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Occupational Risk Perceptions Among Foreign-Born Construction Workers in Central Florida

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
2023

Abstract

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by

Matthew E. Law

MPH, West Virginia University, 2016

BS, West Virginia University, 2013

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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May 2023

Abstract

Hispanic and Latino foreign-born construction workers in the United States experience higher rates of serious injuries and fatalities in the workplace than their native-born peers. Previous research has pointed to specific vulnerabilities among this population, including birthplace, age of the worker, language barriers, and education level, but little to no research has examined addressable risk factors, such as occupational risk perceptions, among this population. The purpose of this quantitative study was to determine the relationship between birthplace, number of years working in the United States, and occupational risk perceptions while controlling for age of the worker, language barriers, and education level. A modified conceptual model that links specific demographic factors to occupational risk perceptions served as the framework for the study. A convenience sample of construction workers in central Florida provided demographic information and self-reported risk perceptions in this cross-sectional study. Multiple linear regression analyses were used to examine potential relationships between birthplace and risk perceptions as well as number of years working in the United States and risk perceptions. The results of these analyses indicated a statistically significant difference in risk perceptions between foreign-born and native-born construction workers, but time spent working in the United States did not affect these risk perceptions. The implications for positive social change include the identification of risk factors that are addressable through improved training and better communication. Addressing these factors may help reduce injuries and fatalities among Hispanic and Latino foreign-born construction workers in central Florida.

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Dedication

This doctoral study is dedicated to my family, friends, and colleagues who provided all the support and patience necessary to complete my doctoral studies. They remained supportive through changes in priorities, absences from daily routines, and other burdens that came with accomplishing such a lofty goal. My wife, Stacy, who knew I would be pursuing a doctoral degree even before I did, remained unwaveringly patient and forgiving over the years it took to complete this program, and I could not have accomplished anything without her support, love, and sense of humor. To my kids, I am forever grateful for enduring through the times I prioritized work over play, and I look forward to making up for lost time.

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Thank you to my family and friends for the support and encouragement throughout this journey. I also want to thank my chair, Dr. David Anderson, and my committee member, Dr. Claudia Kozinetz, for providing timely feedback and guidance throughout the doctoral study. I could not have accomplished any of this without their support. I must also thank Dr. Travis Kruse for being a supportive advocate and mentor while I balanced my professional and academic careers.

Thank you to the Board of Certified Safety Professionals Foundation for providing the grant that funded this study. I hope that this work enables continued efforts toward improving occupational safety and health among vulnerable populations within the workforce.

I must thank Dr. Daniel Snyder for providing crucial support and guidance at a time when I needed it most. Thank you to Richard Nichols and Wyatt Bradbury for giving me some logistical but mostly moral support throughout this journey. Lastly, thank you to Timothy Bernardi for the advocacy and enthusiasm that made this work possible.

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Section 1: Foundation of the Study and Literature Review

Introduction

Hispanic and Latino foreign-born construction workers are one of the most vulnerable populations to occupational injuries and fatalities in the United States. About 20% of all workplace fatalities occur in the construction industry, and foreign-born workers experience higher rates of serious injuries and fatalities (SIFs) than their native-born counterparts (Cunningham et al., 2018; Oswald et al., 2018; Ricci et al., 2021; United States Bureau of Labor Statistics [BLS], 2021). However, few studies have explored the potential causes of the increased vulnerabilities of foreign-born construction workers in the United States, and there is little to no research that has identified the magnitude of risk in central Florida, which is home to a significantly larger percentage of foreign-born workers than the rest of the country (Cruz et al., 2018; Cunningham et al., 2018; Flynn et al., 2015; United States Census Bureau [USCB], 2021). While the disparities in occupational injuries and fatalities among foreign-born construction workers can be inferred from data such as that provided by BLS (2021), identifying the leading indicators of increased risk could help with the appropriation of intervention efforts to reduce vulnerabilities among this population.

One of the most important leading indicators that must be understood is the perceptions of occupational risk among foreign-born construction workers. Occupational risk perceptions have been identified as a key component that influences safety behaviors and vulnerability to injury and fatalities in the workplace (Aboagye et al., 2022; Vierendeels et al., 2018; Xia et al., 2020). The risk perceptions of foreign-born construction workers have been studied to some extent in other countries, but little to no research has been conducted in the United States on this topic (Man et al., 2019b; Ricci et al., 2021). Additionally, perceptions of risk are more often measured qualitatively, and few, if any, studies have effectively quantified risk perceptions among foreign-born construction workers (Man et al., 2019b). The quantitative measurement of occupational risk perceptions could help develop a more thorough understanding of the impact of this leading indicator on the disparities of occupational injuries and fatalities among foreign-born construction workers in central Florida.

Problem Statement

Foreign-born construction workers are subject to increased occupational injuries and fatalities not just in the United States but also in many other countries across the globe (Cruz et al., 2018; Lyu et al., 2018; Mosly & Makki, 2021; Rupakheti et al., 2018; Travnicek et al., 2020). This global public health issue has corporealized in the United States where the construction industry accounts for 35% of all Hispanic and Latino worker fatalities, and 74% of these fatalities occur among foreign-born workers (Oswald et al., 2018). Occupational fatalities among Hispanic and Latino foreign-born workers continue to increase year over year, and these workers are 15% more likely to experience a fatal injury than native-born workers (BLS, 2021; Byler & Robinson, 2018). While a few studies have correlated demographic trends, such as birthplace, age of the worker, language barriers, and education level, to occupational injuries and fatalities among construction workers in the United States, only international studies have explored occupational risk perceptions among foreign-born construction workers and the various factors that influence these risk perceptions (García-Arroyo & Segovia, 2020; Lyu et al., 2018; Mosly & Makki, 2021; Ricci et al., 2021; Rupakheti et al., 2018; Travnicek et al., 2020). Because of the disparities in occupational injury and fatality rates among Hispanic and Latino foreign-born workers in construction in the United States and the high percentage of Hispanic and Latino foreign-born persons in the state of Florida, the risk perceptions of Hispanic and Latino foreign-born workers in construction in central Florida must be quantitatively explored (BLS, 2021; Byler & Robinson, 2018; USCB, 2021).

Purpose of the Study

The purpose of this doctoral study was to quantitatively explore the occupational risk perceptions among Hispanic and Latino foreign-born construction workers in central Florida compared to their native-born counterparts. Central Florida is home to a higher percentage of Hispanic and Latino workers than the U.S. average, and foreign-born workers experience higher rates of injuries and fatalities than their U.S.-native counterparts (BLS, 2021; USCB, 2021). Some U.S.-based research has correlated occupational injury and fatality outcomes with specific demographic factors, such as birthplace, number of years working in the United States, age of the worker, language barriers, and education level (Flynn, 2015; Moyce & Schneker, 2018). However, there is little to no quantitative knowledge about the relationship between such factors and occupational risk perceptions, a key leading indicator for occupational injuries and fatalities (Aboagye et al., 2022; Vierendeels et al., 2018; Xia et al., 2020). In this doctoral study, I examined the relationship between birthplace and occupational risk perceptions among construction workers in central Florida as well as the relationship between number of years working in the United States and occupational risk perceptions among foreign-born construction workers in central Florida using quantitative methods.

Research Questions and Hypotheses

The research questions and hypotheses of the study are described below.

Research Question (RQ)1: Is there an association between birthplace, in terms of foreign-born or native-born, and occupational risk perceptions among construction workers in central Florida when controlling for age of the worker and education level?

$H_0$1: There is no significant association between birthplace and occupational risk perceptions among construction workers in central Florida when controlling for age of the worker and education level.

H_a1: There is a significant association between birthplace and occupational risk perceptions among construction workers in central Florida when controlling for age of the worker and education level.

RQ2: Is there an association between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born construction workers in central Florida when controlling for English language fluency and education level?

$H_0$2: There is no significant association between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born construction workers in central Florida when controlling for English language fluency and education level.

H_a2: There is a significant association between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born workers in central Florida when controlling for English language fluency and education level.

Conceptual Framework

The conceptual framework for this study included a modified conceptual model of risk perceptions as presented by Taofeeq et al. (2020) and incorporated factors identified by Flynn et al. (2015) that correlated with occupational injuries and fatalities among foreign-born construction workers in the United States. In the model presented by Taofeeq et al., the authors explored the relationships between risk attitudes and certain influential factors, including working experience, educational background, physical health, and emotional intelligence, while allowing for control variables that could also influence risk attitudes. This model provided the foundational basis to explore demographic factors identified by Flynn et al., including birthplace and number of years working in the United States, while controlling for variables known or suspected to correlate with occupational injuries and fatalities, such as age of the worker, language barriers, and education level.

The seminal work by Flynn et al. (2015) is still regarded by the National Institute for Occupational Safety and Health (NIOSH) and the American Society of Safety Professionals (ASSP) as a report that supplies significant insight into the overlapping vulnerabilities of foreign-born construction workers in the United States. The authors summarized demographic trends that correlate with increased vulnerability to occupational injuries and fatalities among this population, including birthplace, age of the worker, and size of the organization. The report also presented specific case studies as well as hypothesized reasons why these factors may contribute to increased vulnerabilities, including organizational culture, language barriers, and training or education levels. Quantitatively, however, this report only explored the relationships between these factors and occupational injuries and fatalities, not occupational risk perceptions.

In the regression model for this study, the direct relationship between birthplace, in terms of foreign-born and native-born, and occupational risk perceptions as well as the relationship between number of years working in the United States and occupational risk perceptions are explored. To do this, the conceptual framework incorporated known concepts from existing literature. First, risk perceptions have been established as a leading indicator of occupational injuries and fatalities (Aboagye et al., 2022; Vierendeels et al., 2019; Xia et al., 2020). Second, specific demographic factors have been correlated with occupational injuries and fatalities among foreign-born construction workers in the United States (Flynn et al., 2015). Finally, the model by Taofeeq et al. (2020) provided the structural foundation for exploring the relationships between demographic factors and the risk perceptions among the target population. This conceptual framework helped define the parameters for the various observations expected within the regression model for this study.

Nature of the Study

I used a quantitative analysis of primary data to address the RQs in this study. The research design included a cross-sectional study of self-reported risk perceptions among Hispanic and Latino foreign-born construction workers and their native-born counterparts in central Florida using a web-based survey. The primary data included participant demographics that made up the independent variables, birthplace and number of years working in the United States; the control variables, age of the worker, English language fluency, and education level; and the dependent variable, occupational risk perception. I measured the dependent variable using a validated instrument, the Construction Worker Risk Perception (CoWoRP) scale, developed by Man et al. (2019a) and recorded as a single total score. I used SPSS version 28 to facilitate the data analysis using multiple regression.

Literature Search Strategy

I conducted the literature review using multiple databases to identify published research related to the problem, purpose of the study, and the framework for the study. The databases included Academic Search Complete, APA PsychTests, Business Source Complete, Complementary Index, Computers & Applied Sciences Complete, Directory of Open Access Journals, CINAHL Plus, Emerald Insight, and PubMed. The Walden University Library and Google Scholar search engines were used to locate relevant articles. The search terms used included *immigrant worker, immigrant, migrant, foreign-born, ethnic minority, construction, risk perception, risk attitude, safety, occupational safety, injury, occupational injury, work-related injury, workplace injury, fatality, United*

States, *theoretical framework*, *conceptual framework*, and *model*. The search was initially limited to works published within the last 5 years but was expanded to locate seminal works related to the topic and the supporting framework, including influential works published by the NIOSH. Foundational information and data were also found through USCB (2021) and BLS (2021).

Literature Review Related to Key Variables and/or Concepts

Background

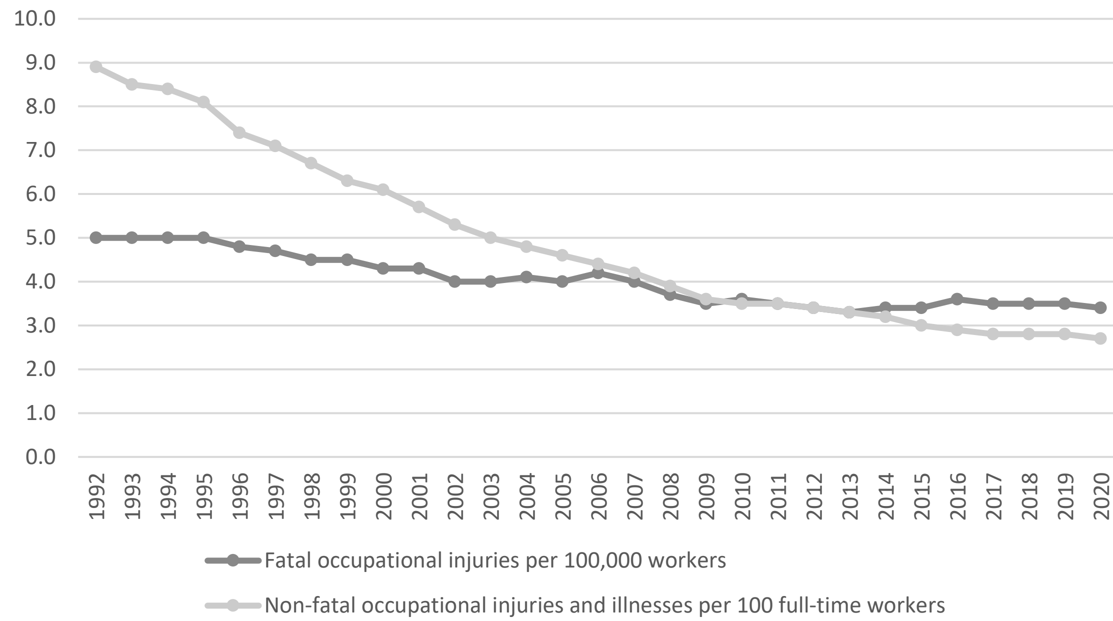
The disparity in occupational injuries and fatalities among foreign-born construction workers is a significant public health issue that affects many countries around the world. Over 150 million workers have migrated from their country of origin to high-income destinations in North America, Europe, and the Middle East, and are more likely to work in hazardous roles, such as construction, than native-born workers (Hargreaves et al., 2019). The construction industry alone accounts for about 20% of all workplace fatalities, and foreign-born workers in construction are more likely to experience SIFs than their native-born counterparts (Cunningham et al., 2018; Ricci et al., 2021). Some studies in Spain, Italy, Hong Kong, Nepal, Saudi Arabia, and the Czech Republic have begun to explore the vulnerabilities and risk perceptions of foreign-born construction workers related to occupational injury and fatality outcomes (García-Arroyo & Segovia, 2020; Lyu et al., 2018; Mosly & Makki, 2021; Ricci et al., 2021; Rupakheti et al., 2018; Travnicek et al., 2020). However, only a few recent studies have explored the vulnerabilities specific to foreign-born construction workers in the United States and have been limited to inferences made from correlation with demographic trends (Cruz et al., 2018; Cunningham et al., 2018; Flynn et al., 2015). Nevertheless, the realization of this global public health issue in the United States demonstrates the need for further research into potential causes of the disparity in occupational injuries and fatalities among foreign-born construction workers to properly align intervention efforts.

Occupational Injury and Fatality Trends in the United States

Two primary trends in occupational injuries and fatalities in the United States were foundational to this doctoral study. First, over the past few decades, a disparity has emerged in the reduction of nonfatal injury rates and fatal injury rates. As reflected in Figure 1, nonfatal injury rates in the United States have dropped 69.7% from 8.9 incidents per 100 full-time workers in 1992 to 2.7 incidents per 100 full-time workers in 2020 (BLS, 2021). In contrast, fatal injury rates in the United States have only dropped 32.0% from 5.0 fatalities per 100,000 workers in 1992 to 3.4 fatalities per 100,000 workers in 2020, and that rate has remained relatively stagnant for over a decade (BLS, 2021; Cooper, 2019). The disparity in rate reduction has prompted occupational safety and health (OSH) scientists to look deeper into the potential causes of SIFs to proactively gather and analyze data that can inform the implementation of the support systems that help reduce risk (Busch et al., 2021; Cooper, 2019). While much emphasis has been placed on identifying leading indicators prior to the fruition of SIFs, lagging indicators, such as injury and fatality outcomes for certain populations, also help determine potential vulnerabilities that need to be investigated (Busch et al., 2021).

Figure 1

Occupational Injury and Fatality Trends in the United States

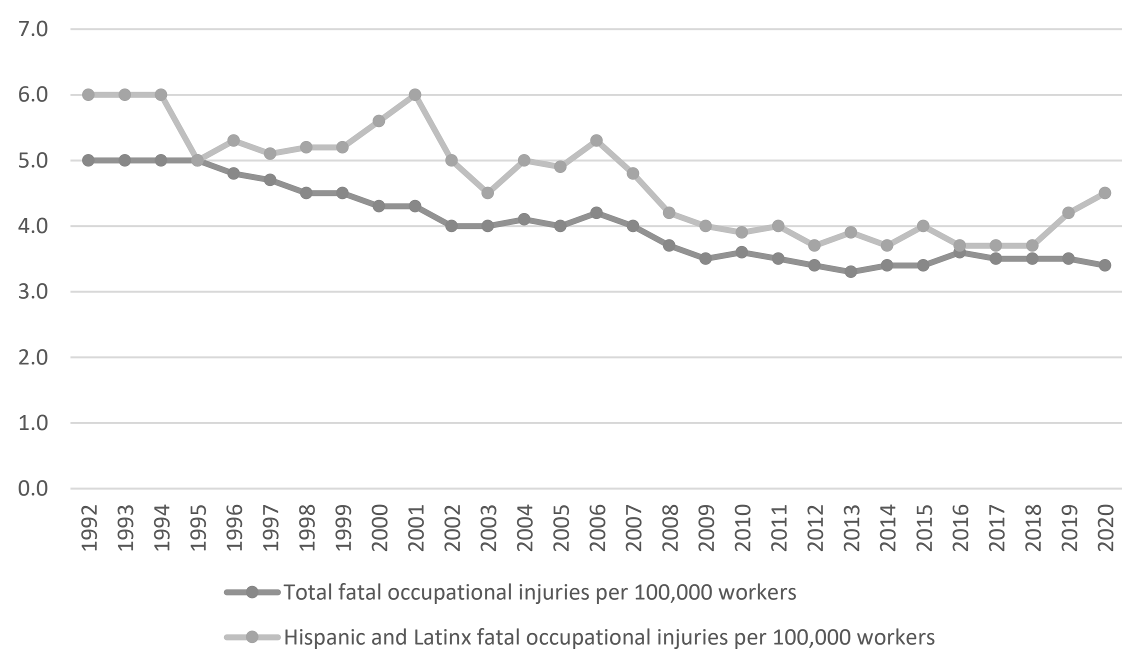


Note. Adapted from "Injuries, Illnesses, and Fatalities: Census of Fatal Occupational Injuries (CFOI) – Current," by BLS, December 16, 2021. https://www.bls.gov/iif/oshcfoi1.htm#rates

The second trend in the United States that informed the purpose of this study was the disparity in fatality rates among Hispanic and Latino workers. Figure 2 illustrates how Hispanic and Latino workers have consistently experienced higher fatality rates compared to the total population. In fact, Hispanic and Latino workers only saw a 25% reduction in fatalities from 6.0 per 100,000 workers in 1992 to 4.5 per 100,000 workers in 2020, and was a sharp 32.4% increase in the fatality rate among this population from 2018 to 2020 (BLS, 2021). Furthermore, as shown in Figure 3, almost twice as many fatalities occur among foreign-born Hispanic and Latino workers compared to native-born Hispanic and Latino workers (BLS, 2021). Foreign-born workers are 15% more likely to experience fatal injuries than native-born workers, and data from both the U.S. Census of Fatal Occupational Injuries (CFOI) and Fatality Assessment and Control Evaluation (FACE) programs have consistently indicated these disparate outcomes (Byler & Robinson, 2018; Cruz et al., 2018; Seabury et al., 2017; Welton et al., 2020). These trends indicate a clear disparity in occupational fatalities among Hispanic and Latino foreign-born workers and a need to identify the specific vulnerabilities that may lead to these outcomes.

Figure 2

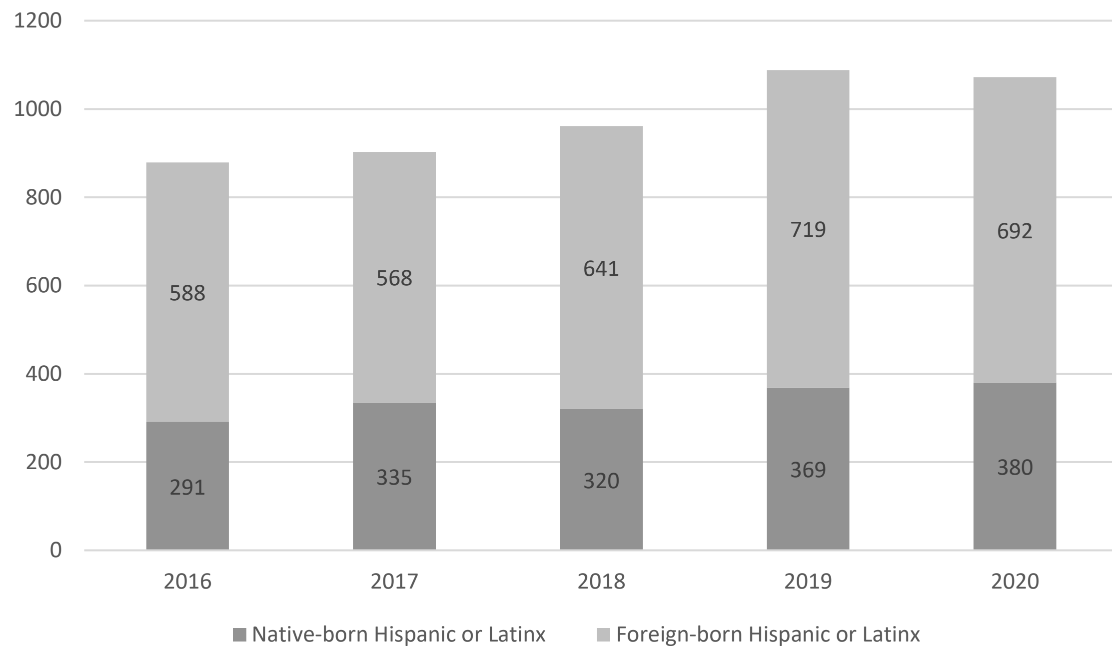
Hispanic and Latino Fatality Trends in the United States



Note. Adapted from "Injuries, Illnesses, and Fatalities: Census of Fatal Occupational Injuries (CFOI) – Current," by BLS, December 16, 2021. https://www.bls.gov/iif/oshcfoi1.htm#rates

Figure 3

Fatal Work Injuries to Hispanic and Latino Workers in the United States



Note. Adapted from "Injuries, Illnesses, and Fatalities: Census of Fatal Occupational Injuries (CFOI) – Current," by BLS, December 16, 2021. https://www.bls.gov/iif/oshcfoi1.htm#rates

Vulnerabilities of Foreign-Born Workers in Construction

The disparities in injury and fatality outcomes for foreign-born workers in construction is not limited to the United States. Over 150 million workers across the globe have migrated to higher-income countries in North America, Europe, and the Middle East, and these workers more often accept employment in more dangerous jobs and industries than native-born workers (Hargreaves et al., 2019; Moyce & Schenker, 2018). While global data are often not as extensive or accessible as those provided by BLS, studies in these regions have identified similar increased rates of occupational injuries and fatalities among foreign-born workers (Hargreaves et al., 2019; Moyce & Schneker, 2018). By examining some of the research in other countries, it is possible to identify some of the vulnerabilities of foreign-born workers in construction that may not have been discussed in the limited research that has occurred in the United States.

Themes in vulnerabilities among foreign-born workers in construction can be derived from research conducted in other countries, including Spain, Italy, Hong Kong, Nepal, Saudi Arabia, and the Czech Republic. Some of the common vulnerabilities among foreign-born workers in construction discussed in international studies include age of the worker, amount of time working in the destination country, language barriers, education level, occupational training, cultural values, and workplace safety climate (García-Arroyo & Segovia, 2020; Hargreaves et al., 2019; Lyu et al., 2018; Mosly & Makki, 2021; Ricci et al., 2021; Rupakheti et al., 2018; Travnicek et al., 2020). Of these vulnerabilities, language barriers and cultural values are most often explored as factors directly linked to birthplace that may impede or facilitate other factors (García-Arroyo & Segovia, 2020; Hargreaves et al., 2019; Moyce & Schneker, 2018). For example, language barriers likely affect the ability to receive occupational training and proper risk communication related to the work being performed (Moyce & Schneker, 2018).

Similarly, cultural values complicate perceptions of risk and how work is performed and can also impede communication and workplace climate (García-Arroyo & Segovia, 2020; Oswald et al., 2018; Ricci et al., 2021). However, both factors may be influenced by the amount of time spent working in the destination country as workers may adopt new language or cultural values over time (Moyce & Schneker, 2018). While the exact influence of these vulnerabilities may deviate from country to country, the factors identified in international studies must be considered when examining similar populations within the United States.

Vulnerabilities of Foreign-Born Workers in the United States

Although foreign-born workers in the United States are evidentially at higher risk of occupational injuries and fatalities, few studies have been conducted in the United States to identify specific vulnerabilities that may exist among this population. One of the most prominent studies was conducted by Flynn et al. (2015) and is still regarded by NIOSH and ASSP as seminal work that examines overlapping vulnerabilities of foreign-born construction workers in the United States. The authors correlated age of the worker, birthplace, and size of the organization with increased injury and fatality rates among Hispanic and Latino foreign-born construction workers in the United States, created a conceptual model for understanding the overlap in vulnerabilities, and hypothesized specific contributing factors to disparities such as language barriers and training or education level based on previous research. Consistent with the findings of international studies, the authors suggested other factors that must be explored in future research, including the amount of time spent working in the United States. Cunningham et al.

(2018) expanded upon this study by exploring the differences in safety and health training provided to foreign-born workers based on size of the organization and found that smaller construction firms supply less-sufficient training to foreign-born workers. Given the limited research regarding foreign-born workers in the United States but the consistency with international studies in correlation of these vulnerabilities with occupational injury and fatality outcomes, future research should identify how and why these vulnerabilities increase risks for this population in the United States.

Foreign-Born Workers in Central Florida

Central Florida hosts a higher number of foreign-born workers than much of the United States. Sixteen point seven percent of the U.S. workforce is comprised of foreign-born workers, 48.8% of which are of Hispanic and Latino origin (Moyce & Schneker, 2018). As of 2021, the estimated population of Hispanic and Latino persons in the state of Florida was 26.4% compared to the United States at 18.5% (USCB, 2021). Additionally, the estimated population of foreign-born Hispanic and Latino persons in the state of Florida was 20.8% compared to the United States at 13.5% (USCB, 2021). Florida also accounted for 7.6% (N = 82) of all fatalities among Hispanic and Latino workers in the United States in 2020, 75.6% (N = 62) of which were foreign-born workers (BLS, 2021). Forty point three percent (N = 25) of fatalities among Hispanic and Latino foreign-born workers in Florida occurred in the construction industry (BLS, 2021). These data informed the need to examine the vulnerabilities specific to Hispanic and Latino foreign-born construction workers in central Florida.

Risk Perceptions as a Leading Indicator to Occupational Injuries and Fatalities

Perceptions of occupational risk have been linked to safety behaviors and occupational injury and fatality outcomes in previous research. Aboagye et al. (2022) studied the impact of risk perception related to musculoskeletal hazards and found a positive relationship between risk perception and both task performance and contextual performance, a positive relationship between risk perception and safety behaviors, and a mediating effect of safety behaviors on the relationship between risk perception and task and contextual performance. Similarly, Xia et al. (2020) established a relationship between risk perception and safety behaviors among construction workers in China, further identifying that this relationship can be influenced by supervisor safety climate, coworker safety climate, and safety motivation. The evidential relationship between occupational risk perception, safety behaviors, job performance, and subsequent injury and fatality outcomes establishes an essential factor that needs to be examined among vulnerable populations.

Occupational risk perceptions are also important to measure as a leading indicator of occupational injuries and fatalities because they can be influenced by both static and changeable factors. Vierendeels et al. (2018) developed a conceptual framework, the egg aggregated model of safety culture, to illustrate the effects of multiple variables on safety behaviors, safety culture, and safety outcomes. In this model, the authors established that occupational risk perceptions are influenced by factors such as preexisting beliefs and values, organizational safety climate, occupational training, and individual skills and abilities. Furthermore, Ricci et al. (2021) conducted a study in Italy that measured the differences in occupational risk perceptions between foreign-born and native-born workers before and after a targeted training intervention and found that, while the differences in risk perception were statistically significant before the training course, the differences were not significant after the training course. Because occupational risk perceptions directly affect safety behaviors and occupational injuries and fatalities but can be improved using appropriate intervention, they must be appropriately measured among vulnerable populations to determine where interventions should be applied.

The CoWoRP

Given the influence of occupational risk perceptions on injury and fatality outcomes, it is necessary to quantify risk perceptions to identify vulnerabilities among specific populations. Man et al. (2019a, 2019b) developed and validated the CoWoRP scale to quantify occupational risk perceptions among construction workers in Hong Kong. The CoWoRP scale measures occupational risk perceptions in two components: 1) cognitive, which consists of the perceived probability of an accident occurring and the severity of the accident if it occurs, and 2) affective, which consists of the emotions associated with risk perceptions, worry about potential injuries and unsafe feelings about potential injuries associated with risky workplace scenarios (Man et al., 2019b). The authors reported internal consistency, test-retest reliability, and convergent, discriminant, and criterion-related validity for 13 items across 3 dimensions with each item using an 11-point Likert scale to establish a total risk perception score (Man et al., 2019b). Man et al. (2021a, 2021b) have subsequently used the CoWoRP scale to explore the relationship between personal and organizational factors and risk perceptions as well as the relationship between risk perceptions and acceptance of personal protective equipment (PPE), and the scale has also been adopted to identify risky scenarios among construction workers in Thailand (Khaday et al., 2021a, 2021b). The CoWoRP scale serves as an effective instrument to quantify risk perceptions among foreign-born and native-born construction workers in central Florida.

Conceptual Framework for the Study

Although studies have explored the relationship between birthplace and occupational injury and fatality outcomes as well as the relationship between risk perceptions and occupational injury and fatality outcomes, there is little to no research that has explored the relationship between birthplace and occupational risk perceptions, creating a need for the incorporation of multiple known concepts to create a framework for this doctoral study. The work by Taofeeq et al. (2020) resulted in a framework that links specific individual and demographic factors to risk attitudes, creating a foundation for exploring the RQs in this study. Additionally, the seminal work by Flynn et al. (2015) established specific vulnerabilities, such as birthplace, age of the worker, amount of time spent working in the United States, language barriers, and education level, that serve as the primary factors to be explored as well as variables that need to be controlled when examining the risk perceptions of foreign-born construction workers. This literature comprises the basis for the conceptual framework that was used in this doctoral study.

Definitions

Control variables: Age of the worker; English language fluency, categorized as “none,” “some English,” and “fluent English”; education level, categorized as “did not attend school," "I attended school but did not attend high school," "some high school (did not graduate)" "high school diploma/GED or equivalent," "some trade school," "completed trade school," "some college," and "bachelor's degree or higher."

Dependent variable: Risk perception, reported as one total score from 13 items across 3 domains (perceived probability of injury or fatality, perceived severity of injury or fatality, and worry and unsafe feelings about potential injury or fatality)

Independent variables: Birthplace, categorized as "foreign-born," meaning not born in the United States, and "native-born," meaning born in the United States; number of years working in the United States, categorized as "less than 1 year," "1 to 5 years," "6 to 10 years," "11 to 15 years," and "more than 15 years."

Assumptions

I made some assumptions regarding the primary data collected from the survey used in this doctoral study. First, I assumed that respondents were able to understand each of the presented questions and respond honestly. Second, I assumed that the respondents have experienced or possessed knowledge of the specific risky scenarios presented in the CoWoRP scale as these scenarios are common within the construction industry. Lastly, although the study consisted of a convenience sample, I assumed that the sample would be large enough to be representative of the population of construction workers within central Florida.

Scope and Delimitations

The data used for this doctoral study were restricted to the primary data collected from a convenience sample of construction workers in central Florida. Convenience sampling was selected due to the expected barriers of accessing participants that can stem from employers not allowing time for survey completion as well as hesitancy from participants depending on their sensitivity to questions about immigration status and work. Social media marketing, as well as existing partnerships with local organizations who provide occupational training and services to construction workers, were utilized to gain access to participants. As a convenience sample, the resulting data may not be generalizable to the entire population, even if the target sample size was met. The convenience sampling methods used also do not allow for appropriate delineation of size of the organization for which respondents work, which may be a contributing factor to occupational risk perceptions. However, random sampling was not possible due to the anticipated participant access restrictions.

Additionally, the collected data were subject to impedance from language and communication barriers as well as the limitations of self-reported data. Both English and Spanish versions of the survey were made available to participants. The survey was initially written in English, translated by an American Translators Association (ATA) certified translator, back-translated into English by a separate ATA certified translator, and tested for face validity and stability of scale between versions in a pilot survey as described in Sections 2 and 3. As this was a web-based survey, access to the survey could also have served as a barrier, and a paper-based survey was provided as an alternative for those who could not access the web version. All responses, including those of risk perception, were self-reported, and data points were subject to participant’s honesty and accuracy of interpretation and recollection.

Significance

This doctoral study provides a better understanding of the risk perceptions of Hispanic and Latino foreign-born workers in construction in central Florida. While the data provided by BLS (2021) clearly show an increased risk of occupational injuries and fatalities among Hispanic and Latino foreign-born construction workers in the United States, little to no research has examined the risk factors among this population that could be influenced by appropriate intervention. Occupational risk perceptions are leading indicators of injuries and fatalities in the workplace and can be improved through occupational training, better communication, and changes to cultural values and safety climate (Aboagye et al, 2022; Ricci et al., 2021; Vierendeels et al., 2018; Xia et al., 2020). Therefore, a better understanding of the risk perceptions of this vulnerable population could help improve targeted intervention efforts to decrease the risk of occupational injuries and fatalities.

Summary and Conclusions

Foreign-born workers in construction are one of the most vulnerable populations to occupational injuries and fatalities in the United States and throughout the world. central Florida is home to a significant number of Hispanic and Latino foreign-born construction workers, and the majority of fatalities among Hispanic and Latino workers in the state of Florida occur among those who have migrated to the United States from other countries (BLS, 2021; USCB, 2021). Some studies conducted in the United States have identified specific vulnerabilities among foreign-born construction workers that correlate with occupational injuries and fatalities, but few, if any, have provided actionable data for appropriate interventions (Cunningham et al., 2018; Cruz et al., 2018; Flynn et al., 2015; Seabury et al., 2017; Welton et al., 2020). As a leading indicator of occupational injuries and fatalities that can be addressed through targeted intervention, the occupational risk perceptions of Hispanic and Latino foreign-born construction workers in central Florida must be measured effectively (Aboagye et al., 2022; Ricci et al., 2021; Vierendeels et al., 2018; Xia et al., 2020). In this doctoral study, I sought to identify how birthplace and time spent working in the United States influence the risk perceptions of foreign-born construction workers in central Florida to provide actionable knowledge for intervention that may address the disparities in occupational injury and fatality outcomes among this population.

Section 2: Research Design and Data Collection

Introduction

As discussed in Section 1, the purpose of this quantitative study was to explore the occupational risk perceptions of Hispanic and Latino foreign-born construction workers in central Florida compared to their native-born counterparts. While much secondary data are available from BLS (2021) and USCB (2021) that explain the population makeup and the disparities in occupational injury and fatality outcomes, there are little to no data or literature available that have measured leading indicators of adverse outcomes, such as occupational risk perceptions, among this population. Furthermore, most studies conducted in the United States have only used secondary data to explain the disparities between foreign-born and native-born workers and to identify potential vulnerabilities, and little to no research has been conducted in central Florida, which houses a higher percentage of Hispanic and Latino foreign-born workers than much of the rest of the United States (Byler & Robinson, 2018; Cruz et al., 2018; Cunningham et al., 2018; Flynn et al., 2015; USCB, 2021). Because of the lack of available secondary data, the evidential relationship between occupational risk perceptions and injury and fatality outcomes, and the ability to affect occupational risk perceptions through appropriate intervention, I collected primary data from the target population to identify the hypothesized relationships between variables described in the RQs presented in Section 1 (see Aboagye et al., 2022; Ricci et al., 2021; Vierendeels et al., 2018; Xia et al., 2020).

In this chapter, I describe the research methods used for this doctoral study. I describe research design, rationale, methodology, and potential threats to validity in major sections of this chapter. Additionally, I explain the methodology by describing the population, sampling procedures, description of the instrument, operationalization, and data analysis plan. Due to the sensitivity of certain topics associated with the target population, I also discuss ethical procedures within this chapter before concluding with an overall summary.

Research Design and Rationale

To address the RQs associated with this quantitative study, the specific research design included a cross sectional study of self-reported risk perceptions and demographic data among Hispanic and Latino foreign-born workers in construction and their native-born counterparts in central Florida using a web-based survey. For the study design, I collected primary data, including participant demographics as well as occupational risk perceptions among participants as measured using the CoWoRP instrument developed by Man et al. (2019a). Due to the nature of accessibility of construction workers in central Florida, participants consisted of a convenience sample recruited through social media and select in-person events hosted by local organizations with access to construction workers. This research design was advantageous because it provided the primary data needed to measure the relationships between variables described in the RQs while minimizing the time and resources required to access the population. Additionally, the use of social media and local events for survey distribution helped ensure participants were recruited from the targeted geographic location. While convenience sampling may not allow for a truly statistically balanced population selection, it was possible to recruit an appropriate sample size using this method when resources and access to the population were limited.

Methodology

Population

The target population for this study consisted of construction workers in central Florida. Central Florida includes the major metropolitan areas of Lakeland-Winter Haven, Ocala, Orlando-Kissimmee-Sanford, Sebring, and The Villages. The total estimated population of employed construction workers in the major metropolitan areas of central Florida was 73,950 out of 1,576,720 total workers employed in all occupations as of May 2021, an average of about 54 construction workers per 1,000 jobs in the area (BLS, 2021). While state-specific demographic data were not available from BLS (2021) regarding the workforce, in the United States, 38.9% of construction workers are Hispanic or Latino, compared to the entire U.S. workforce, which is 18.0% Hispanic and Latino. Also, 16.7% of the U.S. workforce is comprised of foreign-born workers, 48.8% of which are of Hispanic and Latino origin, and 9.8% of all foreign-born workers work in construction (BLS, 2021; Moyce & Schneker, 2018). From this, I estimated that about 28,767 (38.8%) of construction workers in central Florida are Hispanic and Latino, 25,805 (34.8%) of all construction workers in central Florida are foreign-born, and 12,593 (48.8%) of foreign-born construction workers in central Florida are Hispanic and Latino.

According to BLS (2021), Florida had the third highest employment level in construction and extraction occupations at 398,060 as of May 2021, behind Texas at 568,930 and California at 663,570. In central Florida, the top employed occupations in this industry (those with over 300 employed within a given metropolitan area) include construction laborers; first-line supervisors of construction trades and extraction workers; carpenters; electricians; roofers; plumbers, pipefitters, and steamfitters; operating engineers and other construction equipment operators; painters, construction and maintenance; cement masons and concrete finishers; helpers; sheet metal workers; drywall and ceiling tile installers; pipelayers; glaziers; tile and stone setters; structural iron and steel workers; brickmasons and blockmasons; insulation workers, floor, ceiling, and wall; elevator and escalator installers and repairers; paving, surfacing, and tamping equipment operators; fence erectors; and plasterers and stucco masons (BLS, 2021). Construction and building inspectors are also included under construction and extraction occupations according to BLS (2021) but were excluded in this study due to the assumed lower risk associated with the occupation. For the purposes of this study and simplification of the survey, occupations, or trades, and titles were consolidated into options detailed in Table 2.

The primary population central to addressing the RQs in this study were Hispanic and Latino foreign-born construction workers. Hispanic and Latino is important to distinguish as a subset of foreign-born workers because of the increased population of Hispanic and Latino workers in Florida compared to the rest of the United States as well as the fact that Hispanic and Latino workers comprise nearly half of the foreign-born labor force in the United States (BLS, 2021; USCB, 2021). Hispanic and Latino foreign-born workers mostly originate from Spanish-speaking countries in Latin America, including Mexico, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. For the purposes of this study, participants were only asked (a) whether they were born in the United States and (b) whether they identified as Hispanic or Latino. Therefore, the final sample of Hispanic and Latino foreign-born workers may have included those born in other regions, including South America and the Caribbean.

Sampling and Sampling Procedures

The sample strategy for this doctoral study included the recruitment of a convenience sample through social media and select in-person events hosted by nonprofit organizations that provide training and other services to construction workers in central Florida. I selected convenience sampling due to anticipated constraints of accessing construction workers, including employers' unwillingness to allow time to take the survey during working hours and workers' hesitancy to participate in certain environments. G*Power software version 3.1.9.7 was used to determine an appropriate sample size using a priori power analysis (see Faul et al., 2007). Assuming a multiple regression model, an effect size of 0.15, an alpha of 0.05, a minimum statistical power of 0.95, and three predictor variables, the total sample size needed was $N = 119$. A post hoc power analysis was conducted after the study using G*Power software to determine the power of the final sample size (see Faul et al., 2007).

Procedures for Recruitment, Participation, and Data Collection

The primary data collected for this doctoral study included demographic information and occupational risk perceptions of construction workers in central Florida. I used a web-based survey distributed through social media marketing and by QR code at select in-person events. A paper-based survey was made available for accessibility at in-person events if needed, and the survey was made available in both English and Spanish. An ATA certified translator was used to translate all participant-facing materials, including the consent form and survey. At the beginning of all forms of the survey, participants were provided a consent form consistent with approved institutional review board (IRB) guidelines. Participants had the opportunity to decline consent before taking either form of the survey, resulting in immediate termination of the web-based survey or instruction to return paper-based survey materials to me during in-person events. The survey collected demographic information used as independent variables as well as inclusion and exclusion criteria. Demographics included age of the worker, ethnicity, birthplace, English-language fluency, number of years working in construction, current trade, current title, education level, number of years working in the United States, and metropolitan area in which the participant worked.

Operationalization of the survey distributed using social media marketing included a targeted approach to ensure delivery to the most appropriate potential participants. Facebook and Instagram by Meta were used for paid strategic automated marketing, targeting audiences in the metropolitan areas of central Florida, as described in the population subsection, who had associated interests in construction, construction and extraction, or associated trades or those who had construction-related jobs listed on their pages. Target audiences received a link while browsing on these platforms that took them to the web survey on SurveyMonkey, including the consent form at the beginning. Facebook, Instagram, and YouTube were selected as the most appropriate social media platforms because of their usage prevalence among adults in the United States (see Pew Research Center, 2021).

I also distributed surveys using email and during select in-person events hosted by local organizations who provide services to construction workers in central Florida, including training and career development. I was present at these events to distribute QR codes that linked to the web-based survey and paper-based surveys as needed. Paper-based surveys were only handled and secured by me to ensure data security and to avoid additional training for any event hosts. The identity of the organizations hosting these events were also masked for publishing.

I used specific inclusion and exclusion criteria during data preparation to determine a final sample. Participants were excluded from the study if they did not work in construction or if they did not work in central Florida. Additionally, participants were excluded if they were determined to hold an occupation with lower risk, reduced exposure to construction site hazards, or potential bias to occupational risk perceptions, such as inspectors, estimators, and safety professionals. Hispanic and Latino ethnicity did not serve as exclusion criteria but served as a qualifier to address RQ2.

Pilot Study

To ensure validity and reliability between the English and Spanish versions of the survey, I conducted a pilot study using a convenience sample of safety professionals who were fluent in both languages. The survey was first written in English, translated into Spanish by an ATA certified translator, back translated from Spanish to English by a separate ATA certified translator, then prepared for a pilot study to establish face validity and measure stability of scale between languages using intraclass correlation coefficient. Bilingual safety professionals were targeted for this pilot study due to their knowledge of occupational risk perceptions and fluency in English and Spanish. The target sample size for the pilot study was met at > 5% (N = 7) of the target sample size for the main study. In a modified test-retest fashion, participants completed the English version of the survey and then completed the Spanish version of the survey 1 week later. Each item of the CoWoRP scale was tested for stability of scale between languages, and unstructured qualitative feedback was gathered from participants for face validity. This pilot study helped maintain validity and reliability when translation was needed to effectively reach the target population.

Instrumentation and Operationalization of Constructs

Aside from demographic information, the major part of the survey measured occupational risk perceptions using the CoWoRP scale developed by Man et al. (2019a). I obtained permission from the authors to use the CoWoRP scale, which is included in Appendix A. The CoWoRP scale was deemed appropriate to the study because it was specifically designed to quantitatively measure occupational risk perceptions among construction workers. Man et al. (2019b) developed and validated this instrument using data from a sample of *N* = 469 construction workers in Hong Kong, and they reported internal consistency, test-retest reliability, and convergent, discriminant, and criterion-related validity for 13 items across three dimensions. The CoWoRP scale has been used to explore relationships between occupational risk perceptions and organizational factors, use of personal protective equipment, and has even been adopted for a study among construction workers in Thailand (Khaday et al., 2021b; Man et al., 2021a, 2021b). Table 1 describes the final version of the CoWoRP scale. For this doctoral study, one total score was derived from the instrument to indicate occupational risk perceptions of participants.

Table 1

Item Details of the Final Version of the CoWoRP Scale With 13 Items

Factor	Scale format	Item
RP – probability	An 11-point phrase completion scale ranging from 0 (indicating “not at all likely”) to 10 (indicating “extremely likely”)	If you experience the following work events or situations, how likely will you be to experience negative consequences in your perspective? RP-P1. Working on a moving route of lifting RP-P2. Engaging in electrical works (e.g. electric arc welding) in a workplace that is affected by rainy weather RP-P3. Using electrical equipment with damaged wires
RP - severity	An 11-point phrase completion scale ranging from 0 (indicating “not at all severe”) to 10 (indicating “extremely severe”)	If you experience the following work events or situations how severe will the potential negative consequences be in your perspective? RP-S1. Working on an unstable trestle ladder RP-S2. Working at heights with high winds RP-S3. Working under suspended materials RP-S4. Using electrical equipment without insulation and proper earthing of electrical circuitry in a wet workplace
RP – worry and unsafe	An 11-point phrase completion scale ranging from 0 (indicating “not at all worried”) to 10 (indicating “extremely worried”)	If you experience the following work events or situations, how worried will you be about the potential negative consequences? RP-WU1. Improperly placing wires on the ground RP-WU2. Using a phone when working on a construction site RP-WU3. Not wearing masks when working in a dusty workplace
	An 11-point phrase completion scale ranging from 0 (indicating “extremely safe”) to 10 (indicating “extremely unsafe”)	If you experience the following work events or situations, how unsafe will you feel regarding the potential negative consequences? RP-WU4. Walking through an improperly paved carpet or mat RP-WU5. Wearing protective gloves of inappropriate size to move heavy objects RP-WU6. Not wearing a reflective vest when working in a dim workplace

Note: From “Construction Worker Risk Perception Scale,” by S. S. Man, A. H. Chan, and S. Alabdulkarim, 2019a, *PsycTESTS*. https://doi.org/10.1037/t83568-000. Copyright

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Operationalization

In this section, I describe the operational definition and measurement of each variable. The independent variable for RQ1 was the nominal variable birthplace, categorized as foreign-born or native-born, and also acted as exclusion criteria for RQ2. The independent variable for RQ2 was the ordinal variable number of years working in the United States. The dependent variable for both RQs was risk perception presented as one total score as measured by the CoWoRP scale (Man et al., 2019a). The control variable, education level, was used for RQ1 and RQ2, and the other control variable, age of the worker, was only used for RQ1 due to the potential correlation with number of years working in the United States. English language fluency was also used as a control variable for RQ2. Exclusion criteria variables included work location, to ensure only participants working in central Florida were included, and number of years working in construction, to ensure participants either were working in construction or had construction experience and could be reasonably expected to understand the items presented in the CoWoRP scale. Participants who were under 18 years of age were automatically excluded through disqualification logic in the web-based survey. Variable definitions and coding are detailed in Table 2.

Table 2

Variable Definitions and Coding

Variable name	Type of measure	Definition	Use	Variable codes
BIRTH	Nominal	Where the worker was born	Independent	United States = 1; Outside the United States = 2
USWORK	Ordinal	How many years worked in the United States	Independent	< 1 year = 1; 1-5 years = 2; 6-10 years = 3; 11-15 years = 4; > 15 years = 5
RISK	Scale	Total risk perception score from CoWoRP scale	Dependent	Range is 0-130, higher values mean higher risk perception
AGE	Ordinal	Reported age of the worker	Control/ Exclusion	<18 = 1; 18-24 = 2; 25-34 = 3; 35-44 = 4; 45-54 = 5; 55-64 = 6; 65 or older = 7
ETHNIC	Nominal	Reported ethnicity	Demographic	Hispanic or Latino = 1; Not Hispanic or Latino = 2
FLUENT	Ordinal	Reported English language fluency	Demographic	None = 1; Some English = 2; Fluent English = 3
METRO	Nominal	Reported geographical location of work	Exclusion	Lakeland-Winter Haven = 1; Ocala = 2; Orlando-Kissimmee-Sanford = 3; Sebring = 4; The Villages = 5; outside central Florida = 6; Other = 7
CONSTR	Ordinal	How many years worked in construction	Exclusion	No construction experience = 1; < 1 year = 2; 1-5 years = 3; 6-10 years = 4; 11-15 years = 5; > 15 years = 6

Variable name	Type of measure	Definition	Use	Variable codes
EDUC	Ordinal	Education level	Control	Did not attend school = 1; I attended school but did not attend high school = 2; Some high school (did not graduate) = 3; High school diploma/GED or equivalent = 4; Some trade school = 5; Completed trade school = 6; Some college = 7; Bachelor’s degree or higher = 8
TRADE	Nominal	Primary trade within construction	Demographic	Electrical = 1; Masonry/concrete = 2; Pipefitting = 3; HVAC = 4; Carpentry = 5; Drywall = 6; Painting = 7; Steelwork/Ironwork = 8; Roofing = 9; General Labor = 10; Insulation = 11; Other = 12
TITLE	Nominal	Title of the worker	Demographic /Exclusion	Helper/Laborer = 1; Skilled worker = 2; Operator = 3; Apprentice or equivalent = 4; Journeyman or equivalent = 5; Master or equivalent = 6; Manager/Supervisor = 7; Superintendent = 8; Project manager = 9; Director = 10; Inspector = 11; Surveyor = 12; Safety = 13; Owner = 14; Other = 15

Data Analysis Plan

I used SPSS Version 28 for the data analysis in this study. I exported the data set from the web survey platform, SurveyMonkey, to a SAV file that could be imported into SPSS. The target sample size for analysis was N = 119 based on the power analysis previously discussed in the population subsection. I thoroughly reviewed each response and excluded responses with missing data, participants located outside of central Florida, participants with no construction experience, and participants in occupations that had lower risk, had little to no exposure to construction hazards, or potentially had biased occupational risk perceptions. I then analyzed the final prepared data set and conducted an effect size test using G*Power software.

The steps for analysis of the dataset to address the RQs are described as follows. First, I created a variable which is the total of all 13 risk variables to serve as the final risk perception score for each participant. I created descriptive statistics of all variables including mean, standard deviation, minimum, and maximum. I also created frequency tables for all nominal and ordinal variables. Pearson correlations were inspected for all independent, dependent, and control variables to identify any multicollinearities. I used a multiple linear regression model to address RQ1 and RQ2 using associated independent variables, dependent variables, and control variables. Ethnicity was used as a selection variable for RQ2. Any control variables that were not found to be statistically significant were removed from the final regression model. The RQs are restated below.

RQ1: Is there an association between birthplace, in terms of foreign-born or native-born, and occupational risk perceptions among construction workers in central Florida when controlling for age of the worker and education level?

$H_0$1: There is no significant association between birthplace and occupational risk perceptions among construction workers in central Florida when controlling for age of the worker and education level.

H_a1: There is a significant association between birthplace and occupational risk perceptions among construction workers in central Florida when controlling for age of the worker and education level.

RQ2: Is there an association between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born construction workers in central Florida when controlling for English language fluency and education level?

$H_0$2: There is no significant association between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born construction workers in central Florida when controlling for English language fluency and education level.

H_a2: There is a significant association between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born workers in central Florida when controlling for English language fluency and education level.

Threats to Validity

I implemented several strategies to ensure internal and external validity concerns were addressed. I employed a convenience sample due to resource availability and participant accessibility, and while the resulting data may not be generalizable to the entire population, external validity was addressed by obtaining an adequate sample size determined from the use of G*Power software. Although the final proportion of birthplace and ethnicity among participants was not identical to the characteristics of the entire population discussed in the population subsection, limiting generalizability, the adequate representation of groups within the study allowed for effective analysis using the regression models in this study. This study also required translation of the CoWoRP scale instrument into Spanish for participant accessibility, which necessitated translation, backtranslation, and the pilot study to measure validity and reliability between languages. Finally, I addressed statistical validity through thorough data cleaning to exclude responses with missing and inconsistent data.

Ethical Procedures

Due to the nature of the population and the data needed for this study, some ethical concerns needed to be addressed. Because of the demographic variables being collected that could potentially be aggregated to identify participants, complete anonymity may not have been possible, but participant confidentiality was still maintained. Additionally, the identity of any organizations that assisted in accessing participants were masked in the final study. A Walden University IRB application was submitted, and this study was approved prior to data collection, analysis, and reporting under approval number 01-03-23-1052862.

A data security plan was also implemented to ensure confidentiality of participant data. Momentive (2022) provides physical security, access control, and encryption for all data collected via the web-based survey on SurveyMonkey and housed on Momentive servers. Data exported from SurveyMonkey for analysis was housed on an encrypted hard drive only accessible by me. Paper-based surveys were kept in a locked case that was only accessible by me until the data could be merged with web-based survey data in SPSS. Five years after the study has concluded, paper-based survey data will be destroyed using a micro-cut shredder with P-5 high-security level. The hard drive containing the electronic data will be wiped using a partition wizard to remove every sector of data and fill sectors with zero and one.

Summary

Section 2 detailed the research methodology used for this quantitative study. This cross-sectional study of self-reported risk perceptions among construction workers in central Florida was designed to address the RQs described in Section 1. A web-based survey was distributed to participants through social media marketing and at select in-person events hosted by non-profit organizations that provide services to construction workers in central Florida. Along with demographic information, risk perceptions were measured using a total score derived from the CoWoRP scale developed and validated by Man et al. (2019a, 2019b). After data cleaning and the use of exclusion criteria, multiple regression served as the statistical analysis strategy for both RQs. Strategies were implemented to ensure threats to validity, ethical procedures, and data security were addressed appropriately. The results of the study are presented in Section 3.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this doctoral study was to explore the occupational risk perceptions among foreign-born construction workers in central Florida compared to their native-born peers. RQ1 sought to determine if there was a relationship between birthplace, in terms of foreign-born or native-born, and occupational risk perceptions among construction workers in central Florida while controlling for age of the worker and education level. RQ2 was designed to determine if there was a relationship between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born construction workers in central Florida while controlling for English language fluency and education level. In this section, I describe the pilot study for validity and reliability testing of the survey instrument, the data collection process, statistical analysis used for the study, and the final results.

Pilot Study

I conducted a pilot study to establish face validity and reliability between the English and Spanish versions of the survey. A final sample size of $N = 7$ bilingual safety professionals were issued the English version of the web-based survey then asked to complete the Spanish version of the survey 1 week later. Qualitative feedback for face validity was obtained through email, and data were exported to SPSS version 28 for reliability analysis. I used Pearson correlation and intraclass correlation coefficients to evaluate reliability across CoWoRP item means between the English and Spanish versions of the survey. Overall reliability analysis results reflected moderate correlations between item means, and qualitative feedback gained from select participants revealed additional limitations to both versions of the CoWoRP scale. Results of the pilot study are more thoroughly detailed in Appendix B.

Data Collection

A web-based survey was distributed to a convenience sample of construction workers in central Florida through social media marketing, SurveyMonkey targeting, and local organizations with access to construction workers over a period of six weeks. A paper-based survey was made available, but none were requested or received. A total of N = 162 responses were received from all distribution channels, including N = 85 from distribution through local organizations, N = 77 through SurveyMonkey targeting, and no responses from social media marketing. Responses were removed if they indicated they lived outside of central Florida (N = 3), possessed titles that were considered to have little exposure to construction hazards (i.e. administrative assistant, human resources, accounting) or have biased risk perceptions (i.e. safety; N = 11), or were incomplete (N = 18), resulting in a final sample size of N = 130 and exceeding the target sample size of N = 119. A post hoc power analysis was conducted after the study using G*Power software to determine the power of the final sample size. For a multiple regression model, an effect size of 0.15, an alpha of 0.05, and three predictor variables, a sample size of N = 130 resulted in a statistical power of .97. The final sample size was appropriate for the regression model used in this study to address the RQs.

As detailed in Section 2, approximately 38.8% of construction workers in central Florida are Hispanic and Latino, 34.8% of all construction workers in central Florida are foreign-born, and 48.8% of foreign-born construction workers in central Florida are Hispanic and Latino. In the final sample, 56.9% (*N* = 74) of respondents were Hispanic or Latino, 43.1% (*N* = 56) of respondents were foreign-born, and 94.6% (*N* = 53) of foreign-born respondents were Hispanic or Latino. The discrepancy in representation could be attributed to the convenience sampling methods used for survey distribution. However, the adequately sized groups of foreign-born and native-born construction workers within the sample allowed for adequate analysis within the regression model for this study.

Table 3 describes the final sample by demographic variables, including dependent and control variables, collected during the survey. Most participants were aged between 25 and 54 years, with 61.6% (*N* = 80) of participants aged between 25 and 44 years. Thirty point eight percent (*N* = 40) of participants reported their highest level of completed education as high school diploma, GED, or equivalent; 18.5% (*N* = 24) of participants completed some college; and 40.0% (*N* = 52) of participants possessed a bachelor's degree or higher. Participants were only asked, "How many years have you worked in the United States?" and "How well do you speak English?" if they indicated that they were born outside the United States. Most participants (69.2%, *N* = 90) had worked in construction for less than 10 years, and the top trades represented were electrical (26.2%, *N* = 34), general labor (20.0%, *N* = 26), and masonry/concrete (10.8%, *N* = 14). Respective to convenience sampling methods used and the geographical concentration of construction work in central Florida, the majority of participants indicated their primary work location as Orlando-Kissimmee-Sanford (90.0%, *N* = 117).

Table 3

Descriptive Statistics of the Final Sample

Item (Type)	(Code) Response	Frequency	Percent
Age (Ordinal)	(2) 18-24	11	8.5
	(3) 25-34	40	30.8
	(4) 35-44	40	30.8
	(5) 45-54	27	20.8
	(6) 55-64	11	8.5
	(7) 65+	1	0.8
	Total	130	100.0
Birthplace (Nominal)	(1) United States	74	56.9
	(2) Outside the United States	56	43.1
	Total	130	100.0
Number of years worked in the United States (Ordinal)	(1) Less than 1 year	5	3.8
	(2) 1-5 years	29	22.3
	(3) 6-10 years	11	8.5
	(4) 11-15 years	2	1.5
	(5) More than 15 years	9	6.9
	Total	56	43.1
English language fluency (Ordinal)	(1) I do not speak any English	18	13.8
	(2) I speak some English	23	17.7
	(3) I am fluent in English	15	11.5
	Total	56	43.1
Race/ Ethnicity (Nominal)	(1) Hispanic or Latino	74	56.9
	(2) Not Hispanic or Latino	56	43.1
	Total	130	100.0
Education level (Ordinal)	(2) Attended school but did not attend high school	2	1.5
	(3) Some high school	3	2.3
	(4) High school diploma/GED or equivalent	40	30.8
	(5) Some trade school	4	3.1
	(6) Completed trade school	5	3.8
	(7) Some college	24	18.5
	(8) Bachelor's degree or higher	52	40.0
	Total	130	100.0
Work location (Nominal)	(1) Lakeland-Winter Haven	3	2.3
	(2) Ocala	4	3.1
	(3) Orlando-Kissimmee-Sanford	117	90.0
	(4) Sebring	1	0.8
	(5) The Villages	5	3.8
	Total	130	100.0

Item (Type)	(Code) Response	Frequency	Percent
Number of years worked in construction (Ordinal)	(2) Less than 1 year	11	8.5
	(3) 1-5 years	46	35.4
	(4) 6-10 years	33	25.4
	(5) 11-15 years	15	11.5
	(6) More than 15 years	25	19.2
	Total	130	100.0
Construction trade (Nominal)	(1) Electrical	34	26.2
	(2) Masonry/concrete	14	10.8
	(3) Pipefitting	7	5.4
	(4) HVAC	9	6.9
	(5) Carpentry	7	5.4
	(6) Drywall	6	4.6
	(7) Painting	7	5.4
	(8) Steelwork/ironwork	5	3.8
	(9) Roofing	8	6.2
	(10) General labor	26	20.0
	(11) Insulation	3	2.3
	(12) Other	4	3.1
	Total	130	100.0
Title (Nominal)	(1) Helper/laborer	16	12.3
	(2) Skilled worker	39	30.0
	(3) Operator	6	4.6
	(4) Apprentice or equivalent	9	6.9
	(5) Journeyman or equivalent	17	13.1
	(6) Master or equivalent	6	4.6
	(7) Manager/supervisor	19	14.6
	(8) Superintendent	2	1.5
	(9) Project manager	7	5.4
	(10) Director	5	3.8
	(14) Owner	3	2.3
	(15) Other	1	0.8
	Total	130	100.0

Note. Number of years worked in the United States and English language fluency were only answered by respondents who indicated they were born outside the United States (*N* =56).

As noted in Table 3, some independent and control variable categories had very few observations. For example, the control variable education level had very few observations for the categories "attended school but did not attend high school" (*N* = 2), "some high school" (*N* = 3), "some trade school" (*N* = 4), and "completed trade school" (*N* = 5). Categories with so few observations were deemed to be statistically inappropriate. Therefore, categories were combined and recoded for the variables "age," "number of years worked in the United States," and "education level" for strengthened analysis using the regression models for this study. Table 4 provides the descriptive statistics and updated coding for these variables.

Table 4

Descriptive Statistics of Variables With Corrected Categories

Item (Type)	(Code) Response	Frequency	Percent
Age (Ordinal)	(1) 18-24	11	8.5
	(2) 25-34	40	30.8
	(3) 35-44	40	30.8
	(4) 45-54	27	20.8
	(5) 55+	12	9.2
	Total	130	100.0
Number of years worked in the United States (Ordinal)	(1) Less than 5 years	34	60.7
	(2) 6-10 years	11	19.6
	(3) More than 11 years	11	19.6
	Total	56	100.0
Education level (Ordinal)	(1) High school diploma/GED or less	45	34.6
	(2) Some trade school/completed trade school/some college	33	25.4
	(3) Bachelor's degree or higher	52	40.0
	Total	130	100.0

Note. Number of years worked in the United States was only answered by respondents who indicated they were born outside the United States (*N* =56).

Table 5 provides descriptive statistics for the CoWoRP scale across all items as well as the total score used for the regression models for RQ1 and RQ2. Responses for each individual CoWoRP item ranged from 0 to 10, and the total score ranged from 0 to 130. Higher scores represent higher perceptions of occupational risk (Man et al., 2019b). The highest mean statistics were among items RP-S2 (7.78), RP-S4 (7.75), RP-S3 (7.64), and RP-S1 (7.61), indicating overall higher mean perceptions of severity of negative consequences relative to risky scenarios than perceived probability, worry, or unsafe feelings about risky scenarios presented in the CoWoRP scale. However, the relatively small mean range across individual items adequately justified the use of a total score for the regression models used in this study. Table 6 displays the item-wise descriptives by response along with the exact questions that were used within the CoWoRP scale. No wording or items were altered from the original version published by Man et al. (2019a). Scale reliability was evaluated using Chronbach's Alpha for each of the three domains as well as overall, each having a value of greater than 0.7.

Table 5

CoWoRP Scale Descriptive Statistics

		Mean				Skewness	
CoWoRP Item	*N*	Statistic	Std. Error	Std. Deviation	Variance	Statistic	Std. Error
RP-P1	130	6.41	.274	3.125	9.763	-.632	.212
RP-P2	130	6.76	.296	3.371	11.361	-.811	.212
RP-P3	130	6.25	.326	3.719	13.834	-.647	.212
RP-S1	130	7.61	.249	2.835	8.039	-1.260	.212
RP-S2	130	7.78	.245	2.793	7.803	-1.388	.212
RP-S3	130	7.64	.240	2.736	7.488	-1.291	.212
RP-S4	130	7.75	.262	2.991	8.947	-1.227	.212
RP-WU1	130	7.34	.253	2.882	8.303	-1.034	.212
RP-WU2	130	6.74	.279	3.176	10.086	-.690	.212
RP-WU3	130	7.32	.248	2.832	8.019	-.917	.212
RP-WU4	130	6.79	.262	2.990	8.941	-.727	.212
RP-WU5	130	6.55	.271	3.093	9.567	-.619	.212
RP-WU6	130	7.52	.252	2.875	8.267	-1.146	.212
RISK (Total score)	130	92.47	2.424	27.640	763.987	-.814	.212

Table 6

Item-Wise Descriptive Statistics by CoWoRP Scale Items

Item	Score Response Percentage										
	RP Domain 1: Probability (Chronbach's Alpha = .846)										
	Not at all likely										Extremely likely
	0	1	2	3	4	5	6	7	8	9	10
RP-P1: Working on a moving route of lifting	7.7	3.8	2.3	4.6	4.6	16.2	3.1	13.8	13.1	8.5	22.3
RP-P2: Engaging in electrical works (e.g. electric arc welding) in a workplace that is affected by rainy weather	11.5	0.0	3.8	3.1	3.8	9.2	7.7	9.2	10.8	6.9	33.8
RP-P3: Using electrical equipment with damaged wires	16.9	4.6	0.8	1.5	6.2	6.2	3.8	10.8	10.0	11.5	27.7
RP Domain 2: Severity (Chronbach's Alpha = .938) If you experience the following work events or situations, how <u>severe</u> will the potential negative consequences be in your perspective?											
	Not at all severe										Extremely severe
	0	1	2	3	4	5	6	7	8	9	10
RP-S1: Working on an unstable trestle ladder	5.4	0.0	2.3	3.1	3.1	6.2	6.9	10.8	12.3	11.5	38.5
RP-S2: Working at heights with high winds	4.6	0.8	2.3	3.1	1.5	5.4	6.9	8.5	14.6	10.8	41.5
RP-S3: Working under suspended materials	4.6	0.8	1.5	2.3	3.1	7.7	5.4	10.8	17.7	8.5	37.7
RP-S4: Using electrical equipment without insulation and proper earthing of electrical circuitry in a wet workplace	4.6	0.8	3.8	3.1	2.3	8.5	5.4	5.4	8.5	8.5	49.2
RP Domain 3: Worry and unsafe (Chronbach's Alpha = .915) If you experience the following work events or situations, how <u>worried</u> will you be about the potential negative consequences?											
	Not at all worried										Extremely worried
	0	1	2	3	4	5	6	7	8	9	10

Item	Score Response Percentage										
RP-WU1: Improperly placing wires on the ground	4.6	1.5	2.3	3.8	4.6	4.6	9.2	13.8	12.3	6.9	36.2
RP-WU2: Using a phone when working on a construction site	6.2	3.1	3.1	6.9	6.2	6.9	8.5	9.2	10.0	10.8	29.2
RP-WU3: Not wearing masks in a dusty workplace	3.1	0.8	4.6	4.6	4.6	6.9	7.7	10.8	13.1	9.2	34.6
If you experience the following work events or situations, how <u>unsafe</u> will you feel regarding the potential negative consequences?											
	Extremely safe										Extremely unsafe
	0	1	2	3	4	5	6	7	8	9	10
RP-WU4: Walking through an improperly paved carpet or mat	4.6	4.6	2.3	2.3	6.9	9.2	10.8	13.1	10.8	6.9	28.5
RP-WU5: Wearing protective gloves of inappropriate size to move heavy objects	6.2	3.1	4.6	4.6	3.1	13.1	10.8	10.0	10.8	7.7	26.2
RP-WU6: Not wearing a reflective vest when working in a dim workplace	4.6	2.3	0.0	3.1	4.6	10.8	3.8	7.7	14.6	10.0	38.5

Note. Chronbach's Alpha for all items in the CoWoRP scale was .917.

Results

Linear regression models were used to determine the relationships between variables for both RQ1 and RQ2. I chose linear regression as the preferred statistical test because it was an appropriate means to determine the relationship between both ordinal and nominal independent variables and a scale dependent variable. For both RQs, I used a simple linear regression model to examine the direct relationship between the independent variable and the dependent variable followed by a multiple linear regression model which incorporated the control variables respective to each RQ. For each regression model, the *F* test was used to determine the model's overall significance, R^2 values were used to identify model fit and the amount of variance in the dependent variable that could be explained by the model, and coefficient *p* values were used to determine the significance of each independent and control variable with a prechosen study alpha of .05.

RQ1 sought to determine if there was a relationship between birthplace (i.e., United States or outside the United States) and occupational risk perceptions among construction workers in central Florida while controlling for age and education level. To answer RQ1, three regression models were used. Model 1, a simple linear regression model, used only birthplace as the independent variable and the CoWoRP scale total score as the dependent variable. Model 2, a multiple linear regression model, used birthplace as the independent variable and incorporated both control variables, age and education level. However, education level was determined to not statistically significantly predict risk perceptions in this model, and Model 3 was created to only control for age.

Table 7 displays the model summary for all three models, Table 8 shows the ANOVA for the regression models, and Table 9 shows the coefficients for each model.

Table 7

RQ1 Regression Model Summary

					Change Statistics				
Model	*R*	*R* Square	Adjusted *R* Square	Std. Error	*R* Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.270	.073	.066	26.717	.073	10.072	1	128	.002
2	.373	.139	.118	25.955	.066	4.815	2	126	.010
3	.372	.139	.125	25.853	.066	9.700	1	127	.002

Note. Dependent variable: RISK (CoWoRP scale total score). Model 1 predictors: (Constant), birthplace. Model 2 predictors: (Constant), birthplace, age, education level. Model 3 predictors: (Constant), birthplace, age.

All three regression models used for RQ1 were statistically significant with *p* values below the prechosen study alpha of .05. In the simple linear regression Model 1, R^2 = .073, indicating a low model fit for explaining the outcome of risk perceptions, but birthplace still statistically significantly accounted for 7.3% of the variance in CoWoRP scale total scores. The multiple linear regression Model 2, which included education level and age as control variables, had an R^2 value of .139, significantly predicting 13.9% of the variance in CoWoRP total scores. Finally, Model 3, which only included age as a control variable due to the lack of significance of education level as a predictor of risk perceptions as indicated in Table 8, had an R^2 value of .139, significantly predicting

13.9% of the variance in CoWoRP total scores. Even so, the standard error values for Model 1 (*SE* = 26.717), Model 2 (*SE* = 25.955), and Model 3 (*SE* = 25.853) indicate a high level of variance of the observed values from the regression line.

Table 8

ANOVA for RQ1 Regression Models

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	7189.395	1	7189.395	10.072	.002
	Residual	91364.982	128	713.789		
	Total	98554.377	129			
2	Regression	13676.229	3	4558.743	6.767	<.001
	Residual	84878.148	126	673.636		
	Total	98554.377	129			
3	Regression	13672.263	2	6836.131	10.228	<.001
	Residual	84882.114	127	668.363		
	Total	98554.377	129			

Note. Dependent variable: RISK (CoWoRP scale total score). Model 1 predictors: (Constant), birthplace. Model 2 predictors: (Constant), birthplace, age, education level. Model 3 predictors: (Constant), birthplace, age.

Table 8 displays the ANOVA for each of the regression models used for RQ1. All 3 models indicated good fit and a statistically significant prediction of risk perceptions with *p* values below the prechosen study alpha of .05. Model 2 had the lowest overall *F* value of 6.767 but was statistically significant ($p < .05$). Model 1 had a higher overall *F* value of 10.072 ($p < .05$), and Model 3 had the highest *F* value of 10.228 ($p < .05$).

Table 9

Coefficients for RQ1 Regression Models

Model	Variable	Unstandardized Coefficients *B*	Std. Error	Standardized Coefficients Beta	*t*	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound
1	Constant	70.982	7.164		9.908	<.001	56.806	85.158
	BIRTH	15.018	4.732	.270	3.174	.002	5.655	24.381
2	Constant	53.618	9.632		5.567	<.001	34.556	72.679
	BIRTH	13.814	4.654	.248	2.968	.004	4.604	23.023
	AGE	6.401	2.095	.256	3.056	.003	2.256	10.546
	EDUC	.207	2.698	.006	.077	.939	-5.133	5.547
3	Constant	53.905	8.839		6.099	<.001	36.414	71.396
	BIRTH	13.861	4.594	.249	3.017	.003	4.770	22.952
	AGE	6.425	2.063	.257	3.114	.002	2.343	10.508

Note. Dependent variable: RISK (CoWoRP scale total score).

Table 9 shows the coefficient values for each regression model, noting that all regression models were found to be statistically significant as shown in Table 7 and Table 8. Model 1 shows that birthplace statistically significantly predicted risk perceptions, $F(1, 128) = 10.072$, $p < .05$, $R^2 = .073$, with an unstandardized coefficient *B* for birthplace indicating that being born outside the United States accounts for CoWoRP scale total score increase of 15.018, even if birthplace alone only accounts for 7.3% of the variance in risk perceptions. Model 2 was also statistically significant, $F(3, 126) = 6.767$, $p < .05$, $R^2 = .139$, but education level did not statistically significantly predict risk perceptions ($B = .207$, $p = .939$), indicating a lack of need to control for education level in the final regression model. Model 3 provided the strongest prediction of risk perceptions, $F(2, 127) = 10.228$, $p <.05$, $R^2 = .139$. In this model, it was found that both birthplace ($B = 13.861$, $p <.05$) and age ($B = 6.425$, $p < .05$) significantly predicted risk perceptions accounting for 13.9% of the variance. Table 10 displays collinearity diagnostics for all 3 regression models, in which no issues with multicollinearity were found between variables. In the final regression model, being born outside the United States predicted a CoWoRP total score increase of 13.861 when controlling for age of the worker. While this model rejects the null hypothesis for RQ1, it is important to note that foreign-born construction workers indicated higher perceptions of occupational risk than their native-born peers, which is further illustrated in Figure 4.

Figure 4

Mean CoWoRP Total Score by Age and Birthplace

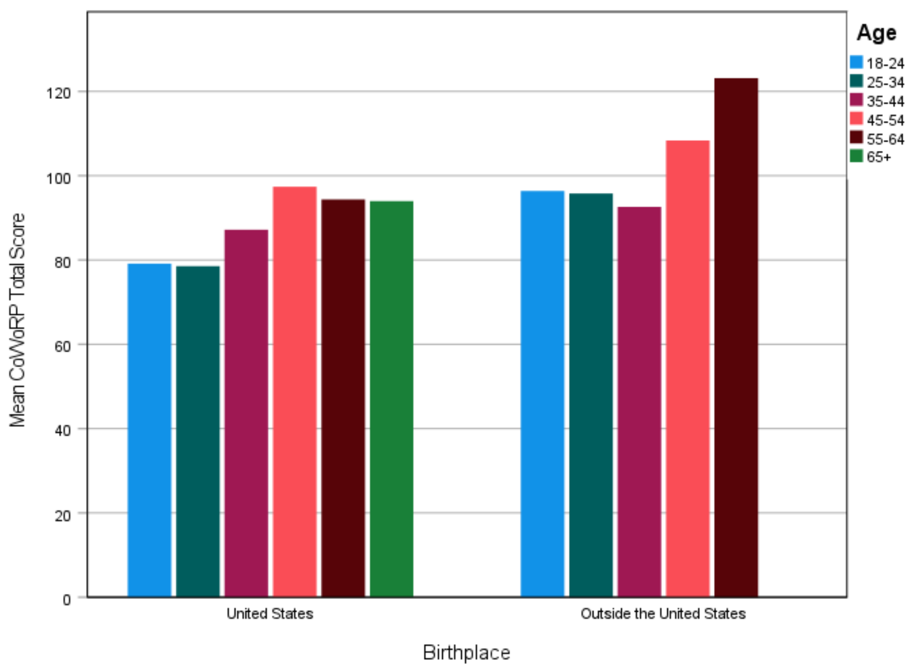

Figure 4 visually summarizes the differences in mean CoWoRP total scores across age categories between native-born and foreign-born construction workers. Both birthplace and age were found to have statistically significant effects on risk perceptions in the final regression model for RQ1. While this illustration is not a further test for statistical significance, it serves to visualize how foreign-born construction workers indicated higher perceptions of occupational risk across all categories compared to native-born construction workers in central Florida. The interpretation of these findings are further discussed in Section 4.

Table 10

Collinearity Diagnostics for RQ1 Regression Models

				Variance proportions			
Model	Dimension	Eigenvalue	Condition index	Constant	BIRTH	AGE	EDUC
1	1	1.945	1.000	.03			
	2	.055	5.947	.97	.97		
2	1	3.735	1.000	.00	.01	.01	.01
	2	.117	5.638	.01	.03	.27	.84
	3	.107	5.919	.00	.54	.46	.06
	4	.041	9.570	.99	.42	.26	.10
3	1	2.849	1.000	.01	.01		
	2	.107	5.155	.00	.44	.64	
	3	.044	8.090	.99	.55	.35	

Note. Dependent variable: RISK (CoWoRP scale total score).

RQ2 was designed to determine if there was an association between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born construction workers in central Florida while controlling for English language fluency and education level. Two regression models were used to answer RQ2, with the first, a simple linear regression model, using only number of years worked in the United States as an independent variable and the second, a multiple linear regression model, incorporating English language fluency and education level as control variables. Neither model was found to significantly predict occupational risk perceptions. It should also be noted that this model used a reduced sample size (*N* = 53, statistical power = .61) as described in Table 11 because of the specificity of the population required to answer RQ2. However, Cohen's defined effect sizes for regression models of .10, .30, and .50 as small, medium, and large, respectively, suggest that this sample still resulted in a large effect size to test the hypothesis for the population (see Faul et al., 2007). Table 12 shows the regression model summary, Table 13 displays the ANOVA for the two models, and Table 14 describes the coefficients for the regression models.

Table 11

Descriptive Statistics for RQ2 Sample Variables (N = 53)

Item (Type)	(Code) Response	Frequency	Percent
Number of years worked in the United States (Ordinal)	(1) Less than 5 years	34	64.2
	(2) 6-10 years	11	20.8
	(3) More than 11 years	8	15.1
	Total	53	100.0
English language fluency (Ordinal)	(1) I do not speak any English	18	34.0
	(2) I speak some English	23	43.4
	(3) I am fluent in English	12	22.6
	Total	53	100.0
Education level (Ordinal)	(1) High school diploma/GED or less	16	30.2
	(2) Some trade school/completed trade school/some college	10	18.9
	(3) Bachelor's degree or higher	27	50.9
	Total	53	100.0

Note. Selecting cases for which birthplace = outside the United States and race/ethnicity = Hispanic or Latino.

Table 12

RQ2 Regression Model Summary

					Change Statistics				
Model	*R*	*R* Square	Adjusted *R* Square	Std. Error	*R* Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.046	.002	-.017	27.301	.002	.110	1	51	.741
2	.174	.030	-.029	27.456	.028	.713	2	49	.495

Note. Selecting cases for which birthplace = outside the United States and race/ethnicity = Hispanic or Latino. Dependent variable: RISK (CoWoRP scale total score). Model 1 predictors: (Constant), number of years worked in the United States. Model 2 predictors:

(Constant), number of years worked in the United States, English language fluency, education level.

Neither of the regression models used for RQ2 were statistically significant with *p* values above the prechosen study alpha of .05. In the simple linear regression Model 1, R^2 = .002, indicating a poor model fit and was not statistically significant (p = .741). This model suggests that number of years working in the United States had little to no effect on the variance in CoWoRP total scores among Hispanic and Latino foreign-born construction workers. The multiple linear regression Model 2, which included English language fluency and education level as control variables, had an R^2 value of .030, again indicating poor model fit and did not statistically significantly predict variance in CoWoRP total scores (p = .495). Standard error values for Model 1 (*SE* = 27.301) and Model 2 (*SE* = 27.456) indicated a high level of variance of the observed values from the regression line.

Table 13

ANOVA for RQ2 Regression Models

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	82.352	1	82.352	.110	.741
	Residual	38012.441	51	745.342		
	Total	38094.792	52			
2	Regression	1157.259	3	385.753	.512	.676
	Residual	36937.534	49	753.827		
	Total	38094.792	52			

Note. Selecting cases for which birthplace = outside the United States and race/ethnicity = Hispanic or Latino. Dependent variable: RISK (CoWoRP scale total score). Model 1 predictors: (Constant), number of years worked in the United States. Model 2 predictors:

(Constant), number of years worked in the United States, English language fluency, education level.

Table 13 shows the ANOVA for each of the regression models used for RQ2. Neither model indicated good fit and did not statistically significantly predict risk perceptions with *p* values above the prechosen study alpha of .05. Model 1 had an overall *F* value of .110 and was not statistically significant (*p* = .741). Model 2 had a higher overall *F* value of .512 but was also not statistically significant (*p* =.676).

Table 14

Coefficients for RQ2 Regression Models

Model	Variable	Unstandardized Coefficients *B*	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	*t*	Sig.	95.0% Confidence Interval for *B* Lower Bound	95.0% Confidence Interval for *B* Upper Bound
1	Constant	101.316	8.493		11.929	<.001	84.266	118.366
	US WORK	1.678	5.048	.046	.332	.741	-8.457	11.813
2	Constant	115.139	17.026		6.763	<.001	80.924	149.354
	US WORK	3.844	6.032	.107	.637	.527	-8.277	15.965
	FLUENT	-6.390	5.785	-.177	-1.105	.275	-18.015	5.235
	EDUC	-2.281	4.573	-.075	-.499	.620	-11.471	6.908

Note. Selecting cases for which birthplace = outside the United States and race/ethnicity = Hispanic or Latino. Dependent variable: RISK (CoWoRP scale total score).

Table 14 displays the coefficient values for each variable used in the regression models for RQ2. Model 1 for RQ2, which examined only the relationship between number of years working in the United States and CoWoRP scale total score among Hispanic and Latino foreign-born construction workers, was not statistically significant ($F(1, 51) = .110$, $p = .741$, $R^2 = .002$), indicating almost no relationship between the two variables. Model 2 introduced the control variables, English language fluency and education level, but was also not statistically significant ($F(3, 49) = .512$, $p = .676$, $R^2 = .030$). In this model number of years worked in the United States (*B* = 3.844, *p* = .527), English language fluency (*B* = -6.390, *p* = .275), and education level (*B* = -2.281, *p* = .620) did not significantly predict occupational risk perceptions. The collinearity diagnostics shown in Table 15 indicated no issues with multicollinearity between variables in the two models. The regression models for RQ2 failed to reject the null hypothesis, suggesting that the number of years worked in the United States has no relationship with occupational risk perceptions among Hispanic and Latino foreign-born construction workers in central Florida.

Table 15

Collinearity Diagnostics for RQ2 Regression Models

				Variance Proportions			
Model	Dimension	Eigenvalue	Condition Index	Constant	US WORK	FLUENT	EDUC
1	1	1.897	1.000	.05	.05		
	2	.103	4.297	.95	.95		
2	1	3.645	1.000	.00	.01	.01	.01
	2	.241	3.893	.01	.21	.03	.27
	3	.079	6.786	.00	.62	.80	.05
	4	.035	10.198	.99	.16	.16	.67

Note. Selecting cases for which birthplace = outside the United States and race/ethnicity = Hispanic or Latino. Dependent variable: RISK (CoWoRP scale total score).

Summary

In Section 3, I detailed the completed analysis for the study, including an overview of the demographic makeup of the participants and the regression models used to address the RQs. The post hoc power analysis reflected that the sample size (N = 130, statistical power = .97) for RQ1 resulted in a large effect size. The specific portion of the sample used for the regression model for RQ2 (N = 53) had a reduced statistical power of .61, but this could still be interpreted as a large effect size (see Faul et al., 2007). Due to the convenience sampling methods used, the demographic makeup of the final sample was not perfectly reflective of the general population, but the adequate representation of foreign-born and native-born construction workers allowed for group comparison in the regression model. In the final regression model for RQ1, in which education level was removed due to not being a statistically significant predictor of risk perceptions, both birthplace (B = 13.861, p <.05) and age (B = 6.425, p < .05) were found to have statistically significant relationships with risk perceptions, accounting for 13.8% of the variance in CoWoRP scale total scores among construction workers in central Florida. In the regression model for RQ2, neither the independent variable, number of years working in the United States (B = 3.844, p = .527), nor the control variables, English language fluency (B = -6.390, p = .275) and education level (B = -2.281, p = .620), were found to have a statistically significant association with CoWoRP scale total scores among Hispanic and Latino foreign-born construction workers. In Section 4, I detail the interpretation of these findings, the limitations to the study identified during both the pilot and main portions of the study, and implications for social change.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

In this cross-sectional study, I aimed to quantitatively study the relationship between birthplace, in terms of foreign-born or native born, and occupational risk perceptions among construction workers in central Florida as well as the relationship between number of years working in the United States and occupational risk perceptions among Hispanic and Latino foreign-born workers in central Florida. I intended to fill a research gap in which few U.S.-based studies have addressed the specific vulnerabilities linked to workplace injury and fatality outcomes among Hispanic and Latino foreign-born construction workers, little if any research has examined addressable leading indicators such as risk perceptions, and no studies identified in the literature review had been conducted in central Florida. The findings from the regression models used to address the RQs indicated that birthplace has a significant effect on occupational risk perceptions when controlling for age, but no significant relationship was found between number of years working in the United States and occupational risk perceptions. In this section, I describe the interpretation of the findings relative to previous research, limitations of the study, recommendations for future research, and implications for professional practice and positive social change.

Interpretation of the Findings

The findings from this study both confirm and contradict certain assumptions that could be gleaned from previous research. First, with the understanding that higher perceptions of risk are linked with better OSH outcomes, including observable behaviors as well as workplace injuries and fatalities, it could be assumed that risk perceptions would be lower among the groups who experience higher rates of workplace injuries and fatalities, including foreign-born workers and young workers (see Aboagye et al., 2022; Flynn et al., 2015; Vierendeels et al., 2018; Xia et al., 2020). In fact, the final regression model for RQ1 reflected that lower age groups had lower mean CoWoRP scale total scores among both foreign-born and native-born construction workers in central Florida, accounting for a mean 6.197 increase in risk perception scores with each higher age group. This finding is consistent with the discussion by Flynn et al. (2015), which suggests that younger workers take more risks, even purposefully, resulting in lower perceptions of occupational risks and higher injury and fatality rates. This significant correlation between age and occupational risk perceptions among construction workers should be noted for future research as both a prominent vulnerability and a variable to be controlled when examining relationships between risk perceptions and other potential vulnerabilities.

However, this same model for RQ1 concluded that foreign-born construction workers had statistically significantly higher occupational risk perceptions than their native-born peers, which would conflict with the assumption of lower risk perceptions among this group who is more vulnerable to workplace injuries and fatalities. While there is little to no research that has examined the differences in risk perceptions between foreign-born and native-born workers in the United States, the assumption that risk perceptions would be lower among foreign-born workers was based on the fact that (a) injury and fatality rates are higher among foreign-born construction workers, not only in central Florida, but across the United States and internationally; and (b) some international research has found significantly lower risk perceptions among foreign-born workers compared to native-born workers in the destination country (BLS, 2021; Flynn et al., 2015; Ricci et al., 2021). This contradictory finding, coupled with the lack of association between occupational risk perceptions and other factors noted in previous research, such as education level, language barriers, and number of years working in the destination country, may be reflective of the limitations to the study identified during sampling and execution of the pilot and main surveys. Given the limitations and limited precedent associated with this study, future researchers should seek to further understand the relationship between birthplace and occupational risk perceptions among construction workers in central Florida and the rest of the United States.

Limitations of the Study

Several limitations to this study should be noted as identified through sampling methods and qualitative feedback gathered through the pilot study. First, as a convenience sample, it is difficult to control sampling bias that results in overrepresentation from certain groups, whether that be specific organizations, birthplace, or ethnicity. Second, due to the convenience sampling methods used, size of the organization, a vulnerability identified by Flynn et al. (2015) and Cunningham et al. (2018), was not controlled when examining the relationships between birthplace, number of years working in the United States, and occupational risk perceptions. Third, even though the survey was entirely anonymous and voluntary, the self-reported nature of risk perceptions is subject to certain response biases, such as social desirability bias or extreme responses. The sampling and response biases may have impacted the results of the survey when examining the relationships between variables presented in the RQs for the study.

Additionally, qualitative feedback gathered from the pilot study implied that rewording may be required in both the English and Spanish versions of the CoWoRP scale for improved comprehension and relevancy to the target population. Specific feedback noted grammatical, reading-level, and terminological anomalies within CoWoRP items that could have impacted the effectiveness of interpretation by participants. However, the CoWoRP scale was adopted verbatim from Man et al. (2019a) to ensure validity and reliability was not compromised, and the instrument was translated into Spanish and backtranslated from Spanish to English by two separate ATA certified translators. It may be necessary for future quantitative study of risk perceptions among construction workers in central Florida and the rest of the United States to use a modified version of the CoWoRP scale that is reworded for relevancy and comprehension followed by thorough tests for validity and reliability. The limitations noted for this study provide the foundation for recommendations for future research when examining risk perceptions among construction workers in the United States.

Recommendations

The recommendations for future research exploring the relationships between occupational risk perceptions and certain risk factors among construction workers in central Florida and the United States stem from the strengths and limitations of this study. Although convenience sampling was appropriate to overcome resource availability and participant accessibility in this study, a more thorough investigation should incorporate some method of random sampling to ensure generalizability to the entire population. This method should also incorporate potential control variables, such as size of the organization, that have been identified as vulnerabilities to workplace injuries and fatalities in previous research. While a larger sample size may not be needed to improve the statistical power of the entire sample, the reduced statistical power of .61 associated with the portion of the sample used for RQ2 ($N = 53$) suggests that a larger sample size may be needed when examining relationships between factors among Hispanic and Latino foreign-born workers, and both sampling methods and survey construction should account for potential response biases that could occur among this population. Lastly, the relevance and comprehension of items in quantitative risk perception measurement scales should be thoroughly evaluated to ensure scale items are grammatically correct, use appropriate terminology for the industry and geographical location, and are presented at the appropriate reading level for the population, and, if modifications are made, the scales must be tested for validity and reliability. Overcoming the limitations of this study should provide the opportunity for better understanding of occupational risk perceptions among construction workers in future research.

Implications for Professional Practice and Social Change

Professional Practice

The primary findings from this study provide the foundation for improved professional practice to reduce vulnerabilities to workplace injuries and fatalities among foreign-born construction workers in central Florida. Notably, occupational risk perceptions among construction workers can be improved through effective training practices (Ricci et al., 2021). With the knowledge that both age and birthplace have a relationship with occupational risk perceptions, workplace safety training should be targeted toward and tailored to more vulnerable audiences, accounting for language barriers, reading levels, and industry experience. In fact, additional workplace safety training, or lack thereof, has been associated with both risk perceptions and injury and fatality outcomes in previous research (Cunningham et al., 2018; Ricci et al., 2021). Additionally, while education level and language barriers did not appear to influence risk perceptions in this study, those factors should still be considered when designing effective workplace safety training (Cunningham et al., 2018; Flynn et al., 2015; Ricci et al., 2021). Training improvements can help increase occupational risk perceptions and, in turn, workplace injury and fatality outcomes among construction workers in central Florida.

Positive Social Change

This study provides the basis for positive social change in a few notable ways. The literature review for this study revealed that much of the previous research among foreign-born construction workers in the United States has focused on the relationships between demographic factors and workplace injury and fatality outcomes. While this type of research highlighted specific vulnerabilities, including age of the worker, birthplace, size of the organization, education level, and language barriers, these vulnerabilities are not easily, and sometimes not ethically, changeable to prevent adverse outcomes. This study was designed to examine the relationships between demographic vulnerabilities and risk perceptions, which are both addressable through appropriate intervention and directly linked to workplace injury and fatality outcomes. Other examples of quantifiable and addressable risk factors for workplace injuries and fatalities include workplace safety training and organizational culture or safety climate (Cunningham et al., 2018; Lyu et al., 2018; Ricci et al., 2021; Tear et al., 2020). Future research should continue to examine the addressable leading indicators of workplace injuries and fatalities to enable positive social change for vulnerable populations.

Conclusion

As workplace injury and fatality rates continue to increase year over year among Hispanic and Latino foreign-born construction workers in the United States, it is critical to identify addressable risk factors among this population to begin the path to positive social change. This doctoral study was designed to examine how demographic vulnerabilities, such as birthplace and number of years worked in the United States, affect occupational risk perceptions, a known predictor of workplace injury and fatality outcomes. The regression models used in this study revealed that birthplace is a significant predictor of occupational risk perceptions, even when controlling for age of the worker, which is also a significant predictor of occupational risk perceptions. Professional practices should account for these relationships when designing interventions, such as workplace safety training, to address workplace injury and fatality outcomes among construction workers who are more vulnerable. Future research should continue to quantify addressable risk factors, such as risk perceptions, workplace safety training, and organizational culture, among the most vulnerable populations to enable positive social change by reducing workplace injuries and fatalities among Hispanic and Latino foreign-born construction workers.

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Appendix A: Email Approval to Use the CoWoRP Scale Instrument

Re: [Ext] CoWoRP use permission

Dr. MAN Siu Shing [redacted]
Fri 7/29/2022 7:25 PM
To: Matthew Law [redacted]

Dear Matthew,

Yes, you can use the scale for your study with citation of the CoWoRP scale paper. Thanks.

Best regards,
Siu Shing Man

Get Outlook for iOS

From: Matthew Law [redacted]
Sent: Saturday, July 30, 2022 5:45:52 AM
To: Dr. MAN Siu Shing [redacted]
Subject: [Ext] CoWoRP use permission

This email originated from outside of City University of Hong Kong. Do not respond, click links, or open attachments unless you recognize the sender and know that the content is safe.

Good afternoon,

I am a Doctor of Public Health student at Walden University, and I am beginning work on my capstone study. My doctoral study aims to explore the risk perceptions of immigrant workers in construction in Central Florida.

I found the Construction Worker Risk Perception (CoWoRP) scale via APA PsycTests, and I believe the instrument is a perfect fit for my study. Would I be able to get your permission to use the CoWoRP scale for my capstone work?

Please let me know if you have any questions or would like more details on my doctoral work.

Respectfully,

Matt Law, MPH, CSP, REHS
DrPH Student at Walden University
[redacted]

Find me on

Appendix B: Pilot Study Results

Data collection and results

A pilot study was conducted to establish face validity and reliability between the English and Spanish versions of the survey. *N* = 14 bilingual safety professionals were recruited through professional networks because of their fluency in both English and Spanish and their knowledge of occupational safety risks. Participants were first issued the English version of the web-based survey then asked to complete the Spanish version of the survey one week later. Of those recruited, *N* = 2 participants did not fully complete the English version, and *N* = 5 participants were lost to follow up, resulting in a final sample size of *N* = 7 and a completion rate of 50.0%. The final sample size of participants in the pilot study exceeded the target sample size of 5% of the target sample size for the main study. Qualitative feedback for face validity was obtained through email, and data was exported to SPSS version 28 for reliability analysis. Table B1 displays the demographics of the pilot study participants, Table B2 details the results of the reliability analysis using Pearson correlation, and Table B3 details the results of the reliability analysis using intraclass correlation coefficient.

Table B1

Pilot Study Demographics

Response	Frequency	Percent
Age		
25-34	1	14.3
35-44	1	14.3
45-54	2	28.6
55-64	2	28.6
65+	1	14.3
Birthplace		
United States	5	71.4
Outside the United States	2	28.6
Race/Ethnicity		
Hispanic or Latino	6	85.7
Not Hispanic or Latino	1	14.3
Education		
Some college	2	28.6
Bachelor’s degree or higher	5	66.7
Construction Experience		
No construction experience	3	42.9
1-5 years	1	14.3
11-15 years	1	14.3
More than 15 years	2	28.6

Table B2

Pilot Study Reliability Analysis Results Using Pearson Correlation

CoWoRP Scale Item	Pearson Correlation	Sig. (2-Tailed)	N
RP-P1	.464	.295	7
RP-P2	.978	<.001	7
RP-P3	.720	.068	7
RP-S1	.420	.349	7
RP-S2	.078	.867	7
RP-S3	.088	.852	7
RP-S4	.483	.272	7
RP-WU1	.111	.813	7
RP-WU2	.738	.058	7
RP-WU3	.167	.721	7
RP-WU4	.614	.270	5
RP-WU5	.586	.300	5
RP-WU6	.805	.101	5

Table B3

Pilot Study Reliability Analysis Results Using Intraclass Correlation

CoWoRP Scale Item	Intraclass Correlation[a] Average Measures[b]	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound	F Test with True Value 0 Value	df1	df2	Sig
RP-P1	.604	-1.307	.932	2.522	6	6	.142
RP-P2	.983	.899	.997	57.462	6	6	<.001
RP-P3	.836	.046	.972	6.102	6	6	.022
RP-S1	.505	-1.880	.915	2.021	6	6	.206
RP-S2	.123	-4.103	.849	1.140	6	6	.439
RP-S3	.144	-3.984	.853	1.168	6	6	.428
RP-S4	.535	-1.705	.920	2.152	6	6	.187
RP-WU1	.200	-3.658	.862	1.249	6	6	.397
RP-WU2	.777	-.298	.962	4.485	6	6	.045
RP-WU3	.283	-3.173	.877	1.395	6	6	.348
RP-WU4	.759	-1.310	.975	4.158	4	4	.098
RP-WU5	.691	-1.963	.968	3.241	4	4	.141
RP-WU6	.826	-.669	.982	5.753	4	4	.059

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance. [b] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Overall reliability analysis results reflected moderate correlations between item means across the English and Spanish versions of the survey. In the analysis using Pearson correlation, CoWoRP scale items RP-P2 was found to have strong reliability with a Pearson correlation coefficient of .978 (p < .05). RP-WU6, RP-WU2, RP-P3, RP-WU4, and RP-WU5 were found to have acceptable reliability with Pearson correlation coefficients of .805, .738, .720, .614, and .586 respectively but were not significant (p >

.05). In the intraclass correlation analysis, RP-P2 was found to have a strong intraclass correlation coefficient of .983 ($p < .05$), accounting for 98.3% of the variance in the mean between surveys. RP-P3 and RP-WU2 had acceptable intraclass correlation coefficients of .836 and .777 respectively and were also significant ($p < .05$). RP-WU6 and RP-WU4 had acceptable intraclass correlation coefficients of .826 and .759 respectively but were not significant ($p > .05$). The reliability analysis results from this pilot study may be subject to limitations associated with test-retest models along with qualitative feedback received from participants.

Limitations to the pilot study

Some limitations exist with the test-retest model used for the pilot study to establish reliability between the English and Spanish versions of the study. First, while the sample size $N = 7$ met the target requirements, it is still a relatively small sample that may not provide adequate data to establish item means between versions. Second, while the delivery method of the web-based survey remained the same between versions, it is unclear whether the participants experienced changes in conditions between test and retest periods, including fatigue, device used to take the survey (i.e. personal computer or mobile phone), time of day, and other environmental factors. Third, $N = 2$ participants did not complete the last three items in the English based survey, limiting the data available for reliability analysis across those items. Lastly, qualitative feedback received from pilot study participants revealed that rewording may be required for items in the CoWoRP scale across both English and Spanish versions for improved relatability to the target population. However, this would require additional validity and reliability testing that may not be feasible for this doctoral study. The pilot study results and limitations should be considered when evaluating the results of the main study.

Appendix C: CoWoRP Author Approval for Spanish Translation

Re: [Ext] CoWoRP permission to translate

Dr. MAN Siu Shing [redacted]
Thu 12/1/2022 6:56 AM
To: Matthew Law [redacted]

Dear Matthew,

Please feel free to translate the CoWoRP scale. Also, please cite my work accordingly in your manuscript. Thanks.

Best regards,
Shing

Get Outlook for iOS

From: Matthew Law [redacted]
Sent: Thursday, December 1, 2022 7:54:06 PM
To: Dr. MAN Siu Shing [redacted]
Subject: [Ext] CoWoRP permission to translate

This email originated from outside of City University of Hong Kong. Do not reply, click links, or open attachments unless you confirm the identity of the sender and know that the content is safe.

Good morning,

I am following up on my previous request to use the CoWoRP scale for my doctoral study. The Walden IRB requires that I gain permission from the original author to translate the instrument into Spanish. To maintain validity and reliability, I have proposed the following steps for translation of the instrument:

1. Perform translation and backtranslation of the survey with two different ATA certified translators.
2. Gain consensus for face validity (potentially a Delphi Panel method) with 3 bilingual subject matter experts (SMEs, i.e. safety professionals) who:
    a. Have construction experience
    b. Are familiar with the target population
    c. Understand the concepts of measuring risk perception
3. Perform a modified test-retest pilot study with 10-12 bilingual SMEs, separate from the face validity group but possessing the same qualifications
    a. Administer first survey in English
    b. 1 week later, administer second survey in Spanish
    c. Use intra-class correlation coefficient (ICC) to measure stability of scale between languages

Please let me know if this is acceptable for me to translate the CoWoRP scale into Spanish.

Respectfully,

Matt Law, MPH, CSP, REHS
DrPH Student at Walden University
[redacted]