sum of Overall Injury Score

[b] Selecting only cases for which Sum of English Proficiency = More English

Chapter 5: Discussion

Several studies have identified various predictors of work injuries among different populations (Frone, 1998). This study looked at predictors of work injuries, such as impulsivity, job tenure, physical hazards, etc., in an attempt to examine the language barrier as a possible contributor to work injuries. The review of literature demonstrated a higher than average number of accidents among Spanish speaking workers (Flory, 2001) in the construction industry. There were no studies found in the review of literature that attempted to link level of English proficiency to work injuries. As such, this study is predominantly exploratory in nature. It builds off of prior studies involving predictors, but to the knowledge of the researcher, is the first time predictors of work injuries were related to level of English proficiency in the construction industry.

Overview of Findings

The discussion will follow the order of the research questions. Beginning with the descriptive statistics, then moving into the mean comparisons, and correlations, and ending with the regression statistics. The variables used in the study by Frone (1998) will be addressed, as well as the variables created for this study.

Based on research question one, the ten most likely places for construction workers in this study to be inured, solely regarding location are displayed in Table 5.1 (following page). The ten most likely places to be injured based on type of pain (i.e., sharp, sore and heavy, or numb and tingling) are displayed in Table 5.2. This is strictly a descriptive look at the location of work injuries. There was nothing found in the literature to indicate different areas as having higher frequencies of injuries. Lower back, shoulders, foot and calf, and knee were reported as the most common areas to receive an injury. This could give a good starting point for preventative measures to reduce work injuries. Possible solutions could be changes to policies regarding personal safety equipment such as back braces or support for the lower back, or looking at employees' footwear to determine if that is partly to blame for the injuries. In either case, proactive ergonomics or personal safety equipment could be a possible solution.

Table 5.1

Rank of Injury Frequencies, Location

Rank	Location	Frequency
1	Lower Back, both Sides	128
2	Back Right Shoulder	48
3	Back Left Shoulder	42
	Back Left Foot & Calf	42
4	Back Right Foot & Calf	40
5	Front Right Knee	39
6	Back Middle Spine	38
7	Back Neck	35
8	Front Left Knee	34
9	Front Right Shoulder	23
	Back Right Hip & Buttock	23
10	Front Right Foot & Shin	22
	Back Left Hip & Buttock	22
	Back Left Knee	22

Research question two sought to identify if a difference existed between level of English proficiency and safety knowledge. The resulting Mann-Whitney U test for significance indicated that there was a significant difference in mean safety knowledge scores, based on level of English proficiency. This was a finding that was anticipated by the review of literature. When a Spearman's Rho correlation was done, the result was not significant in regards to a difference between level of English proficiency and safety knowledge. The two-tailed significance was only .073. Had the assumption of the researchers been translated into a one-tailed test for significance, the .073 would have been flagged as significant. A regression was done to identify the extent of the relationship. The resulting regression indicated an r squared of .032, with a small to medium effect size of .179. The direction of the relationship indicated that as level of English proficiency increased, so did the mean safety score.

Table 5.2

Rank of Injury Frequencies, Type of Pain

Rank	Location	Type of Pain	Frequency
1	Lower Back, both Sides	Sore, Heavy, Tiring	91
2	Back Right Shoulder	Sore, Heavy, Tiring	48
3	Back Left Shoulder	Sore, Heavy, Tiring	42
	Back Left Foot & Calf	Sore, Heavy, Tiring	42
4	Back Right Foot & Calf	Sore, Heavy, Tiring	40
5	Front Right Knee	Sore, Heavy, Tiring	39
6	Back Middle Spine	Sore, Heavy, Tiring	38
7	Lower Back, both Sides	Sharp	37
8	Back Neck	Sore, Heavy, Tiring	35
9	Front Left Knee	Sore, Heavy, Tiring	34
10	Front Right Shoulder	Sore, Heavy, Tiring	23
	Back Right Hip & Buttock	Sore, Heavy, Tiring	23

Since the two variables in research question three were approximately normally distributed, an independent samples t-test was run on to identify if there was a difference between level of English proficiency and impulsivity. The resulting t-test was not significant, indicating that there was no difference in impulsivity based on level of English proficiency. It would appear that both groups are similar in their level of impulsivity. There was no literature reviewed that identified possible differences in impulsivity based on level of English proficiency.

Research questions four and six (research question five will be discussed later in chapter 5) sought to find differences in job tenure, and work injuries based on level of English proficiency. Since at least one of each variable was skewed, the Mann-Whitney U test was used. The results indicate that there is not a significant difference between job tenure and overall injuries, based on level of English proficiency. It is interesting to note that both would have been significant at the one-tailed level with significance values of .074 for job tenure and .095 for overall injury score. The literature would have supported a one-tailed test for significance, but in the opposite direction than the one found here, with more Spanish, not more English, reporting the higher injury scores. The resulting r squared value is .028, with a small effect size of .167. This finding would indicate that there is no difference in injuries based on level of English proficiency.

Regarding the higher than average accident rates among Hispanics in construction referenced in the literature, other variables will need to be developed in an attempt to isolate the differences between English and Spanish speaking employees. One possible explanation for there being no difference between the two groups could be due to the company that was chosen to participate in this study. The company chosen has a history of excellent safety scores. This was done so that if differences did occur, it would not be as easy to explain them away by citing poor safety records, or other extraneous factors involving poor safety. Regardless, at least in this national construction company, there are no significant differences in accident rates based on an individual's level of English proficiency. Being careful not to over generalize the findings, it would appear that if companies put as much into their company's hands on safety (Weidner et al., 1998) and safety culture as this one does, there might be a positive effect in the reduction of higher accident and injury rates among the Hispanic population.

The independent samples t-test for research question five, with both variables being normally distributed, was not significant. There was no difference between mean physical hazard scores based on level of English proficiency. The mean physical hazard variable looked at perception of worksite hazards that could lead to injuries. Since there was no difference between the two groups, it would appear that both groups have similar views on physical hazards at the worksite.

Research questions seven through eleven identify whether significant correlations exist between the five independent variables used in this study (impulsivity, job tenure, safety knowledge, physical hazards, and level of English proficiency) and the dependent variable, overall injury score. Since overall injury score was not normally distributed, all correlations use the Spearman's Rho statistic instead of the more popular Pearson correlation statistic used for normally distributed variables. These research questions more closely mimic those presented by Frone (1998), as they do not differentiate on level of English proficiency, but seek only to identify if they are predictors of work injuries.

According to the .342 significance statistic for the correlation between impulsivity and overall injury score, research question seven, there is not a significant correlation between the two variables. Frone (1998) hypothesized that impulsivity would be positively related to the frequency of work injuries. In this study, that was not the case. There is no significant relationship between impulsivity and overall injuries.

Frone (1998) did not propose a hypothesis for the relationship between job tenure and injuries, research question eight. In this study, with a significance score of .109, there was not a significant correlation between these two variables. Had a one-tailed test for significance been used, in lieu of the .05 for the two-tailed test, the resulting significance statistic would have come very close to the .10 cutoff. This would have mimicked the finding in the Frone (1998) study where it was found that "job tenure was positively related to work injuries" (p. 573). This related to the literature discussed by Frone (1998) involving Iverson and Erwin's (1997) suggestion that more experienced workers would be given jobs entailing greater skill and that were also more dangerous to complete.

Research question nine identifies if there is a correlation between safety knowledge and overall injuries. With a significance statistic of .352, there is not a significant correlation between safety knowledge and overall injuries. Safety knowledge was not a variable that was directly linked by the literature to work injuries.

The results of research question ten were consistent with the study by Frone (1998), in that physical hazards were highly correlated with overall work injuries. The variables were correlated at well below the .01 significance level with a significance statistic of .004 and a correlation coefficient of .216 indicating a small to medium effect size. The resulting r square value is .0467 indicating that 4.67% of work injuries can be explained by the physical hazards of the job site.

Research question 11, identified that the correlation between level of English proficiency and work injuries, was also statistically significant. The correlation coefficient was .172, a small effect size, with a significance value of .018. The resulting r squared value was .0296, indicating that about 3% of work injuries can be predicted by an individual's level of English proficiency. It is interesting to note that in this correlation, as level of English proficiency increases, so does the overall injury number.

This is directly the opposite of the assumed relation at the start of this study. This could have occurred by the underreporting of some injuries, or it could relate to the numbers present in each of the two groups. In any event, this is an interesting finding. Correlations could also be different if the study was conducted with a construction company lacking the high level of safety involvement that the company used in this study contained.

Research questions 12 through 14 examine various regression models in relation to work injuries. Research question 12 looks at the combination impulsivity, job tenure, physical hazards, and safety knowledge have on predicting work injuries. This model does not separate the participants based on their level of English proficiency. This first model had an overall R of .251, which would be considered a small to medium effect size. With an r squared statistic of .063, this model predicts 6.3% of overall work injuries based on the variables included. The overall model had a significance statistic of .024 making it statistically significant at the .05 level. There were three significant correlations within the model; all were significant at the .01 level. The first two were relationships between mean physical hazards and both overall injury score (R = .209) and mean impulse score (R = .179). The correlation coefficients both indicate a small to medium effect size. The third significant relationship was between safety knowledge and impulsivity. With a correlation coefficient of -.296 (a medium effect size), the sign indicates that as impulsivity increases, safety knowledge decreases. It would appear that the more impulsive an individual is, the less likely they are to have a high level of safety knowledge.

Looking into the data a bit further, the majority of the predictability in this model can be explained by the correlation between physical hazards and overall work injuries.

With a significance statistic of .003, this coefficient affects the over model the most significantly. The next closest variable is impulsivity at .081, followed by job tenure at .495.

Research question 13 looks at the same set of independent variables as research question thirteen. The only difference is that the level of English proficiency is now broken out into two groups, more English and more Spanish. Research question thirteen looks only at the more Spanish group. Regarding the correlation coefficients, there are only two significant correlations in this model, both just barely making the .05 cutoff for significance. Both relate to mean physical hazards. The first is between mean physical hazards and mean impulse. As is the case with the group regression model, the more impulsive an individual is, the lower their level of safety knowledge. The correlation coefficient was .257, a small to medium effect size, and the significance statistic was .044.

The second significant correlation coefficient is between physical hazards and job tenure. The correlation coefficient is .253, indicating a small to medium effect size, and the significance statistic is .047. It is interesting that the more job tenure a member from the more Spanish group has, the higher the perceived physical hazards are. This does seem to make sense from the standpoint that the more you are exposed to dangerous thing, the more you become aware of things that are dangerous.

Although there were two significant correlations within the model, the overall model is poor in its attempt to predict work injuries based on the independent variables. The overall significance statistic for the model is .826 meaning that this model is far from statistically significant. The coefficients in isolation add to this fact by their extreme lack of significance in the model. The closest to adding statistical significance to the model is the impulse score with a significance statistic of .284, which indicates a 30% chance that the results occurred by change.

When the same model is run using the more English group in research question 14, the results are strikingly different. Here we are presented with three significant correlations, two at the .01 level. The first is the correlation between mean physical hazard and overall injuries. The correlation coefficient is .295, indicating a small to medium effect, and the significance statistic is .001. The second significant correlation is between safety knowledge and mean impulse. The correlation coefficient is -.365, a medium to large effect size, with a significance statistic of .000. The negative sign indicates that as impulsivity increases, the level of safety knowledge decreases. It appears that the more impulsive an individual is, the less likely they are to identify potential hazards.

The third and final correlation is between mean safety knowledge and mean physical hazard. This correlation has significance at the .05 level with a significance statistic of .036. The correlation coefficient indicates a small effect size with a value of -.179. The negative sign indicates that as mean safety knowledge increases, the corresponding level of physical hazards go down. It seems that as one becomes more aware in relation to safety knowledge, the perception of physical hazards is not as great. This could lead to more injuries if the apparent safety knowledge makes individuals think things are safer than they actually are. On the flip side, it makes sense that as individuals gain in safety knowledge, they are able to complete dangerous tasks safely.

The overall model has a correlation coefficient of .312, a medium effect size, with an *r* squared value of .097. This would indicate that almost 10 percent of work injuries among the more English group can be explained by this mode; this with an overall significance statistic for the model of .041, just inside of the .05 cutoff. Of additional interest is that the mean physical hazard coefficient, at .003, is the only significant coefficient in the model. This means that the majority of the statistical significance for the overall model comes solely for the effect of mean physical hazard. This supports the almost intuitive notion, supported by Howe (2000), that exposure to hazards cause injury.

Auxiliary Findings

When Spearman correlations were run on most all available variables in the study, there were several interesting correlations to note. Only correlations with significance of .05 or stronger are included in this section, as can be seen in Table 5.3. The * indicates significance at the .01 level.

Table 5.3

Other Significant Correlations of Interest

Variables	Spearman Correlation Coefficient	Significance	N
Faces of Pain & Job Tenure	0.182	0.013	187
English Proficiency & Level of School	0.575	0.000*	182
English Proficiency & Faces of Pain	0.179	0.014	187
Safety Knowledge & Level of School	0.151	0.044	180
Physical Hazard & Faces of Pain	0.197	0.008*	178
Company Safety Questions & Job Tenure	-0.166	0.024	185
Company Safety Questions & Physical Hazards	0.156	0.038	178
Overall Injuries & Faces of Pain	0.328	0.000*	184
Faces of Pain & Age	0.232	0.001*	189
Age & Physical Hazards	0.151	0.045	178
Company Safety Questions & Age	-0.211	0.004*	183

There is a strong correlation between level of English proficiency and level of schooling. With a correlation statistic of .575 (a very large effect size), it appears that the more English proficient employees are, the more likely they are to have completed a higher level of education. This was not the aim of the study, but is an interesting finding nonetheless.

Another correlation of note is one that was hoped would be present. The correlation of .328, a medium effect size with a significance statistic of .000, between the faces of pain scale and overall injuries shows that the reporting of injuries was fairly consistent. It shows that participants were consistent with the number of injuries and how those injuries impacted their overall feeling of health. This also demonstrates convergent validity by the "relatively high correlations between [one] scale and other measures that the theory suggests would be related" (Gliner & Morgan, 2000).

Other correlations resulting from analyses show several other interesting relationships. Faces of pain and job tenure were correlated at a correlation coefficient of .182, a small to medium effect size, indicating that the longer a person worked, the more likely they were to view themselves as having more pain. The correlation between English proficiency and faces of pain, correlation coefficient of .179, lends a bit more weight to the previous correlation between level of English proficiency and work injuries. In this instance, the higher the English proficiency, the more overall pain is felt. An interesting hypothesis here could be a difference between reporting of pain based on cultural differences. The level of pain could be quite similar, but one group could report less pain due to some cultural expectations or norms.

Safety knowledge is positively correlated with level of school, which agrees with the prior correlation between level of English proficiency and level of school. The more schooling an individual has, the higher the level of safety knowledge.

The prior correlation between physical hazards and overall work injuries is supported here by the correlation between physical hazards and faces of pain. Both seem to be indicators physical hazards. As with the previous correlation between physical hazards and overall injuries, the higher the faces of pain score, the greater the perception of physical hazards.

The company safety question variable, a variable developed using questions from the companies safety programs, was inversely related to job tenure. As fewer questions were answered no, indicating greater knowledge of the company safety questions, job tenure increased. This indicated that the longer a person is employed in this particular construction company, the greater their company safety knowledge. This would be an expected outcome, but is verified here. Company safety was also correlated to another variable, physical hazards. In this relationship the correlation statistic is .156 with a significance statistic of .038. Here, it appears that the more you understand the company safety questions, the more likely it is that you will perceive more hazards on the job site.

The faces of pain variable, being correlated with age, is also an interesting finding. There was not a correlation between overall injuries and age, but it seems that as age increases, so does pain as measured by the faces of pain scale. With a correlation statistic of .232, indicating a small to medium effect size, this is a fairly significant correlation.

Age was also correlated with physical hazards, which indicates that as age increases, so does an individual's perception of physical hazards on the job site. This correlation was significant at the .05 level with a significance statistic of .045, and a correlation coefficient of .151 indicating a small effect size.

Mann Whitney U statistics, displayed in Table 5.4, were run including two more points on each side of the level of English proficiency continuum. The increase on the Spanish speaking side added more individuals closer to the bilingual designation. The English-speaking group had their scores lowered two levels, again adding more individuals closer to the bilingual midpoint.

Table 5.4

Mann-Whitney U Test for Main Variables Including More Subjects

	Level of School	Years Working Const.	Faces of Pain Scale	Mean Imp. Score	Mean Safety Know.	Mean Physical Hazard	Mean of Company Safety Questions	Sum of Overall Injury Score
Mann-Whitney U	1076	3110.5	2777.5	3129	2868.5	3077	3108	2993
Asymp. Sig. (2-tailed)	0.000	0.115	0.023	0.17	0.039	0.673	0.339	0.088

The first significant difference, including more participants, is in relation to level of schooling (all means are shown in Table 5.5). The correlation was previously identified involving the positive correlation between level of English proficiency and level of school completed. This difference in means further demonstrates the finding. Additionally, this difference is significant at the .01 level with a significance statistic of .000. There is also a difference among the group means in the faces of pain scale. With a significance statistic of .023, this difference is significant at the .05 level. This finding further supports the earlier finding of the more English group indicating a higher overall injury score.

The third and final significant difference in means is found in mean safety knowledge. The more English group has the higher safety knowledge scores. With a significance statistic of .039, this difference is significant at the .05 level.

Table 5.5

Mean Ranks for Mann Whitney U Test

	Level English Proficiency	N	Mean Rank	Sum of Ranks
Level of Schooling	More Spanish	64	49.31	3156
	More English	103	105.55	10872
	Total	167		
Years Working Const.	More Spanish	69	80.08	5525.5
	More English	105	92.38	9699.5
	Total	174		
Faces of Pain Scale	More Spanish	66	75.58	4988.5
	More English	105	92.55	9717.5
	Total	171		
Mean Impulse Score	More Spanish	68	93.49	6357
	More English	105	82.8	8694
	Total	173		
Mean Safety Knowledge	More Spanish	67	76.81	5146.5
	More English	105	92.68	9731.5
	Total	172		
Mean Physical Hazard	More Spanish	61	81.44	4968
	More English	105	84.7	8893
	Total	166		
Mean of Company Safety Questions	More Spanish	65	80.82	5253
	More English	104	87.62	9112
	Total	169		
Sum of Overall Injury Score	More Spanish	68	78.51	5339
	More English	104	91.72	9539
	Total	172		

To further expound on the difference in level of schooling between the two groups, a regression was run with level of schooling and level of English proficiency as variables (see Table 5.6). The r value is .580 indicating a very large effect size. The resulting adjusted r squared value is .333, which means that 33.3% of an individual's level of schooling can be predicted by their level of English proficiency.

Table 5.6

Regression of Level of Schooling and Level of English Proficiency

R	R Square	Adjusted R Square	Std. Error of the Estimate
.580(a)	0.337	0.333	2.433

With the inclusion of two more points on each group relating to level of English proficiency, a regression model containing all relevant variables was run. The resulting model (Table 5.7), in an attempt to identify predictors of work injuries, identified an R of .155 (a small effect size) and an adjusted r squared value of 0.067 indicating that 6.7% of work injuries can be explained by the variables in the model. The resulting ANOVA table identified the F statistic as 2.132 and the significance at .025, indicating that there were significant predictors in the model.

Table 5.7

Regression of Full Model

R	R Square	Adjusted R Square	Std. Error of the Estimate
.355(a)	0.126	0.067	6.38016

a Predictors: (Constant), Mean of Company Safety Questions, Sum of Level of English Prof., Recode of Hours Worked Last Day, Mean Safety Knowledge, Faces of Pain Scale, Mean Physical Hazard, Years Working const., Mean Impulse Score, Level of Schooling, Hours Worked Last Day

Of interest in this model is that only two of the coefficients were significant (Table 5.8). First was the faces of pain scale at a .007 level of significance, and the second was mean physical hazard at .015. Most of the predictability of the model is contained in these two coefficients.

Table 5.8

Coefficients of Interest in Regression of Full Model

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Faces of Pain Scale	1.253	0.456	0.222	2.75	0.007
Mean Physical Hazard	1.857	0.755	0.198	2.459	0.015

Qualitative Findings from the Instrument

The final question of the research instrument was qualitative in nature. This was done to allow participants to voice any safety issues relating to their overall health, while working on the job, which may not have been addressed by the instrument. Twenty-seven of the 191 participants completed the qualitative question for a 14.14% response rate. Responses were grouped into categories. The 27 responses resulted in 15 categories and 29 pieces of information to place in a category. The categories, and the number of times it was mentioned is included in Table 5.9 (following page). If a response contained multiple categories, there response was counted for each category, hence the 29 pieces of information from 27 comments.

Table 5.9

Results of the Qualitative Question

Category	Number of Responses
Air quality	10
Negligence of others as a safety concern	3
Education of others regarding safety	2
Noise levels	2
Stress	2
Teamwork leading to safety	2
Overhead traffic	1
Take care of your back by proper lifting	1
Pressure from a foreman resulted in accidents	1
Possible illegal material	1
Long strenuous hours	1
Language barrier	1
Hygiene (cleanliness of bathrooms)	1
Equipment causing soreness	1
Construction is just more dangerous	1

Of the 29 pieces of information, ten, or 34.45% related directly to air quality on the job. An example of one comment is that there is a "constant battle of air particles and pollutants in work environments," and that there is "insufficient fresh air in the lower level." Three individuals cited the negligence of others as their primary safety concern. Several other categories received two responses each. Those categories were stress, noise levels, teamwork leading to safer work environments, and education for certain groups relating to safety. Appendix B provides a list of all qualitative data gathered by the instrument.

Modifications to the Instrument

In retrospect, there are several modifications to the instrument that could improve the data collection process. Although developing the instrument so as to be scanned for purposes of tabulation was effective, there were a few areas that were problematic. First, the questions relating to age, level of schooling, and hours worked, would have caused fewer problems had participants simply entered the appropriate number and not the corresponding bubbles. The researcher could then have entered those few pieces of data by hand. Second, clearer instructions might have prevented participants from filling the instrument out in crayon instead of pencil. This would have saved some time as it would not have been necessary to enter this data by hand.

In the groups observed by the researcher, there was reluctance for some monolingual individuals to ask questions. This was observed through behavior exhibited by the participant. It is the researcher's opinion that if these groups were separated, with a Spanish-speaking individual providing more specific instructions to the group that spoke only Spanish, more accurate data might have been obtained. One on one interpretation would have been too time consuming for the one half hour lunch break granted by the company to gather the data.

Lastly, some of the qualitative data related specifically to dust and air pollution. Originally, the workers primary occupation (i.e., painter, drywall, etc.) was left off of the instrument due to a human subjects concern. It would have been beneficial to know the primary occupation to know if it was an issue only affecting painters or finishers, or if the problem was more widespread. The reason for this is that there are many different construction trades working on a project the size of the one used in this study. With some care, there is no reason why this type of question could not be included in the instrument.

Conclusion

The overall findings of this research indicate that there are not significant differences between the two groups in this study, relating to work injuries, when level of English proficiency is used as a predictor variable. In fact, in this study, the more English proficient an individual was, the more likely they were to experience more injuries. This finding contradicts some areas in the literature that identify Spanish speaking individuals as having a higher accident rate than their more English speaking counterparts. It is important to note that this relates to this sample, for this national construction company. These findings could be completely different when the same instrument is applied to other construction companies.

It is also important to recognize that there could still be a difference in accident rates based on both level of English proficiency and race. More research will need to be done on this area in order generalize the findings to greater populations. Additionally, this study was done with one national construction company, with a reputation for outstanding safety ratings. Doing this study with another national construction company, with less emphasis on safety, could yield vastly different results. To the researcher's knowledge, this was the first study that tried to compare work injuries based on level of English proficiency as a predictor variable.

Areas for Further Research

Since this study was primarily exploratory in nature, there are numerous areas for further research. One is to further study the significant difference in level of schooling, based level of English proficiency, to see if there are safety areas that this might affect. It would also be interesting to further expound on the inverse relationship between impulsivity and safety knowledge. Why does safety decrease as impulsivity increases?

One large area for further research is to further examine the higher than average accident rates, cited by various authors, among Hispanic workers in the construction industry. Is there truly a difference between the groups, or is there something else accounting for the difference? This study could be replicated in various locations, with more than one company, in an attempt to isolate the reported differences in accidents. Additionally, a study that used a company without a long history of a good safety record could yield very different results than those gathered here. For one, it could show that Hispanics are injured more often than their English-speaking counterparts. This might then show that with proper focus on safety, Hispanics do not have to experience a disproportionate amount of accidents to their percentage of the workforce.

The correlation between level of English proficiency and work injuries could be further analyzed. Why, when the literature seemed to indicate that Hispanics were being injured more often, did the data identify higher accident rates among the more English proficient group? Would the study have been better served to identify race in lieu of English proficiency? How would that affect the literature that indicates that language barriers are present, and a major contributor to accidents?

As exploratory studies have a tendency to do, far more questions have been generated than answered. It is important to recognize that for this one company, when safety is taken seriously, level of English proficiency does not contribute to higher accident rates among more Spanish speaking individuals. The further research should attempt to identify if similar findings are identified in companies where safety is not a top priority.

One last area for further research would be about the work injuries themselves. For this company, location and frequency of injuries has been documented. This could be an excellent starting point for research into preventative measures to reduce the most common work injuries in general; not just among certain populations.

Implications for Practice

Some recommendations that could be given from this study begin with the descriptive tables identifying location and type of injury. This could be of benefit to an organization interested in proactive solutions to ergonomic issues on a construction site. It could be a starting point for a wellness program, targeting several common injury areas, and demonstrating how to care for your self so as to be less likely to sustain preventable injuries.

On the other side of the issue, this study indicates that literature cannot be unilaterally applied to all construction companies. As is the case with the company that participated here, the higher accident rates are in the more English proficient group. The literature would lead one to believe that anywhere there are non-English speaking individuals working in construction, their accident rates would be higher. It is entirely possible that this approach could be misdirected. The problem could lie among the more English-speaking group, and that group could be the one to benefit from additional training.

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Decision Processes, 50*, 179-211.

Allen, G. (1992). Valuing cultural diversity, industry woos a new work force. *Communication World, 91*, 14-17.

Bernal, H., Wooley, S., & Schensul, J. J. (1997). The challenge of using Likert-type scale with low literate ethnic populations. *Nursing Research, 46*, 179-181.

Cattan, P. (1993). The diversity of Hispanics in the U. S. work force. *Monthly Labor Review, 116*, 3-15.

Cattan, P. (1988). The growing presence of Hispanics in the work force. *Monthly Labor Review, 111*, 9-14.

Clarke, S. G. (1999). Perceptions of organizational safety: implications for the development of safety culture. *Journal of Organizational Behavior*, 20, 185-98.

Clarke, S. G. (2000). Safety culture: underspecified and overrated. *International Journal of Management Reviews, 2*, 65-90.

Clarke, S. G. (2003). The contemporary workforce: Implications for organizational safety culture. *Personnel Review, 32*, 40-57.

Clegg, W. H. (1987). Management training evaluation: an update. *Training and Development, 41*, 65-71.

Cohen, A. (1998). A multidimensional evaluation of fire fighter training for hazardous materials response: first results from the IAFF program. *American Journal of Industrial Medicine, 34*, 331-41.

Cole, B.L., & Brown, M. P. (1996). Action on worksite health and safety problems: a follow-up survey of workers participating in a hazardous waste worker training program. *American Journal of Industrial Medicine, 30*, 730-43.

Cooper, D. (February 2001). Treating Safety as a Value. *Professional Safety, 46*, 17-21.

Cox, S., & Cox, T. (1991). The structure of employee attitudes to safety: a European example. *Work and Stress*, *5*, 93-106.

Dake, K. (1992). Myths of nature: culture and the social construction of risk. *Journal of Social Issues*, *48*, 21-37.

De Lollis, B. (2000, August 19). Increase in deaths prompts OSHA changes. Miami Herald. Retrieved October 24, 2001, from http://herald.com/herald/content/docs /business/035644.htm

Dierks, W. (2000). News release for region 4. U. S. Department of Labor, Office of Public Affairs. Retrieved November 28, 2001, from http://www.osha.gov/media/ oshnews/oct00/reg4-20001025.html

Donald, I., & Canter, D. (1994). Employee attitudes and safety in the chemical industry. *Journal of Loss Prevention in the Process Industries*, *7*, 203-208.

Faucett, J., Meyers, J., Tejada, D., Janowitz, I., Miles, J., & Kabashima, J. (2001). An instrument to measure musculoskeletal symptoms among immigrant Hispanic farmworkers: Validation in the nursery industry. *Journal of Agricultural Safety and Health*, *7*, 185-198.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research.* Reading, MA: Addison-Wesley.

Flory, M. (2001). Solving the Language Barrier [Electronic version]. Occupational Health and Safety, 1, 37-38, from http://newfirstsearch.oclc.org/WebZ/FSPage? pagename=ftascii:pagetype=print:entityprint...

Frone, M. R. (1998). Predictors of work injuries among employed adolescents. *Journal of Applied Psychology*, *83*, 565-576.

Fullerton, H. N. Jr. (1993, November). Another look at the Labor force. *Monthly Labor Review*, 31-40.

Fullerton, H. N. Jr. (1999, November). Labor force projections to 2008: steady growth and changing composition. *Monthly Labor Review*, 19-32.

Garrison, T. (1998, July 31). 31 construction workers die on Metroplex projects. Dallas Business Journal. Retrieved October 24, 2001 from http://dallas.bcentral.com /dallas/stories/1998/08/03/story2.html

Garza, J. (1988). Analyses of safety indicators in construction. *Journal of Construction Engineering and Management*, *124*, 312-314.

Geller, E. S. (1998). *Practical Behavior-Based Safety, Regulatory Compliance.* Neeah, WI: J.J. Keller & Associates.

Glendinning, M. P. (February 2001). Employee Safety Incentives: A Best Practice Survey of Human Resource Practitioners. *Professional Safety, 46*, 22-24.

Gliner, J. A. & Morgan, G. A, (2000). *Research Methods in Applied Settings: An Integrated Approach to Design and Analysis.* Mahwaw, NJ: Lawrence Erlbaum Associates, Publishers.

Harrell, W. A. (1990). Perceived risk of occupational injury: Control over pace of work and blue-collar versus white-collar work. *Perceptual and Motor Skills, 70*, 1351-1359.

Harvey, J., Bolam, H., Gregory, D., & Erdos, G. (2001). The effectiveness of training to change safety culture and attitudes within a highly regulated environment. *Personnel Review, 30*, 615-636.

Henshaw, J. L. (2001, September 25). Speech to the National Safety Congress. Retrieved November 28, 2001 from http://www.osha-slc.gov/OshDoc/Speechdata /SP20010925.html

Hinze, J. (1988). Safety on large building constructions projects. *Journal of Construction Engineering and Management, 114*, 286-293.

Hodne C. J., Thu K., Donham K. J., Watson D., & Roy N. (1999). Development of the farm safety and health beliefs scale. *Journal of Agriculture and Health, 5*, 395-406.

Holcum, M. L., Lehman, W. E. K., & Simpson, D. D. (1993). Employee accidents: influences of personal characteristics, job characteristics, and substance use in jobs differing in accident potential. *Journal of Safety Research, 24*, 205-211.

Holmes, N. (1999). An exploratory study of meanings of risk control for long term and acute effect occupational health and safety risk in small business construction firms. *Journal of Safety Research, 30*, 61-71.

Howe, J. (2000). *Safety Culture and Effective Safety Management, A Union Perspective on Behavior-Based Safety.* Chicago, IL: NSC Press 1999.

Hubbard, R., & Williams, R. (2000, October 29). Hispanic workers feel bias. *The Birmingham News*. Retrieved October 24, 2001 from http://www.al.com/news/ birmingham/Oct2000/29-e197119b.html

Hull, G. (1993). Hearing other voices: A critical assessment of popular views on literacy and work. *Harvard Educational Review, 63*, 20-49.

Iverson, R. D., & Erwin, J. J. (1997). Predicting occupational injury: The role of affectivity. *Journal of Occupational and Organizational Psychology, 70*, 113-128.

Jaselskis, E. (1996). Strategies for achieving excellence in construction safety performance. *Journal of Construction Engineering and Management, 122*, 61-70.

Jex, S. M., & Beehr, P. J. (1997). Emerging theoretical and methodological issues in the study of work related stress. *Research in Personnel and Human Resource Management, 9*, 311-365.

Kurtz, J.R., Robins, T.G., & Schork, M.A. (1997). An evaluation of peer and professional trainers in a union-based occupational health and safety training program. *Journal of Occupational and Environmental Medicine, 39*, 661-671.

Lange, J. W. (2002). Methodological concerns for non-Hispanic investigators conducting research with Hispanic Americans. *Research in Nursing and Health, 25*, 411-419.

Lawrence, T. W., & Flanders, M. E. (2000). *Safety Culture and Effective Safety Management, Incentives for Safety*. Chicago, IL: NSC Press 1999.

Lee, T. R. (1993). Seeking a safety culture. *Atom, 429*, 20-23.

Lee, T. R. (1994). *Employee attitudes: The quintessence of safety culture*. Paper presented at the 3rd European seminar, Human Factors in Offshore Safety: Their Importance in Safety Case Implementation, Aberdeen.

Lee, T. (1998). Assessment of safety culture at a nuclear reprocessing plant. *Work and Stress, 12*, 217-237.

Leiter, J. C., Hossfeld, L., & Tomaskovitcc-Devey, D. T. (2001). We Like Latino Labor: North Carolina Personnel Managers Reflect upon the Growth of Latino Employment. Southern Sociological Society. Abstract retrieved September 25, 2001, from http://www.csa2.com/htbin/ids52/procskel.cgi

Lin, J., & Mills, A. (2001). Measuring the occupational health and safety performance of construction companies in Australia. *Facilities, 19*, 131-138.

Lorriman, J., & Kenjo, T. (1994). *Japan's Winning Margin's. Management Training, and Education*. Oxford: Oxford University Press.

Macdonald, S. (1995). The role of drugs in workplace injuries: Is drug testing appropriate? *Journal of Drug Issues, 25*, 703-722.

Marín, G., & Marín, V. M. (1991). *Research with Hispanic Populations.* Newbury Park, CA: Sage.

Martel, J. L., & Kelter, L. A. (2000, February). The job market remains strong in 1999. *Monthly Labor Review*, 3-23.

Martel, J. L., & Kelter, L. A. (2001, February). The job market in 2000: slowing down as the year ended. *Monthly Labor Review*, 3-30.

McGorry, S. Y. (1999). An investigation of expectations and perceptions of health-care services with a Latino population. *International Journal of Healthcare Quality Assurance*, *12*, 190-198.

McGroarty, M., & Scott, S. (1993). Workplace ESL Instruction: Varieties and Constraints (Report No. EDO-LE-93-07). Washington, DC: National Clearinghouse for ESL Literacy Education. (ERIC Document Reproduction Service No. ED367190)

Mearns, K.J., & Flin, R. (1999). Assessing the state of organizational safety: culture or climate. *Current Psychology*, 18, 5-17.

Morgan, G. A., Griego, O. V., & Gloeckner, G. W. (2001). *SPSS for Windows.* Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Miozza, M. L., & Wyld, D. C. (2002). The Carrot or the Soft Stick?: The Perspective of American Safety Professionals on Behavior and Incentive-Based Protection Programs. *Management Research News*, *25*, 23-41.

Myers, D., Silverstein, B., & Nelson, N. A. (2002). Predictors of shoulder and back injuries in nursing home workers: A prospective study. *American Journal of Industrial Medicine*, *41*, 466-476.

Nelson, M. (1977). Conversational Spanish for Industrial Use. Community College Frontiers. Abstract retrieved October 24, 2001 from http://www.csa3.com/htbin/ids52/procskel.cgi

Nishgaki, S. (1994). Humanware, human error and Hiyari-hat: A template of unsafe symptoms. *Journal of Construction Engineering and Management*, *120*, 421-441.

Nixon, J. C., & Dawson, G. A. (2002). Reason for cross cultural communication training. *Corporate Communication: An International Journal*, 7, 184-191.

Occupational Health and Safety Administration (2003). Retrieved 10/31/03 from http://www.osha.gov/recordkeeping/OSHArecordkeepingforms.pdf

Occupational Safety and Health Administration and US Department of Labor (2002) Retrieved from www.osha/recordkeeping/RKside-byside.html

Pidgeon, N. F. (1991). Safety culture and risk management in organizations. *Journal of Cross-Cultural Psychology*, *22*, 129-40.

Prais, S.J. (1995). *Productivity, Education, and Training. An International Perspective*, Cambridge: Cambridge University Press.

Probst, T. M., & Brubaker, T. L. (2001). The effects of job insecurity on employee safety outcomes: Cross-sectional and longitudinal explorations. *Journal of Occupational Health Psychology*, *6*, 139-159

Rees, J. I., & Rees, C. J. (1996). Lost for words...and losing business. *Industrial and Commercial Training*, *28*, 8-13.

Richardson, S., & Reyes, R. (1995). Fatal Work Injuries in Construction in Texas, 1991-93. Retrieved December 1, 2001 from http://stats.bls.gov/iif/oshwc/cfar0012.pdf

Sacks, E. (August 2000). Don't let incentives interfere with reporting. *Industrial Safety and Hygiene News*, *34*, p.22.

Sauer, B. A. (1996). Communicating risk in a cross-cultural context ± a cross-cultural comparison of rhetorical and social understandings in US and British mine safety training programs. *Journal of Business and Technical Communication*, *10*, 306-329.

Savery, L. K., & Wooden, M. (1994). The relative influence of life events and hassles on work related injuries: Some Australian evidence. *Human Relations*, *47*, 283-305.

Simon, S. J., Grover, V., Teng, J.T.C., & Whitcomb, K. (1996). The relationship of information system training methods and cognitive ability to end-user satisfaction, comprehension, and, skill transfer: a longitudinal field study. *Information Systems Research*, *7*, 466-490.

Simonet, S., & Wilde, G. J. G. (1997). Risk: perception, acceptance and homeostasis. *Applied Psychology: An International Review*, *46*, 235-252.

U. S. Department of Labor, Bureau of Labor Statistics (1999). Available from the Bureau of Labor Statistics Web Site, http://stats.bls.gov/opub/ooq/1999/ winter/art06.pdf

U.S. Department of Labor, Bureau of Labor Statistics. (1996). Monthly Labor Review Index 1991-1995. Available from the Bureau of Labor Statistics Web Site, http://stats.bls.gov/opub/mlr/ind9195.pdf

U.S. Department of Labor, Occupational Health and Safety Administration (1990). Analyses of Construction Fatalities – The OSHA database 1985-1989, 1990 [Data File. Available from the Occupational Health and Safety Web Site, http://www. osha-slc.gov/Publications/Construction_Fatalities/Confat.pdf

Vásquez. B. (1999, January). Breaking the language barrier. The Denver Business Journal. Retrieved October 24, 2001 from http://denver.bcentral.com/denver/stories/1999/01/25/smallb3.html

Veazie, M. A. Landen, D. D., Bender, T. R., & Amandus, H. E. (1994). Epidemiological research on the etiology of injuries at work. *Annual Review of Public Health, 15*, 203-221.

Veneri, C. M. (1999, March). Can occupational labor shortages be identified using available data? *Monthly Labor Review*, 15-21.

Vlek, C. A. J. (1995). Understanding, accepting and controlling risks- a multistage framework for risk communication. *European Review of Applied Psychology*, *45*, 49-56.

Weidner, B. L., Gotsch, A. R., Delnevo, C. D., Newman, J.B., & McDonald, B. (1998). Worker health and safety training: assessing impact among responders. *American Journal of Industrial Medicine*, *33*, 241-246.

Welch, L. S., & Hunting, K. (2003). Injury surveillance in construction: What is an injury anyway? *American Journal of Industrial Medicine*, *44*, 191-196.

Windau, J., (1997, Spring). Occupational Fatalities Among the Immigrant Population. *Compensation and Working Conditions*, 40-25.

APPENDICES

Appendix A: Qualitative Data

186. I would like them to investigate the air that is at the job because when one is close to the focus (center), one sees a lot of dust pass, and that is what one is breathing,
174. Stress is very high at or in the construction work industry. Some supervisors do not make the workplace very comforting. This is a place where men and women spend two thirds of their lives.
173. Working on stilts often make the legs sore.
167. The atmosphere is full of dust and noise.
156. Each employee should receive the filters that contain the elements when working and one could avoid many of the respiratory illnesses which would be good.
155. Too much dust in the air.
150. Sometimes the bathroom is really dirty and I think that can cause an infection or something, especially because I am a woman.
149. Everybody has to work together to keep each other safe.
131. Negligence of others is often a danger to my health.
127. Stress.
121. Constant battle of air particles and pollutants in work environments. Insufficient fresh air in lower level. Not just CO monitoring, particulate and element testing.
119. Very long, strenuous hours.
118. Being aware of others who either have no knowledge of safety hazards; do not care for the safety of others (which is mostly the case); and/or people who are just ignorant of the actual harm things (machinery, equipment) can cause to someone/something. That is what scares me the most about this industry and its safety hazards.
106. Only follow the rules and respect them in working and if not, study the videos and safety videos etc., etc.
97. Loud noises too often. Airborne particles or vapors too often.
94. There is just a certain amount of exposure to unhealthy situations in construction that don't exist in office stores etc.
87. Speak English for a safe project. Poor ventilation during airless paint spraying.
84. Poor ventilation when painting in area.
82. Possibly have people who have been here for a long time go through the safety training again.
80. Dust, the air needs to be cleaner.
78. We do our best to stay safe. Safety pays and is of top importance. It takes every one on the job to make it work.
74. Mono-coxt fire retardant is illegal in California because it is believed to be cancer causing. Why is it in use in Colorado? Does the altitude make it less carcinogenic?
46. Sometimes the foreman pressure us and the want us to do things quickly. This has been the cause of accidents in the workplace, some big and some small.
41. When there is insulation, or we paint the walls or the roof, etc., I have seen our companions not use their protection, and we work beside or underneath them.
30. Take care of your back when you are young. Use proper lifting procedures.
18. Tight jobsite. Much overhead (crane) traffic.
14. When we polish or file some materials, the dust causes us harm, paints, irons, laminates, acids, that affect the respiratory pathways.

Appendix B: Human Subjects Approval Process

Original Application

Objectives

1. Objectives of proposed research and background. (Will be used in assessing the risk/benefit ratio for participants. The hypotheses to be tested may be listed.)

   The objective of this study is to identify if level of English proficiency among construction employees has an effect on work injuries based on several predictor variables.

Human Participants description

2. Source of participant population

   National Construction Company

3. Number of participants (for example, number of surveys to be distributed)

   Approximately 200 employees

4. Characteristics of participants (such as age, gender, student, disease conditions, behavioral abnormalities; affiliations or memberships). Why are these appropriate for this study? If excluding a category, such as minors, explain why.

   Participants will be between 18-65 years of age, gender could be male or female; minors are not an issue as construction workers are generally 18 and over. There are no known affiliations among the construction workers participating in this study. Participants could be of any race.

5. Recruitment procedures

   An operations manager of a National Construction Company will be contacted. The purpose of the study will be explained to that individual and they will determine if the company will allow the researcher access to their employees. Once permission is granted from the company, a series of lunch breaks, where lunch will be provided as participants complete the survey, will be used to collect data. Participation is voluntary and employees will be notified in a meeting that the opportunity to participate in the study is available during lunch of the day(s) in question.

6. Recruiting materials (attach advertisements, posters, letters, scripts)

   Other than the phone conversations, no recruitment materials will be used.

7. Criteria for excluding participants involuntarily (such as "failed to keep food diary as required")

   No exclusion of participants will occur on an involuntary basis.

8. Rationale for using "at-risk" populations (e.g., minors, pregnant women, prisoners)

   N/A

9. Original letters of HRC agreement/approval from organization where participants sought (not concept support letters)

N/A

10. Other matters pertinent to the human participants

N/A

Procedures to be followed with participants (Methodology)

11. Specify location of study

Construction sites where employees of the participating National Construction Company are working.

12. List variables to be studied (what are you measuring or examining)

5 macro categories will be studied. Those categories are: demographics, impulsivity, physical hazards, job tenure, and injuries. Level of English proficiency will be used to determine if differences exist as English proficiency relates to work injuries.

13. Describe method of data collection (attach copies of surveys, instruments, etc. If using a copyrighted instrument, document authorization of use.)

Data collection will consist of Likert surveys, a faces of pain scale, body diagram, job tenure, and general demographic information. The instrument is adapted from two studies, one by Frone (1998) and the other from Faucett (2001).

14. Describe activities involving participants, including frequency and duration of each activity (this could be an experimental stimulus, a survey, what questions would be asked in an interview, for example) Diagramming helps.

Frequency of contact will be a one time visit that will take about 30 minutes to complete.

15. Describe equipment used with subjects, if any

An interpreter will be present to assist with potential literacy problems. They will read the instrument to the participant in Spanish, or English, as needed. For the general instructions, a power point presentation may be used to demonstrate the proper way to fill out the various parts of the instrument.

16. Specify what factors will lead to stopping procedures causing physical or emotional stress

N/A

17. Describe biological samples to be taken, method, and qualifications of individuals taking samples

N/A

18. Provide de-briefing method and materials for participants (required for concealed or deceptive research, desirable for other research)

N/A

19. Other aspects of the procedures
N/A

Risks to participants

20. Describe potential risks and assess the likelihood, severity, duration, and effects of each. (Use "no known risks" if none are anticipated.) **N/A is not an acceptable response for this question.** Common risks include:

a. physical injury **No known risks**
b. psychological trauma or stress **No known risks**
c. social/economic harm **No known risks**
d. legal risk **No known risks**
e. loss of confidentiality **No known risks**

21. Describe methods for minimizing risks. For example, document how potential psychological distress will be addressed, by whom, and with what credentials (provide letter of agreement to serve as a counselor)
No known risks

22. Describe other methods, if any, that were considered alternatively and why they will not be used
No known risks

23. Other matters relative to risk to participants
No known risks

Benefits to participants

24. Describe the direct benefits to these participants because of their participation. **N/A is not an acceptable response for this question.**
A possible direct benefit might be future training, by the participating construction company, to reduce the likelihood of work injuries based on the variables used in the study.

25. Describe the benefits accruing to the class of participants these individuals represent
Training for the Hispanic population in the construction industry could improve as a result of this study. Among all participants, location of and frequency of injuries could be used by the company to provide additional training, or other means of prevention (i.e., protective equipment).

26. Describe the benefits accruing to society-at-large or other
Safer working conditions could be the result for the participating construction company.

27. Other aspects of benefits to participants
N/A

Consent procedures

28. Describe how potential participants will be informed about the project activities

Participants will be notified in a meeting that the opportunity to participate in this study exists on the specified day(s).

29. Attach the consent form (*use reading level and terminology understandable to participants*) or cover letter, script, or other substitution for a consent form. Check 45 CFR 46.117(c) for criteria for waiver of documentation of consent, and 45 CFR 46.116(d) for waiver of consent entirely. If you employ these, provide complete justification of how this project meets the criteria.

See attached cover letter.

30. Other aspects of the consent process

Consent from the company owner will be obtained prior to the job site visit.

Confidentiality

31. Describe the method(s) used to protect the identity of individual participants. If a linked list is used, when will it be destroyed? Provide a sample of the code.

Names will not be places on the survey instrument, and there will not be any link between the instrument and the participant. Completed surveys will be placed in an envelope and sealed by the participant before returning them to the researcher.

32. Describe plans for maintaining data after study is complete. Faculty should keep a copy for 3 years following the conclusion of the project, so the data are auditable. Who retains copies, stored where/how, how is confidentiality maintained, for how long.

Data will be kept by the principle investigator for a period of three years. They will be stored in a secure place. Since there is no identifiable information on the survey, confidentiality is maintained.

33. Describe how federal requirements will be met for consent forms to be retained for 3 years following the conclusion of the project. Typically this entails the faculty member storing the documents in locked storage.

The consent forms will be kept in a secure place by the principle investigator for the same three year period.

34. If audio- or video-taping, specify tape storage, use, and when and how disposition of the tapes will take place

N/A

35. Other aspects of confidentiality

N/A

First response from human subjects committee

From: Meldrem,Janell
Sent: Tuesday, April 27, 2004 10:55 AM
To: Gloeckner,Gene; cwmccon@lamar.colostate.edu
Subject: human research, Gloeckner, Predictors of Work Injuries: A Quantitative Exploration of Level of English Proficiency as a Predictor of Work Injuries in the Construction Industry

HUMAN RESEARCH COMMITTEE DETERMINATION NOTICE

Protocol title Predictors of Work Injuries: A Quantitative Exploration of Level of English Proficiency as a Predictor of Work Injuries in the Construction Industry
PI Gene Gloeckner, School of Education via e-mail
Co-PI C. William McConnell, School of Education via e-mail
Review date April 22, 2004
Notification date April 27, 2004
Type of review

Review of the information you provided resulted in the following determination.

1. Are the lunch meeting locations separate from the usual lunch areas? Will the people be told that they can leave at any time, even though they have had their lunch provided for the survey takers?

2. The proposal mentions about 200 participants will be surveyed and the H-100 indicates that a maximum of 300 will be surveyed. How many surveys will be distributed? Approximately how many people are available to survey from the company?

3. Generally when the research is conducted face-to-face, obtaining signed consent is possible and is the recommended form of consent. Justification to use a cover letter and not obtain signed consent would need to be addressed. Please explain how this project meets the criteria in §__117(c)(2): 1) That the research presents no more than minimal risk of harm to participants and 2) involves no procedures for which written consent is normally required outside of the research context.

> If the cover letter to obtain consent is approved, it would need to be given to the participants on CSU letterhead.

4. The H-100 indicates that there are rarely workers who are less than 18. If there are minors in the participant pool, parental permission would need to be addressed. If there aren't minors who work at this company, the operations manager can send me an email stating such. If there are minors who may wish to participate, parental permission can either be obtained or can be waived if justified.

A) If obtaining parental permission, an appropriate signature block could be added to the signed consent form. Sample text is listed on the model consent form that is at the end of the H-100 application.

B) If asking to waive parental permission, the four criteria in §__116(d) would need to be met: (1) The research involves no more than minimal risk to the participants; (2) The waiver or alteration will not adversely affect the rights and welfare of the participants; (3) The research could not practicably be carried out without the waiver or alteration; and (4) Whenever appropriate, the participants will be provided with additional pertinent information after participation.

Please address how this will be handled.

Your response should be in the form of a memo and any revised attachments, labeled with the PI name and project title. Please ***do not resubmit the H-100***. You can send your responses and documents via mail or e-mail with the attachments in Word or PDF. Your response to this memo will be routed to a reviewer, typically within a day after it is received unless the Committee must re-review it. Your prompt response is important. Research participants may **not** be recruited until the protocol has been approved.

If you have questions, please address them to the HRC, care of Janell Meldrem, Administrator to the HRC, at 1-1655 or janell.meldrem@colostate.edu.

Access our web page at http://www.research.colostate.edu/rcoweb/ for current information and application forms for human research. **An extensive HRC manual has been posted to the Human Research web page.**

Animal Care and Use · Drug Review · Human Research · Institutional Biosafety · Misconduct in Science · Radiation Safety

410 University Services Center

http://www.research.colostate.edu/rcoweb/

Response to human subjects concerns

From: Gloeckner,Gene
Sent: Thursday, April 29, 2004 9:25 AM
To: Meldrem,Janell
Subject: RE: human research, Gloeckner, Predictors of Work Injuries: A Quantitative Exploration of Level of English Proficiency as a Predictor of Work Injuries in the Construction Industry

1a. There are no lunch rooms, as this is a construction site. Workers typically either go out to lunch or they eat at some location on the job site. The project will take place in a designated area, and all employees will have received an announcement about what is taking place at that location.
1b. The cover letter states that, "If for any reason you feel that you do not want to participate further, simply place your form back in the envelope and you are free to leave." They can leave right after they eat if that is what they wanted to do.

2a. The H-100 should have stated that approximately 200 participants will be surveyed.
2b. The sample is one of convenience. If we reach 200, we will stop surveying employees.
2c. There are approximately 600 employees at this jobsite.

3. Since the cover letter indicates that anyone is free to leave at any time, it was felt that the cover letter was sufficient in that filling out a survey indicates consent. Additionally, we are dealing with a limited time frame in which to conduct the research, about ½ an hour. If we must also take time to do a formal consent form, we may not be able to obtain completed instruments.

> 3-1) The research presents no more than minimal risk of harm to participants. Participation is anonymous (no identifying name or numbers will be used), and their job status will not be affected as a result of this study.
>
> 3-2) This study contains no procedures for which written consent is normally required outside of the research context. Other groups such as OSHA and NIOSH could ask the same types of questions in a questionnaire format without written approval.

4. (See memo from Operations Manager). Hensel Phelps does not put minors under the age of 18 in situations of risk, therefore, their presence as an employee would not be expected at this jobsite.

Final approval letter

From: Meldrem,Janell
Sent: Friday, April 30, 2004 8:35 AM
To: Gloeckner,Gene; cwmccon@lamar.colostate.edu
Subject: human research, Gloeckner, Predictors of Work Injuries: A Quantitative Exploration of Level of English Proficiency as a Predictor of Work Injuries in the Construction Industry

Your project, "Predictors of Work Injuries: A Quantitative Exploration of Level of English Proficiency as a Predictor of Work Injuries in the Construction Industry" has been approved on April 29, 2004 with the condition that the approved cover letter is used and is give to the participants on CSU letterhead. Signed documented consent is waived under §__.117(c)(2). Approval is for 200 participants.

The approval letter will be sent to you in the next several days.

Good luck with your project Will.

Janell

Appendix C: Cover Letter

Colorado State University
Knowledge to Go Places

School of Education
1588 Campus Delivery
Fort Collins, Colorado 80523-1588

Estimado Empleado:
Dear Employee:

Gracias por ayudarnos completar este proyecto de investigación. El proyecto investiga predicciones de lesiones del trabajo en construcción. También, este proyecto intenta a identificar si una barrera de lenguaje esta presente en la industria de construcción y si esta barrera tiene un efecto en la seguridad del lugar de trabajo.
Thank you for helping us to complete this research project. The project looks at the predictors of work injuries in the construction industry. This project will also attempt to identify if a language barrier may be present in the construction industry, and if that language barrier has an effect on workplace safety.

Su participación en este proyecto es completamente **voluntario**. Si por cualquier razón se siente que no quiere seguir participando, solo tiene que poner sus papeles otra vez en el sobre y tiene la libertad de salir.
*Your participation in this project is completely **voluntary**. If for any reason you feel that you do not want to participate further, simply place your form back in the envelope and you are free to leave.*

Para asegurar que todas las respuestas son confidenciales, el examen debe ser completado **anónimamente** (no se puede poner su nombre ni números que pueden identificarse en el examen). Toda la información recibida de este examen quedará anónima. Los resultados serán presentados sin enlaces que peuden identificar a los individuos. El examen durará entre 10 y 20 minutos para completarse. No hay riesgos identificados que acompañan la participación en este proyecto.
*To make sure that all answers are kept confidential, the survey should be completed **anonymously** (do not put your name or any identifying number on the survey). All information gathered from this survey will remain anonymous. Results will be presented without any identifying link to an individual. The questionnaire will take between 10 and 20 minutes to complete. There are no known risks for participating in this project.*

Esperamos que este proyecto ayudará en identificar predicciones de lesiones de trabajo y en determinar si una barrera de lenguaje puede estar presente. Preguntas acerca de los derechos de los participantes pueden ser dirigidas a Celia Walker a (970) 491-1536.
We hope that this project will help identify predictors of work injuries and determine if a language barrier may be present. Questions about participants' rights may be directed to Celia Walker at (970) 491-1563.

Gracias por su participación en este examen.
Thank you for your participation in this study.

Sinceramente,
Sincerely,

Will McConnell
School of Education
Colorado State University
Fort Collins, CO 80523
(970) 491-1963
cwmccon@lamar.colostate.edu

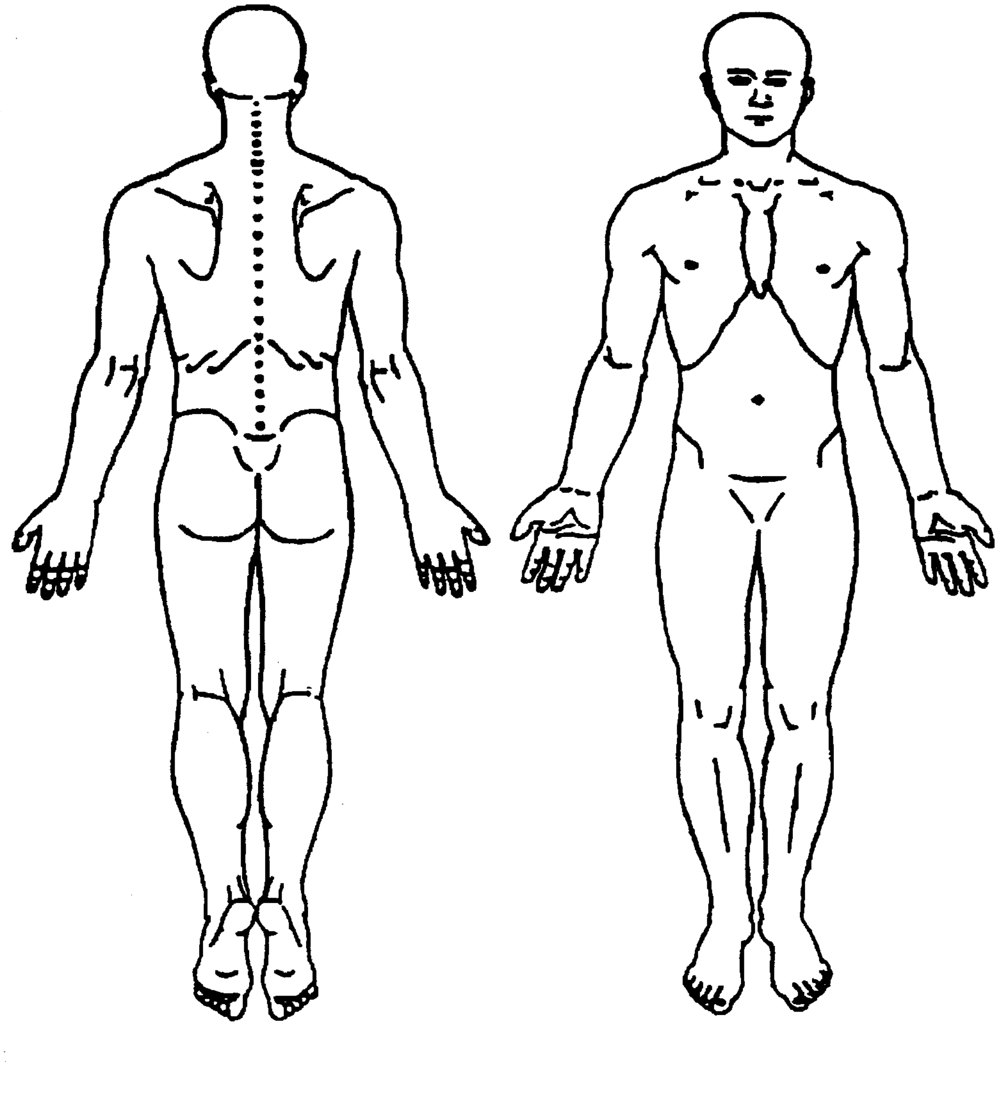
Gene Gloeckner, Ph.D.
Associate Professor, School of Education
Colorado State University
Fort Collins, CO 80523
(970) 491-7661
ggloeckner@cahs.colostate.edu

Appendix D: Research Instrument

Por favor, use el dibujo del cuerpo para marcar los lugares donde ha tenido dolores agudos o persistentes, molestias en los músculos, huesos o nervios en los últimos 30 días.

Please use the body drawing to outline the places you have had aches and pains or discomfort in your muscles, bones, or nerves in the past 30 days.

1. Con el color azul, marque los lugares donde el dolor ha sido fuerte, pesado, o cansador.
   With the color blue, outline the places where the pain has been sore, heavy, or tiring.
2. Con el color rojo, marque los lugares donde el dolor ha sido agudo.
   With the color red, outline the places where the pain has been sharp.
3. Con el color amarillo, marque los lugares donde ha sentido dolor hormiguero o adormecido.
   With the color yellow, outline the places where you have felt numbness or tingling.



Sección A. Preguntas personales:
Section A. ***Personal questions:***

1. ¿Cuántos años tiene?
   How old are you?

   ◯◯ 0 1 2 3 4 5 6 7 8 9

2. ¿Es usted hombre o mujer?
   Are you male or female?
   - ◯ Hombre/*Male*
   - ◯ Mujer/*Female*

3. ¿Que estudios tiene?
   How many years of school did you complete?

   ◯◯ 0 1 2 3 4 5 6 7 8 9

   - 1-6 La primaria/*Grade School*
   - 7-9 La secundaria/*Jr. High School*
   - 10-12 La preparatoria/*High School*
   - 13-16 La Universidad/*College*

Llenar un circulo por cada pregunta.
Fill in one circle per question.

4a. ¿Qué idioma(s) lee y habla usted?
What language do you read and speak?
- ◯ Sólo Español
- ◯ *Only Spanish*
- ◯ Mejor Español que Inglés
- ◯ *Spanish better than English*
- ◯ Ambos por igual
- ◯ *Both equally*
- ◯ Mejor Inglés que Español
- ◯ *English better than Spanish*
- ◯ Sólo Inglés
- ◯ *Only English*

4b. ¿Qué idioma(s) se hablan en su casa?
What language do you speak at home?
- ◯ Sólo Español
- ◯ *Only Spanish*
- ◯ Más Español que Inglés
- ◯ *More Spanish than English*
- ◯ Ambos por igual
- ◯ *Both equally*
- ◯ Más Inglés que Español
- ◯ *More English than Spanish*
- ◯ Sólo Inglés
- ◯ *Only English*

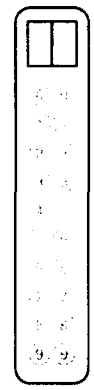
4c. ¿En qué idioma(s) piensa?
In which language do you think?
- ◯ Sólo Español
- ◯ *Only Spanish*
- ◯ Más Español que Inglés
- ◯ *More Spanish than English*
- ◯ Ambos por igual
- ◯ *Both equally*
- ◯ Más Inglés que Español
- ◯ *More English than Spanish*
- ◯ Sólo Inglés
- ◯ *Only English*

4d. ¿En qué idioma(s) habla con sus amigos?
What language do you speak with your friends?
- ◯ Sólo Español
- ◯ *Only Spanish*
- ◯ Más Español que Inglés
- ◯ *More Spanish than English*
- ◯ Ambos por igual
- ◯ *Both equally*
- ◯ Más Inglés que Español
- ◯ *More English than Spanish*
- ◯ Sólo Inglés
- ◯ *Only English*

Sección B. Preguntas acerca de su trabajo:
Section B. *Questions about your work:*

5. ¿Cuantos años tiene trabajando en construcción?
How many years have you worked in construction?

6. ¿En total, cuántos horas elaboró la semana pasada?
How many total hours did you work last week?



7. ¿Cuántos horas elaboró ayer, o en su último día de labor?
How any hours did you work yesterday, or on your last day of work?

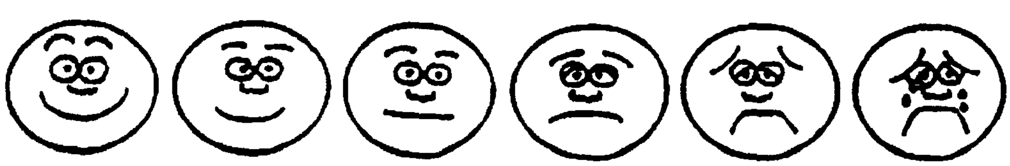
○ 1 - 2 ○ 3 - 4 ○ 5 - 6 ○ 7 - 8 ○ 9 - 10 ○ 11 - 12 ○ 12+

Sección C. Escala de caras que indiquen dolor.
Section C. *Faces of pain scale.*

Cada cara representa un estado de ánimo diferente. La cara feliz (0) representa una persona contenta porque no tiene dolor, y la cara triste (5) representa una persona que siente muchísimo dolor. La cara 1 tiene poco dolor. La cara 2 tiene un poquito más dolor. La cara 3 tiene más dolor todavía. La cara 4 tiene mucho dolor. La cara 5 tiene tanto dolor que le hace llorar. Cuál de estas caras representa mejor el dolor que siente usted?

Each face represents a different state of well being. The happy face (0) represents a happy person because they have no pain, and the sad face (5) represents a person that feels tons of pain. Face number 1 has a little pain. Face number 2 has a little more pain. Face number 3 has even more pain. Face number 4 has a lot of pain. Face number 5 has so much pain that it makes you cry. Which of these faces best represents the pain that you feel?

8. ¿Durante los últimos 30 días, cuál cara representa la gravedad de su dolor? Llene el circulo apropiado.
During the past 30 days, which face represents the severity of your pain? Fill in the appropriate circle.



0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○

Sección D.
Section D.

IMPULSIVIDAD (ser impulsivo): Las respuestas son 1 = estar en total desacuerdo, 2 = estar de desacuerdo moderado, 3 = estar un poco desacuerdo, 4 = estar un poco acuerdo, 5 = estar de acuerdo moderado, 6 = estar de total acuerdo. A continuación hay una lista explicando algunos sentimientos, actitudes, y intereses. Por cada pregunta, llenar el circulo que corresponde al número que le describe mejor.

IMPULSIVITY (to be impulsive): The responses are 1 = strongly disagree, 2 = moderately disagree, 3 = slightly disagree, 4 = slightly agree, 5 = moderately agree, 6 = strongly agree. The next set of statements describes different feelings, attitudes, and interests. For each statement, fill in the one number that best describes you.

9. Soy una persona cuidadosa.
   I am a cautious person. ....

10. A menudo, actúo sin pensar.
    I often act without thinking. ....

11. Me gusta parar y pensar antes de hacer algo.
    I like to stop and think things over before I do them. ....

12. A menudo, hago cosas espontániamente.
    I often act on the spur of the moment. 1 2 3 4 5 6

13. A menudo, no soy tan cuidadosa como debo de ser.
    I am often not as cautious as I should be. 1 2 3 4 5 6

14. A menudo, me gusta hacer lo primero que me venga a la mente.
    I often like to do the first thing that comes to mind. ..

CONOCIMIENTO DE SEGURIDAD: Las respuestas son 1 = estar en total desacuerdo, 2 = estar de desacuerdo moderado, 3 = estar un poco desacuerdo, 4 = estar un poco acuerdo, 5 = estar de acuerdo moderado, 6 = estar de total acuerdo.

SAFETY KNOWLEDGE: The responses are 1 = strongly disagree, 2 = moderately disagree, 3 = slightly disagree, 4 = slightly agree, 5 = moderately agree, 6 = strongly agree

15. Yo sé a quien debo preguntar si no estoy seguro de como completar un trabajo peligroso. ....
    I know who to ask if I am not sure about the safe way to complete a dangerous task.

16. Me siento con la libertad de pedir capacitación adicional si es necesario.
    I feel free to request additional safety training if I think it is needed. 1 2 3 4 5 6

17. Sé la manera segura de completar mis deberes de trabajo.
    I know the safe way to complete my work tasks. ....

18. El video de seguridad por nuevos empleados es fácil de entender.
    The new employee safety orientation video is easy to understand. ....

19. Las palabras en el video de seguridad por nuevos empleados son fáciles de entender. ....
The words in the new employee safety orientation video are easy to understand.

20. Los conceptos de seguridad en el video de seguridad por nuevos empleados son fáciles de entender. ....
The safety concepts in the new employee safety orientation video are easy to understand.

Por las preguntas 21-25, llene el circulo apropiada que corresponde a su respuesta.
For questions 21-25, fill in the appropriate circle that corresponds to your answer.

21. Siento que el manual de seguridad y salud es un recurso bueno para ayudarme completar mis trabajos con seguridad. .... Yes/Sí No
I feel the safety and health handbook is a good resource to help me complete my job tasks safely.

22. Uso el manual de seguridad y salud para identificar la manera segura de completar un trabajo. .... Yes/Sí No
I use the safety and health handbook to identify the safe way to complete a task.

23. Me siento con la libertad de reportar actos de trabajo no seguros. .... Yes/Sí No
I feel free to report unsafe work acts.

24. Me siento con la libertad de reportar condiciones de trabajo no seguros. .... Yes/Sí No
I feel free to report unsafe work conditions.

25. Entiendo la programa S. T. O. P. .... Yes/Sí No
I understand the S.T.O.P program.

RIESGOS FÍSICOS: Las respuestas son 1 = nunca, 2 = raramente, 3 = a veces, 4 = a menudo, 5 = muy a menudo. A continuación hay una lista explicando algunas cosas que puedan pasar mientras trabaja. Por favor, indique cuan a menudo usted experimenta cada situación en su trabajo presente.

PHYSICAL HAZARDS: The responses are 1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = very often Below is a list of statements regarding possible experiences at work. Please indicate how often you experience each situation on your current job.

26. Yo estoy expuesto a equipo que puede causar serio daño físico.
I am exposed to equipment that could cause serious injury. 1 2 3 4 5

27. Yo estoy expuesto a niveles altos de contaminación ambiental.
I am exposed to high levels of air pollution. 1 2 3 4 5

28. El ambiente de mi trabajo es a menudo demasiado frio o demasiado caliente.
My job environment is often too hot or too cold. . 1 2 3 4 5

29. Hace damasiado ruido en mi ambiente de trabajo.
My job environment is too noisy. 1 2 3 4 5

30. Yo estoy expuesto a químicos peligrosos.
I am exposed to dangerous chemicals. 1 2 3 4 5

31. Yo estoy expuesto a condiciones peligrosas en el trabajo que pueden causar daño físico. 1 2 3 4 5
I am exposed to unsafe working conditions that could lead to an injury.

32. Yo estoy expuesto a condiciones de trabajo que no son muy saludables.
I am exposed to unhealthy working conditions. 1 2 3 4 5

33. Si hay algo más que quisiera decirnos acerca de como el trabajar aquí afecta su salud, escríbelo abajo.
If there is anything else you want to tell us about how working here might affect your health, please write it below.

____

____

____

____