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The Impact of Authentic Leadership Development on Safety Climate Change

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2018

Abstract

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MS, Walden University, 2010

BS, California State University, 2004

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Organizational Psychology

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Abstract

Tragic, life-changing, and fatal incidents are a reality on large-scale, civil construction projects. Despite a decline following the enforcement of the 1971 Occupational Safety and Health Act, serious and fatal incidents on heavy construction projects remain higher than that of the active military and have not declined in any notable way in the past decade. Industrial-organizational literature suggested a lack of applied testing for the well-developed theory of authentic leadership (AL) to impact safety outcomes. This quasi-experiment combined the constructs of authentic leadership with safety climate perception as quantifiable measurement of potential safety outcomes in the workplace. The research question focused on whether AL would impact safety climate, thus, reducing injury and fatalities on the job. The researcher examined 1 of the 4 segments that comprised a $1 billion freeway improvement project. Perceptions of 108 field craft personnel were collected on a Likert-type instrument before and after their supervisors attended a brief AL workshop. Utilizing an ordinal scale, statistical significance was calculated pre- and postintervention by computing a Mann-Whitney *U* for independent samples. Significant improvement was found following the supervisor AL workshop and incidents decreased sharply in the 4 weeks following intervention. The reduction in incidents, when compared to the jobsite's history and the other 3 jobsite segments associated with the highway improvement project, suggests a potential for this framework to support positive social change, that is, to reduce the human cost and suffering associated with industrial accidents.

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Dedication

This study is dedicated to a handful of close friends that I have known and worked with who have lost their lives and limbs as well as to the massive number of people I never met who have suffered from preventable incidents building America's infrastructure.

Acknowledgments

A research study of this magnitude would not be possible without the generous support and encouragement of my dissertation committee. To Dr. Marlon Sukal, I appreciate your unwavering confidence in this important endeavor. To my committee members, Dr. Karla Phlypo and Dr. Frederica Hendricks-Noble, I appreciate all your feedback and advice for making this journey an enlightening experience.

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Chapter 1: Introduction to the Study

Introduction

There is currently no evidence of an empirical field study that measures the impact of authentic leadership (AL) on safety climate in the construction industry, although both constructs have proven to have improved safety outcomes. Because of this study, positive social change may be reflected in the improvement in injury statistics and other benefits associated with perceptions of positive safety climate. Furthermore, the success of field supervisors who participated in the AL workshop may provide an evidence-based implementation model that is currently missing in the industrial-organizational psychology literature.

Background

In more than 30 years of empirical studies, leadership experts agree that the positive qualities that define excellence in business leadership (e.g., integrity, transparency, communication, continual feedback) are the same qualities that make a leader skilled at managing safety (Bass & Steidlmeier, 1999; Cooper, 2015). However, scientific implementation of the current knowledge, that is, connecting leadership, training, and safety climate, is notably lacking (Borgersen, Hystad, Larsson, & Eid, 2014; Christian, Wallace, Bradley, & Burk, 2009; Zohar & Polachek, 2014), particularly in safety-critical, or high safety- risk, organizations (Bass, Jung, Avolio, & Berson, 2003; Borgersen et al., 2014). Only in the past 10 years a genuine effort been made in the

business leadership and safety literature to integrate safety performance and to consider its connectedness to business operations (Veltri et al., 2013).

Following advances in the organizational psychology literature throughout the 1980s and 1990s, new safety improvements were implemented in most large construction companies (Esmaeili & Hallowell, 2012). During this time, safety professionals began using an antecedent-behavior-consequence framework (ABC) to understand and manage unsafe behaviors (Zohar, 2002). The philosophy that became widely accepted during this period was called behavior-based safety (BBS). Safety managers and other management professionals were developed into "trained observers" who made note of "observed acts" (Mathis, 2009, p. 32). The observation feedback was disseminated from varied sources (e.g., safety-specific managers, outside consultants). The OSHA-based compliance training and goal setting gained attention from data and development experts involved in BBS (Zohar, 2002).

Between 1981 and 1991, safety innovation in the construction industry reached its apex. In a study of 58 construction companies, Esmaeili and Hallowell (2012) determined that safety compliance training, safety orientation, and frequent worksite inspections the top three safety-specific activities implemented during that period were cited as the safety management practices commonly utilized by 91% of companies in their field operations. Throughout the 1990s, practitioners in construction safety continued to advance implementation of site-specific safety management practices (e.g., hiring safety managers to observe and train field workers) and stimulate employee involvement in safety

processes (e.g., joint safety committees, job hazard analysis). Since 2000, nothing new has been disseminated or applied in construction safety that demonstrated the implementation of empirical knowledge (Esmaeili & Hallowell, 2012). This lack of innovation, combined with the relative plateau in injury decline (U.S. Department of Labor, 2014), suggests that the effectiveness of current safety practices has reached saturation in the construction field (Esmaeili & Hallowell, 2012; Wilkins 2011).

Despite the lack of recent safety innovation, studies on the impact of leadership on safety have proliferated since 2000 (Clarke, 2013). Zohar (1980) tested an instrument designed to capture the perceptions of safety in a manufacturing environment. This field study was based on the widely accepted organizational climate literature defined by Litwin and Stringer (1968) as the phenomenon of organizational climate. After finding a direct relationship between positive perceptions of safety and safety outcomes, they outlined a construct that has become the most often-cited framework used to measure safety perceptions and consequent positive safety outcomes: the safety climate (Zohar 2000, 2010).

Throughout the 2000s, the safety climate framework provided a quantifiable variable used to study the effects of a variety of leadership types on safety outcomes in the organizational literature (Barling, Loughlin, & Kelloway, 2002; Luria, 2008; Yule, Flin, & Murdy, 2007; Zohar, 2014; Zohar & Luria, 2005). The literature clearly defined the actions of leaders that influenced positive safety outcomes through meta-analysis, safety perception surveys, and emerging theories correlating leadership with safety

outcomes. As an example, Clarke (2013) tested the theoretical models of transformational leadership and active transactional leadership on safety outcomes, including all the notable literature on safety leadership that began to emerge in 2002. Safety compliance (e.g., following rules) and safety participation (e.g., making safety suggestions, watching out for fellow workers' safety) were coded for correlation with the two leadership models. Safety climate, as defined by Zohar (2000), was also measured by survey.

When examining transformational leadership, meta-analytic correlates to perceived safety climate ($\rho = .48$, $p < .05$) and safety participation ($\rho = .44$, $p < .05$) demonstrated moderate effect size. Slightly stronger relationships were seen when correlating active transactional leadership with perceived safety climate ($\rho = .57$, $p < .05$) and compliance ($\rho = .41$, $p < .05$). Clarke (2013) discussed the notion of qualities inherent in transformational leadership that could inspire positive results (e.g., charisma, influence) that could also undermine safety efforts when the transformational leader prioritized production over safety, thereby undermining the safety climate results. Despite the perception of being controlling, transactional leaders were viewed as being more consistent in their efforts to operationalize safety.

Clarke's (2013) study further affirmed the value of positive leadership on safety outcomes along with other scholars who found that transformational leadership with a safety focus affected followers' perceptions of a positive safety climate (Yule et al., 2007). In addition to safety-specific transformational leadership qualities, Luria (2008) demonstrated the importance of the direct crew leader as the primary influence on the

climate of a work crew, further building on the earlier efforts of Zohar (2002), Zohar and Luria (2005) found safety climates varied from crew to crew in the same organizations. Moreover, local leadership has been shown to influence safety climate more than external regulation and even company policy (Barling et al., 2002; Høivik, Tharaldesen, Baste, & Moen, 2009; Mearns, Flin, Gordon, & Fleming, 2001).

Problem Statement

The problem is the paucity of empirical research on whether AL development training can change the perceptions of workers, as well as the safety climate, using a cost effective, meaningful, and organically sustainable approach. This issue is particularly problematic on large-scale, heavy, civil, and public works projects in the construction industry.

Since the passing of the OSHA in 1972, there have been dramatic reductions in work-related fatality and injury rates across all industry types; however, more work needs to be done because these rates have reached a plateau (U.S. Department of Labor, 2014). Specifically, research suggested that the tracking of incident type and implementation of training contributed to sharp reductions in work-related fatalities and injuries (Wilkins, Chen, & Jenkins, 2014). Despite major reductions in fatalities and serious injuries, 4,585 work-related fatalities and 3,007,300 non-fatal but serious injuries, recorded in the United States in 2013, incident rates were no better than the previous 5 years. This called into question whether the tracking, structure, and awareness benefits of OSHA reached their maximum effectiveness (Esmaeili & Hallowell, 2012).

The costs to organizations and society following a fatality or serious are great and often hidden (Leigh, 2011). For example, the government is obligated to cover long-term and permanent disability beyond the statutory requirements of mandated worker's compensation insurance through their employers (Leigh, 2011; Freeman, 2000), specifically Social Security disability. In addition, indirect costs include lost workdays, loss of morale, posttraumatic stress disorder developing in the injured worker or fellow workers, loss of employees' trust in the company, and an organization's reputation in the marketplace (Crites, 1995; Freeman, 2000). An estimated 80% of recorded incidents occurring in the workplace could be linked to preventable behaviors (Fleming & Lardner, 2002). Nonetheless, training in many high-hazard industries did not target authentic and personalized behavior change at the field level (Wilkins, 2011).

The construction field remains in the top five high-hazard industries with opportunities to improve preventable incidents (U.S. Department of Labor, 2014). Notwithstanding technological advancements in safety equipment and safety policy development, 20% of work-related fatalities continue to occur on construction jobsites (U.S. Department of Labor, 2014; Zohar & Polachek, 2014). The fatality rate in construction remains greater than 10 times that of the military, as recorded on OSHA public records of workplace fatalities, in recent combat years (U.S. Department of Labor, 2014).

A plethora of studies provided evidence-based theories to guide leadership and communication development (Borgersen et al., 2014; Gardner, Avolio, Luthans, May, &

Walumbwa, 2005; Griffin, & Neal, 2000; Nahrgang, Morgeson, & Hofmann, 2011; Probst & Estrada, 2010; Zohar 2002; Zohar & Polachek., 2014). Yet, on the majority of construction jobsites, contractors continue to use outdated observation and training methods based on science dating back 25 years. For example, project management or safety professionals conduct safety audits and provide training focused on OSHA compliance alone (Esmaeili & Hallowell, 2012). Implementation of the current research theories on safety leadership and safety climate improvement is a logical next step in advancing the literature (Borgersen et al., 2014; Christian et al., 2009; Eid, Mearns, Larsson, Laberg, & Johnsen, 2012; Zohar, 2014).

Purpose of the Study

The purpose of this quantitative quasi-experiment was to determine whether AL development training could improve workers perceptions of the safety climate that was cost-effective, meaningful, and organically sustainable in heavy, civil and public works projects in the construction industry. Additionally, this study examined whether the AL training as an independent variable influenced a change in the safety climate. With significantly positive results, the basic framework could be replicated in a variety of industries and organizations with similar hierarchies or work groups in offsite or virtual team settings. The primary intent of this field-tested implementation was to contribute to the safety leadership and safety climate literature to benefit both practitioners and researchers in the field of organizational psychology.

Research Questions and Hypotheses

This quantitative study was guided by the following three research questions.

Research Question 1

Do supervisors who complete safety training emphasizing integration of AL and communication skills during leader-member exchanges have significantly higher worker safety climate perceptions?

Null Hypothesis. There will be no difference in the safety climate perceptions of the workers between employees reporting to supervisors who have completed safety training and employees reporting to supervisors who have not completed safety training emphasizing integration of AL and communication skills.

Alternative Hypothesis. There will be a significant difference in safety climate perceptions of the workers whose supervisors have completed safety training compared to workers whose supervisors have not completed safety training emphasizing integration of AL and communication skills.

Research Question 2

Do workers' perception of their supervisor's AL improve significantly after their supervisors are trained to integrate AL and communication skills during leader-member interactions?

Null Hypotheses. There will be no significant difference in the workers' perception of their supervisor's AL after they are trained when compared to

workers' perception measured before their supervisors were trained to integrate AL and communication skills.

Alternative Hypothesis. There will be a significant change in the workers' perception of the supervisor's AL after training when compared to workers' perception measured before their supervisors were trained to integrate AL and communication skills.

Given that choosing safety behavior often competes with the perception of being productive, minor injuries and near-miss incidents often go unreported in crews with poor safety climates (Probst & Estrada, 2010). This study measured the likelihood of reporting near-miss or minor incidents that occurred following the training intervention. Part of the AL training addressed the importance of trust and transparency in leadership skills as well as highlighted empirical leadership. One of the primary antecedents to crews with positive safety outcomes has been high levels of support to report minor incidents and mistakes that create near-miss situations (Tharaldsen, Olsen, & Rundmo, 2008).

Research Question 3

Does workers' willingness to report safety concerns increase following the supervisor training?

Null Hypothesis. Workers' willingness to report safety concerns will be the same when measure before and after supervisor training.

Alternate Hypothesis. Workers' willingness to report safety concerns will increase significantly following the supervisor training when compared to surveys taken before supervisor training.

Theoretical and Conceptual Framework for the Study

Theoretical Foundation

The training applied in this study was grounded in the emerging leadership construct of AL (Avolio, Gardner, Walumbwa, Luthans, & May, 2004). The model's cornerstone has been awareness of personal values and it is often cited as the first step in developing the trustworthy leader (Granerud & Rocha, 2011). Trust is a primary leadership quality required to forge strong and lasting perceptions of a positive safety climate (Avolio et al., 2004; Gardner, Cogliser, Davis, & Dickens, 2011; Liu, Liao, & Wei, 2015). It follows that a measurable improvement in AL would improve the climate.

Although some qualities of authentic leaders are shared with other leadership types, authentic leaders demonstrate consistent moral behaviors, such as integrity, transparency, and balanced processing of decision making (Cavazotte, Duarte, & Gobbo, 2013). Furthermore, leaders rating low in AL qualities can undermine safety (Liu et al., 2015), although leaders may also be described as transformational or transactional (Bass et al., 2003; Conchie, Taylor, & Donald, 2012; Onorato & Zhu, 2014; Schilling & Schyns, 2014). Without authenticity, leaders who score as strong transformational types exhibit a darker, self-serving side that can undermine the strongest safety program or organizational culture (Bass & Steidlmeier, 1999).

Conceptual Framework

Safety climate has become a standard indicator of an organization's safety performance and likelihood of injury, surpassing other leading indicators (Borgersen et al., 2014; Christian et al., 2009; Gardner et al., 2005; Zohar, 1980; 2000; 2002; 2010; Zohar & Polachek, 2014). Encouraged by Zohar (2010) and others (Borgersen et al., 2014; Christian et al., 2009) and utilizing safety climate as a framework to measure safety outcomes, the effects of the AL (Avolio, Gardner, & Walumbwa, 2007) and communication training (Zohar, 2014) were measured using the Safety Climate Inventory (Nielsen, Eid, Hystad, Sætrevik, & Saus, 2013a).

Safety culture and safety climates are often used interchangeably in the literature (Borgersen et al., 2014; Denison, 1996; Mearns & Flin, 1999; Zohar, 2014); however, they represent different constructs. Culture is defined in broader terms and represents the beliefs, assumptions, and attitudes of top management (Mearns & Flin, 1999); it is often associated with a company's image and reputation. On the other hand, safety climate is described as a snapshot of the current state of safety, the picture of employees' perceptions, attitudes, and beliefs about safety. It has been measured and its essential constructs have been used consistently in an array of studies (Christian et al., 2009; Zohar, 2014). Additional information on the theoretical and conceptual framework can be found in Chapter 2.

Nature of the Study

The overarching questions addressed in this study were answered through a quantitative, quasi-experimental design; safety climate perceptions, AL, and any incident reports that occurred within 4–6 weeks of the training intervention (Campbell, Stanley, & Gage, 1963; Cook, & Campbell, 1979) were used to measure change. The scores of the supervisors pre-training were compared to their scores after training had been completed.

Independent Variables

The Authentic Safety Leader Training Program

Dependent Variables

Safety Climate as assessed by the Safety Climate Inventory (Nielsen et al., 2013a)

AL as assessed by the Authentic Leadership Questionnaire (Avolio et al., 2007)

Willingness to Report Incident only (near miss) as assessed by an additional survey question added to pre- and post-training surveys.

Incidents reported both before and after the training intervention were obtained from company records.

A confidential instrument measured safety climate (Brief Norwegian Offshore Risk and Safety Climate Inventory [NORSCI]; Nielsen et al., 2013b) and AL (Authentic Leadership Questionnaire [ALQ]; Avolio et al., 2007) in participant followers. Questions from both instruments and questions relating to willingness to report incidents were combined on a single electronic survey. Pre and posttraining intervention, study participants were asked to complete a survey combining the NORSCI, ALQ, and one

researcher-initiated question regarding the willingness to report a near-miss incident. Both instruments in this study utilized Likert-type scales; the scoring of subscales and total scores were performed in accordance to the published literature. Due to an anticipated large sample, this study was based on the assumption that the results would display elements essential to parametric testing (e.g., normal distribution). A Mann-Whitney U was used to test for any significant difference between individual, pre- and postintervention survey questions as these data were collected in ordinal scales. If the sum of the Safety Climate Inventory and the total score for all ordinal questions met the characteristics of a normal distribution, then *t* tests were conducted to detect significant differences between pre- and postintervention survey responses.

The intervention took place on a mega-construction site; a civil, design-build project representative of the emerging business model for heavy highway projects (i.e., public-private-partnership). Projects of this magnitude are often performed as joint ventures, meaning that several companies merge crews and resources to form a temporary corporation for the duration of the project and are then disbanded upon project completion. The workers and their supervisors who participated in this study were assigned to the work group known as Segment D. The environment was dynamic and competitive, categorized by OSHA as high-hazard work. The effects of an AL training program were measured in relationship to changing the safety climate, increasing safety communication, and the resultant change in likelihood to report near-miss incidents

(Borgersen et al., 2014; Gardner et al., 2005; Griffin & Neal, 2000; Nahrgang et al., 2011; Probst & Estrada, 2010; Zohar 2002; Zohar & Polachek., 2014).

The training intervention was aimed at a sample of superintendents selected by the company, a mixture of midlevel leaders representing Segment D, and at least one leader from each joint venture company. As midlevel field supervision, the supervisors selected were the primary interface with field workers all superintendents from Segment D were included. They were in a pivotal position to relay the ideal corporate safety culture and were privy to information that influenced production schedules and other priorities passed down from the corporate office. In large, corporate-structured, heavy highway companies, midlevel management must translate safety cultures into actionable behaviors that contribute to creating a positive (or negative) environment and have been shown to have a major effect on safety performance and outcomes (Zohar 2014).

The group of supervisors selected by the company for the AL training were assigned to one of the four jobsites comprising the entire project. This group was described as Segment D on company data incident reports. Workers assigned to supervisors received an identical pretest and posttest measure of safety climate perception, the AL indicators, and willingness to report near-miss incidents 4 weeks after the interventional training. The supervisors from Segments A, B, and C were informed that all supervisors would eventually receive training to minimize resentful demoralization or other social interaction threats to validity (Trochim, 2006). Supervisors were educated on the value of reporting near-miss and minor incidents as well as

transitioning from an OSHA-prescribed, albeit lagging, incident tracking system to a more proactive approach based on leading indicators and increased safety communications associated with improvements in both safety incident severity and worker perception of safety climate (Griffin & Neal, 2000; Zohar, 2014). Measurements that indicated an increased positive safety climate on the worksite where the experimental training took place would suggest a positive social change.

Definition of Terms

Authentic leadership (AL). In this study, Development of AL was the independent variable. Defined using the four cornerstones of the AL construct developed, validated, and used in the Authentic Leadership Questionnaire (ALQ; Avolio et al., 2007). Leaders who scored high on the ALQ possessed high levels of (a) self-awareness, (b) relational transparency, (c) internalized moral perspective, and (d) balanced processing.

Construction foreman: In this study, foremen were identified by company leadership as a crew leader responsible for both production and safety of a work group of three or more field workers.

Construction superintendent: Superintendents were identified by company leadership as a crew leader of construction foremen within a specialty area. Superintendents were responsible for both the production and safety of a work group specialty (e.g., carpenters, laborers, ironworkers, electricians).

Incidence rate: A standardized formula to measure injuries within an organization for recordkeeping and comparison. Defined by the OSHA, an incidence rate

was the number of injuries, illnesses, or lost workdays per 100 full-time workers. Rates were calculated as N × 200,000 ÷ EH where:

N = number of injuries and illnesses, or number of lost workdays.

EH = total hours worked by all employees during a month, a quarter, or fiscal year.

200,000 = base for 100 full-time equivalent workers employed 40 hours per week, 50 weeks per year (U.S. Department of Labor, 2014).

Journeyman: A tradesperson who has completed the appropriate number of hours of on-the-job training, formal coursework, and trade apprenticeship to be considered a competent professional in his/her trade. A journeyman worked on a construction crew under the direction of a company foreman.

Near-miss incident: "A Near-miss is an unplanned event that did not result in injury, illness, or damage – but had the potential to do so. Only a fortunate break in the chain of events prevented an injury, fatality or damage; in other words, a miss that was nonetheless very near." (National Safety Council, 2013, p. 1).

Project manager: Individual with ultimate responsibility for the construction project under study. The project manager might hold a middle management position within the overall organization.

Safety culture: In broad organizational terms, safety culture represented the beliefs, assumptions, and attitudes of top management (Mearns & Flin, 1999); it was often associated with a company's image and reputation.

Safety climate: A snapshot of the current state of safety; the picture of employees' perceptions, attitudes, and beliefs about safety; it has been measured and its essential constructs have been used consistently in an array of studies (Christian et al., 2009; Zohar, 2014).

Assumptions

The company selected for this study had a top-level leadership team that was committed to safety as a core value of the organization. However, due to the transient nature of the field craft population, participants could be reluctant to share honest opinions about safety, especially if the crew leader did not reflect the same commitment to safety as top leadership. Based on this assumption, the delivery of information about the study was carefully planned to clearly communicate top leadership's commitment to obtaining true information about the actual safety climate on each crew.

Scope and Delimitations

The scope of the study included tradespeople working in the field as construction workers on one of the four jobsites, Segment D. All craft workers in the field were invited and encouraged to participate in pre- and post-perception surveys. The company selected the superintendents to receive the AL development training following the presurvey. Superintendents from segment A, B, and C were excluded from the AL training conducted during the study.

The communication and scheduling of the training were driven by company management. The AL training was arranged according to the regular scheduling system

utilized by the company for safety compliance training to minimize disruption of the normal routine. All participants were asked to complete two confidential safety climate surveys before work began at the construction yard designated by the company as a meeting spot on Monday mornings. A common practice of large construction companies is to allow for Monday meetings for the entire segment of the project to communicate essential information about safety or other issues. On two separate occasions, the Monday meeting spot was where the data were collected using personal smartphones to submit responses. Using the Monday morning meeting routine proved to be an efficient time and place to disseminate the survey and collect data and could be easily replicated on other projects.

Limitations

There were several minor limitations to completing this study: (a) project management buy-in when it came time to collect survey data, due to time pressure to get to work (b) ability of hourly workers to complete the surveys and training, due to lack of reading ability and vocabulary used on the instruments(c) assurance of confidentiality, and (d) consistency in the training delivery. The support of the CEO and the procedures used to communicate and assist in completion helped to mitigate the limitations.

Several steps were taken to mitigate the limitations. Following permissions from top management, specific project managers were informed of the time commitment, procedure for confidentiality, and potential benefits to the project in a preintervention meeting at the jobsite. Any concerns and questions were resolved before the study began.

Step-by step instructions were given by the researcher at the meetings; time was allotted for technical help and survey completion. Employees were afforded privacy and assured about confidentiality. Participants were informed by the researcher about the parameters and requirements of voluntary participation to complete the surveys (Appendix A). Further discussion of limitations encountered are discussed in Chapter 5.

Significance

Over the past 30 years, safety has become a genuine priority for many organizations (Zohar, 2010), especially in large companies with tasks that routinely expose the workforce to high-risk hazards (Shorrock, Mearns, Laing, & Kirwan, 2011; Simon & Cistaro, 2009; van der Graaf, Bryden, Zijlker, & Hudson, 2004). Leadership, with its influence on both organizational culture and safety outcomes, has been studied extensively in high-hazard industries (Barling et al., 2002; Schein, 1985; 2010; Zacharatos, Barling, & Kelloway, 2000; Zohar, 2002). However, only two field interventions were found in use within the past 15 years that applied evidence-based knowledge to high-hazard industries at the management level. This included Zohar's (2000) seminal field research on safety perception change and Zohar and Polachek's (2014) comprehensive field experiment that tested several antecedent variables associated with positive safety climate perceptions in a before and after, mixed-effects statistical design following a brief communication intervention. Several safety-specific variables were measured, including safety climate, safety behavior, and externally conducted jobsite inspections by safety professionals who were unaware of the experiment's details.

When the scores were compared to each groups' pretreatment scores, the inspection audit scores improved in the work areas of the experimental group but not in the control group.

If a single- session training designed to build AL skill and effective feedback techniques proved successful, it would affirm a model that could be used to implement and measure a wide range of organizational change endeavors (Zohar & Polachek, 2014). It could also provide a new training innovation specific to the construction safety field where there is a critical need (Esmaeili & Hallowell, 2012). The implications of positive social change would be reflected in the improvement in injury statistics and other benefits, such as increased motivation, productivity and job satisfaction that are associated with positive safety climate perceptions (Christian et al., 2009). Furthermore, success of the proposed intervention would provide an evidence-based implementation model for AL that is currently missing in the organizational literature.

Information provided in Chapter 2 will further expand on the development of AL and the potential influence on safety climate.

Summary

Safety programs and improvements to safe working conditions in dangerous environments have improved since government intervention in 1972. Communication advances and the crew-level safety climate have been empirically tested and confirmed as antecedent to positive safety behaviors and performance. This study tested the ability to improve the construction crew member's safety climate perceptions by training superintendents and crew leaders in a high-hazard environment to develop AL skills, a

training that had not been conducted to date in heavy highway construction at the frontline-level. A significant increase in positive safety climate perceptions following the AL training could improve working conditions for a large segment of workers in high-hazard environments and add to both the construction safety literature and the growing body of AL literature.

In the following chapters a review of AL and safety climate literature was explored, valid measurement tools defined, and the current study was tested in the field with positive results.

Chapter 2: Literature Review

Introduction

The purpose of this quantitative, quasi-experiment was to measure a change in perception of safety climate following a brief AL development and safety communication training with field supervision. Despite the growing body of evidence that AL is associated with positive outcomes, there was little empirical guidance on AL development except in the coaching literature.

AL training programs that were discovered in the literature search were primarily long -term organizational programs (Glowacki-Dudka & Griswold, 2016; Granerud & Rocha, 2011). An additional search on *effective authentic leadership* and *training effectiveness* led to a body of literature that included organizational coaching (Fusco, Palmer, & O'Roirdan, 2011; Grant, Curtayne, & Burton, 2009; Grant, Passmore, Cavanagh, & Parker, 2010; Kinsler, 2014) and training content (Baron, 2012, 2016; Baron & Parent, 2015) that corresponded neatly with the literature derived from the both the AL arena and the industrial safety literature. These articles were obtained using the key words *safety coaching*, *group coaching*, and *authentic leadership coaching*. The results provided a training framework (Cherniss, Grimm, & Liautaud, 2010), general coaching approaches (Adams, 2016), and safety-specific coaching methods (Cavazotte et al., 2013) in group settings (Treff & Earnest, 2016) that were included in the training design of the current study.

Literature Search Strategy

Several key words were searched in EBSCO database, using a broad search across all available peer reviewed journals: *leadership*, *authentic leadership development process*, a*uthentic leadership development*, a*uthentic leadership training*, t*raining practices*, l*eadership*, and *training effectiveness*. Safety literature was reviewed as it related to the above: *AL development*, *effective training methods, organizational coaching*, and *organizational change.* Evidence-supported methods from organizational training, safety coaching (Geller & Veazie, 2004; Passmore, Krauesslar & Avery, 2015), and safety climate communication (Zohar, 2014) were merged to create the unique training framework that was used in the present study to test the significance of AL development on safety climate improvement.

The leadership types that surfaced in the literature when searching for appropriate change leaders include *transformational* (Bass, 1985; Tichy & Devanna, 1986), *charismatic* (Conger, 1989), as well as a positive *five level leadership* type (Collins, 2001). However, the large number of corporate scandals and subsequent loss of trust in some organizations and industries over the past decade have caused a growing interest in the *ethical* and *authentic* leadership styles. Following a 2004 Gallup Leadership Institute Summit, which focused on developing scholar-practitioner research interest in developing a foundational conceptualization of AL, many leadership scholars directed their attention to exploring this construct. Twenty-four scholarly articles were published as a direct result of the Gallup Leadership Institute Summit in 2005 (Avolio & Gardner, 2005).

Subsequently, an abundance of theory-expanding literature was published and, by 2010, empirical work outnumbered the theory-defining work for the first time (Gardner et al., 2011)

The definition of AL has been debated but, as the construct has matured, more common overlaps in scholarly works began to emerge (Gardener et al., 2011); it has become a behavior construct that has been well measured over the past 10 years since the development of the 16-item Authentic Leadership Questionnaire (ALQ; Avolio et. al, 2007). Further validation of the four elements that serve as the theory foundations were validated by Walumbwa, Avolio, Gardner, Wernsing, & Peterson (2008). The construct is currently well defined, and the literature saturated with empirical evidence listing positive outcomes associated with AL, indicating that the next step would be field testing the theory (Gardner et. al., 2011).

An abundance of literature was obtained using the key words mentioned at the beginning of this chapter. The review of AL literature was narrowed by excluding any papers published prior to 2003 that were not peer-reviewed, or evidence based. Additionally, peer-reviewed literature was filtered for works that included the use of the ALQ instrument or publications that empirically linked AL with training, group coaching, and safety outcomes to inform the current study.

Authentic Leadership

A robust meta-analysis on the state of AL knowledge by Gardner et al. (2011) traced the scholarly interest in AL from ancient Greece philosophy and Socrates' self-

inquiry through an analysis of 91 AL publications produced since 2005. Gardner and colleagues categorized peer-reviewed literature by content, contributors, research design, and analytical procedures with the intent of establishing a research agenda.

Per the literature, leaders deemed to fit the description of AL, regardless of personality or leadership type (Wang, 2016), had positive effects in several areas of leadership influence such as goal alignment and understanding the impact of beliefs and communication style on both individual behavior and follower perceptions (Gardner et al., 2011; Grant & O'Connor, 2010). Other areas of positive outcomes have been associated with AL such as trust in leadership and job performance (Clapp-Smith, Vogelgesang, & Avery, 2009; Wong & Cummings, 2009), follower citizenship and work engagement (Giallonardo, Wong, & Iwasiw, 2010; Wong, Lascher & Cummings, 2010), team productivity (Hannah, Walumbwa, & Fry, 2011), psychological well-being (Toor & Ofori, 2009), and overall company performance (Hmieleski, Cole & Baron, 2012). Additionally, positive safety climate outcomes have been linked to AL (Christian et al., 2009).

Several studies concurred with the early findings of AL (Avolio et al., 2004); most agreed that authentic leaders acted with transparency, both on a personal level and in the social context through mindful communication, balanced processing, and decisional balance (Miller & Rollnick, 2002; Passmore, 2011). AL was not a *type* of leadership as much as it was the execution of honesty and an ability to bring the unique

leader's self-awareness to leadership in all personal tasks and organizational endeavors (Baron, 2016).

Authentic Leadership Development

Given the maturity of AL theory and the positive outcomes associated with AL, obtaining an empirical-supported training framework specifically designed to facilitate AL development was uncharacteristically difficult. A study by Cherniss et al. (2010) re-visited a compilation of evidence-based trainings gathered by Burke and Day (1986) that measured effectiveness of training programs specifically created to encourage self-reflection and personal growth during the 1970s. Per Cherniss et al., the literature compared the subjective outcome ratings following traditional corporate-style trainings – lecture/discussion with role playing and practice – in contrast with assessment, feedback, and coaching that was commonly used in sensitivity trainings at the time (Burke & Day, 1986). The traditional lecture and discussion with role playing demonstrated the least effective results (effect size d =.30; Cherniss et al., 2010). However, results from groups that participated in the assessment, feedback, and coaching group process utilizing "Behavior modeling" (Burke & Day, 1986, p. 233) averaged an effect size that was more than twice that amount (d = .67).

Behavior modeling was defined as a group process that progressed without an agenda, where the facilitator kept the group focused in the moment, on the dynamic of the group as the group explored personal values, feelings, and received feedback from peers; similar to Yalom and Leszcy's (2005) model for group psychotherapy. However,

Burke and Day (1986) and Cherniss et al. (2010) drew attention to a major limitation of the open-ended nature of the group process and coaching; that results seemed to rely heavily on the personal qualities of the group members and the facilitator making it difficult to replicate with consistency and quality to multiple groups in an organization.

Cherniss et al. (2010) designed a study to overcome the issue of inconsistency revealed in the earlier studies and replicated the successes found in Burke and Day (1986). The researchers aim was to test the effectiveness and consistency of the behavioral modeling training/coaching method to help participants develop emotional and social competencies associated with effective leadership. The Emotional Competence Inventory (ECI) was used as a pre/posttest to measure specific outcomes. Leaders who rated high on the ECI shared similarities with AL such as self-awareness (Boyatzis & Sala, 2004) and leadership behaviors such as social awareness (Al Sahi AL Zaabi, Ahmad, & Hossan, 2016). The randomized experiment used a training structure common to quality management, known as the International Organization for Standardization (ISO), to provide a framework that could be replicated at a variety of test sites (Cherniss et al., 2010).

Within the manualized training session, the reflective, humanistic, behavior-modeling group techniques were used systematically with a solution focus (Cherniss et al., 2010). The consistency demanded in ISO training merged with self- awareness growth techniques found in group-based psychotherapy (Yalom & Lesczy, 2005) and resulted in an effective model called Process Designed Training (PdT) that could be used

to facilitate humanistic, participatory-driven change (Prochaska, Norcross, & DiClemente, 1994; Passmore, 2013). In all nine groups with nine distinct PdT-trained facilitators, the intervention group improved on every variable of the ECI as compared to the control group measured after the study. Although the study was implemented over a 2-year period, the researchers encouraged experimenting with using the PdT in shorter durations when the outcome objective was to improve social climate, culture, or self-awareness competencies associated with effective leadership (Cherniss et al., 2010).

The development of AL required the same self-reflective growth work as the collection of Burke and Day (1986) studies and the ECI development work of Cherniss et al. (2010); however, using the PdT model to frame the AL program could help to operationalize the construct in a group format and replacing the EIC with the ALQ could create a secondary benefit of the present study by creating the opportunity to further validate the structured group coaching model (i.e., PdT) developed by Cherniss et al. (2010).

Small Group Coaching to Facilitate AL Development

The most current research discounted traditional training approaches to facilitate AL development (Baron, 2016). The development of AL is not a set of skills that can be taught; rather, AL is fostered by increasing self-awareness of individual values as well as a developed ability to reflect and correct assumptions and beliefs within a social context (Fusco, O'Riordan, & Palmer, 2015). Groups such as the International Society of Psychological Coaches (ISPC) have been conducting research focused on the results of

coaching efforts utilizing evidence-based approaches to refine and legitimize the organizational psychology coaching tactic as a method to operationalize AL (Spence & Deci, 2016). Reports emanating primarily from psychologists affiliated with the ISPC who currently utilize the coaching approach have called for additional experiments that include measuring training development (Grant & Cavanagh, 2011). Coaching relies heavily on building self-awareness, goals, accountability, and freeing up the human potential in the participant (Schaubroek, Carmeli, Bhatia, & Paz, 2016).

Until recent efforts, there has been little empirical evidence supporting executive coaching; however, evidence exists that companies have been willing to allocate large budgets for use in coaching to help executives develop in existing positions or grow into new roles within organizations. As of 2007, 85% of organizations in the United States were using some type of coaching program to facilitate change, increase competence, or improve performance. The costs to coach a single executive can range from $1,500 per day to over $100,000 for a multi-year contract (Cherniss et al., 2010). Considering the popularity of executive coaching with mere anecdotal evidence of support, the efficiency and ability to tailor developmental efforts to the current objective of this short-term AL development study could provide vital evidence to organizational literature (Fusco, O'Riordan, & Palmer, 2016; Theeboom, Beersma, & van Vianen, 2014). Per Baron and Parent (2015), once leadership authenticity is learned, defined, and activated through experiential activities and executed in small group environments, consciousness related to authentic action reportedly continued to increase on its own.

Safety Coaching

The term *safety coaching* can be traced to Geller, Perdue, and French's (2004) behavior-based safety coaching that demonstrated significantly increased workplace collaboration, positive safety behaviors, and reduced injuries. Safety coaching was further clarified by Passmore et al. (2015) as offering a path to practical implementation of safety coaching in a new area of training for leadership development. The following excerpt from Passmore et al. (2015) combined Gellar et al. (2004) ideas of behavior-based safety training and current evidence-based practices of coaching psychologists and were used to guide the AL training development program used in the present research project:

> A Socratic based, future focused dialog between one individual (safety coach) and another individual (worker) where the lead individual uses open questions, affirmations, summaries and reflections, informed with evidence, aimed at stimulating the self-awareness and personal responsibility of the second individual, with the specific goal of improving safety. (p. 196)

Both Gellar et al. (2004) and Passmore et al. (2015) used the same open Socratic style to coach individuals with a focus on safe behaviors. When combined with PdT in the participatory coaching group process, a consistent framework for AL development was available for replication as well as testing the impact of AL on safety climate change.

Safety Climate

In addition to increasing AL behaviors, this study proposed to affect the safety climate perceptions of workers under the leadership of AL trained supervisors. The influence of positive safety climates (PSCs) on reducing safety incidents has been validated by rigorous meta-analysis (Christian et al., 2009). Safety climate led to further understanding of the variation in safety outcomes among work crews within the same organization (Luria, 2008). Safety climate has become a standard indicator of an organization's safety performance and likelihood of injury, surpassing other leading indicator measures (Borgersen et al., 2014; Christian et al., 2009; Gardner et al., 2005; Zohar, 1980, 2000, 2002, 2010; Zohar & Polachek, 2014).

Zohar (2000) first observed the importance of the direct safety feedback as a highly reliable antecedent to a positive safety perception change in work crews involved in the shop floor level of a manufacturing plant. Subsequently, Zohar and Polachek (2014) conducted a two-group randomized experiment to improve both the safety perceptions (climate) and safety performance of manufacturing crews. The experimental group of 13 supervisors was taught to focus leader-member exchanges on the importance of intertwining production and safety in daily conversation with their direct reports. A total of 313 work crew members participated, including 13 supervisor control-group work crews, to measure the effects both before and after the intervention. Zohar and Polachek (2014) demonstrated measurable results in the experimental group after just two 30-

minute training/feedback sessions conducted in the supervisor's office and spaced 6 weeks apart.

Although Zohar (2002, 2014) tested interventions in a manufacturing plant and found a relationship among leadership, communication improvement, and positive change in safety climate, it was conducted in an environment unlike the dynamic and frontier-like setting of heavy highway or civil construction. Zohar's (2014) work on safety climate provided a theoretical, organizational foundation for this study, but the focus of the present study was distinct in three areas. First was the extreme and ever-changing landscape of an active construction site. Secondly, the field hierarchy affiliated closer to those outlined in the qualitative investigation of Borgersen et al. (2014), as much of the dangerous work activity was conducted beyond the corporate stakeholders' view or control. The third and most significant divergence from Zohar (2014) and the independent variable in the proposed study was the AL training intervention provided at a single point in time. Although sharing Zohar's (2014) communication loop was one feature of the training, the session also focused on developing self-awareness pivotal to AL, an element that has often been reserved for coaching at the executive level of organizations.

Summary and Conclusions

The literature review affirmed the validity of the variables of AL and safety climate and a new gap in the literature emerged regarding AL development. Safety climate has been established as a trustworthy, measurable standard in predicting safety

outcomes and AL is well established as a positive leadership construct; however, these two elements have yet to be combined in a quantitative field study in construction safety. Despite well-defined and validated measurement instruments for AL, there are no AL development or training frameworks found in the literature outside of the emerging coaching literature (Fusco, Palmer, & O'Riordan, 2011; Grant et al., 2009; Grant, Passmore et al., 2010; Kinsler, 2014). The present study tested a model designed by fusing coaching methods used to developed AL skills in executives with standardized training procedures studied for their effectiveness in developing self-awareness, the cornerstone of AL, in small group sessions (Cherniss et al., 2010). It was discovered that, in addition to the original intent of testing the effects of AL development on safety climate improvement, a unique training session model for developing AL qualities in leaders could also be tested, adding further to the growing body of AL development literature. In addition to increasing positive safety climates in construction crews, a standardized training and coaching program using quantitative measures of success, could be easily replicated in a variety of organizational climates to develop AL.

In Chapter 3, the methodology supporting the study will be described in detail.

Chapter 3: Research Method

Introduction

The purpose of the study was to measure a change in perception of safety climate following a brief AL development and safety communication training. Positive safety climates have been previously established as antecedent to positive safety results including injury and incident reduction. This chapter will outline the research design, rationale, and methodology that informed this study, which contributed to the growing body of scientific interest in and investigation of AL and its positive effects in organizations.

Research Design Rational

The primary independent variable was the workers' perception of AL and safety climate. The design for training supervisors in AL was derived from empirical literature about the malleable traits of authentic leaders as delineated in Chapter 2. Perception of AL as well as worker's perception of safety climate was measured before and after the training utilizing the published instruments listed below. A single additional question was added to the perception survey asking participants to respond using a Likert-type scale about how likely they were to report a minor incident or near-miss incident that did not cause any injury or damage.

Company records of incidents were collected pre-and posttraining as a potential data source. Data collection began 2 weeks after the 4-week training period.

The training schedule and duration emulated compliance training that companies have become conditioned to according to OSHA regulations (Esmaeili & Hallowell, 2012). Following a standardized model helped to increase the fidelity of the study as well as to ease access and be less intrusive for participants and management (Bellg et al., 2004; Cook & Campbell, 1979). In addition, the training activities were clearly separated from the survey collection activities.

Methodology

Population

Personnel attending AL training were selected by the company from a population of leaders in high-hazard construction crews, both superintendents and foremen, who oversaw production and safety at the field or craft level. Each leader had a minimum of two direct reports and a maximum of 10 direct reports. Field-level construction crew members who completed the survey represented a variety of craft types: carpenters, pile drivers, equipment operators, and electricians. Each crew member varied in experience from apprentice to journeyman, their ages ranged from 18–60 years, their ethnicity (primarily White and Hispanic, some Black, some in the Other category). Although most crews were all male, there were also some female craftworkers. All participants were union members; their income was at a comfortable, middle-class economic level, ranging from $36,000 to $75,000 per year, and their level of experience was certified as an apprentice, journeyman, or foreman. Craft type and demographic data were collected as dimensional covariates and grouped as much as possible.

Study Sample

The work crews gathered every Monday at a designated outdoor meeting place, also utilized for tools, lumber, and equipment storage and mechanical repairs. The company gave permission to the researcher to meet the workers at the project location before the crews dispersed to their individual work areas throughout the jobsite, described by the management as Segment D. The researcher used that location to collect surveys before the supervisors' AL training (pre-intervention surveys) and approximately 4 weeks later to gather identical post intervention surveys. The times of collection were described as follows:

- Before intervention (T0)
- Four to six weeks after intervention (T1)

Procedures for Recruitment, Participation, and Data Collection

With full endorsement of the company CEO and safety director, utilization of the company's training system was already in place; there were no other known recruitment issues. Communications about the study were sent to the employees by the company safety director. Written and verbal informed consent information was described by the researcher to the participants according to a prepared script.

In addition to the information collected on the primary survey instrument, participants were to check off their level in the field hierarchy (e.g., Superintendent, Foreman, Journeyman, Apprentice), trade (e.g., carpenter, electrician, laborer, pile-driver, operator, concrete specialist, pipe-fitter). Age and gender were also asked on the survey.

Participants accessed the survey by following a link to SurveyMonkey provided by the researcher utilizing their own personal smartphone

Debriefing

Study results were shared throughout the jobsite at the same location where the survey collection was done. The project management and corporate safety department was given a formal report to share with other segments and determine future training needs.

Additional Information

To provide the equivalent training experiences to all participants, the researcher conducted interventional training using standardized training materials, role-play activities, and a computerized presentation. An abbreviated pilot training was conducted at a training site with demographics similar to the study site. The pilot used the same training materials, presentation, and trainer as in the proposed study. The purpose of the pilot was to test the reception of the content and gather qualitative feedback regarding its usefulness to the attendees and the company safety department.

Training sessions were held in the corporate training facility jobsite trailer of a consistent duration to increase treatment fidelity, as recommended by Cook and Campbell (1979). The study design, training, delivery, and enactment of the skills were monitored throughout the study period as recommended by Bellg et al. (2004) for interventions that involve behavioral change research.

Archival Data

Archival records were provided by the company safety director as part of the study agreement. Pre-intervention safety records included the prior year's incidents, including equipment damage, near-miss reports, severe injuries, and minor first aid injuries. The report was inclusive of all four segments for the entire project (i.e., Segments A-D).

Historical OSHA logs were reviewed prior to AL training. Incident patterns were also included in the training sessions to personalize and add value to the leadership training. OSHA logs are legal documents recording both injury type and severity using a standardized set of criteria for categorization. The corporate office provided an incident record for all 4 segments of the project from January 2017 to December 2017, including all incidents, equipment accidents, first aid, OSHA recordable/reportable occurrences, and near miss records for 8 months prior and 2 months post intervention.

Instrumentation and Operationalization of Constructs

A confidential instrument combined questions from The Brief Norwegian Offshore Risk and Safety Climate Inventory (NORSCI; Nielsen et al., 2013b) and the Authentic Leadership Questionnaire (ALQ; Avolio et al., 2007) to measure safety climate and level of AL respectively.

Operationalization. The NORSCI measured the following aspects of safety climate: (a) individual motivation and intention for safety, (b) managements' prioritization of safety, and (c) safety routines of the crew. Respondents rated statements

concerning the safety climate using a five-point Likert-type scale, ranging from 1 (*fully agree*) to 5 (*fully disagree*). Positive and negative statements were scored with selected reverse scoring for certain items to counteract response-style bias. For positive statements (e.g., My supervisor is committed to health and safety on our jobsite), a score of 5 indicated a positive response; however, a negative statement (e.g., The equipment is often not maintained properly) represented a poor evaluation of the safety climate and was reversed scored. A score of 1 indicated a poor evaluation of the safety climate, whereas a score of 5 represented a good evaluation.

The original instrument was modified by Nielsen et al. (2013b) following a principal component factor analysis where three factors were highlighted (i.e., individual intention and motivation, management prioritization, safety routines) in 12 items. Nielson reduced the items to 11 after one statement computed a low factor loading. The final 11-item scale resulted in an acceptable internal consistency for the overall scale using Cronbach's alpha ($\alpha = .78$). The three safety climate factors represented the group level safety climate ($\alpha = .73$), motivation and personal safety for management prioritization of safety ($\alpha = .73$), and safety routine among the crew ($\alpha = .74$). Validity indicators also demonstrated correlations between the safety climate scales and AL. The NORSCI (Nielsen et al., 2013b) was used because of its brief but valid construction. The researcher was interested in the targeted facets of safety climate as well as providing continuity and alignment with recent safety-climate measurement instruments that had strong correlations between safety climate and AL (Gardner et al., 2011). Measuring a

common set of constructs, albeit direct application of quasi-experimental design, was what had been suggested by the noteworthy researchers in the field of organizational safety climate (Christian et al., 2009; Clarke, 2006, 2013; Zohar, 2014).

The authentic model of leadership, previously validated by Avolio et al. (2007), was also linked directly and positively with improving safety climate in high hazard industries as demonstrated through qualitative data that emerged in a study encompassing 450 interviews conducted by Borgersen et al. (2014).

The ALQ is reliable and currently the only instrument with construct validity measuring AL (Avolio et al., 2007). This survey comprised 16 questions, also utilizing a Likert-like scale of 1 (*strongly disagree*) to 5 (*strongly agree*). The ALQ comprised four subscales (i.e., self-awareness, relational transparency, internalized moral perspective, balanced processing) and a total score for AL. In a recent empirical study conducted by Onorato and Zhu (2014) utilizing the ALQ to measure the relationship between AL and follower perceptions of organizational trust, a Cronbach's alpha calculation for the four subscales listed above indicated good reliability results (0.81, 0.77, 0.77, and 0.86 respectively).

The questions from both the NORSCI and the ALQ instruments, along with one question added by the researcher (i.e., willingness to report near-miss information), were combined on a single electronic survey for the convenience of the study participants (Appendix C). Instrument permissions letters are included in the Appendix C.

A single question added to the instrument by the researcher asked the likelihood of reporting a minor or near-miss incident as defined by the National Safety Council (2013). Choosing a safety behavior often competes with the perception of being productive; therefore, the reporting of minor injuries and near-miss incidents often goes unreported in crews with poor safety climates (Probst & Estrada, 2010). The present study measured the likelihood of reporting near-miss or minor incidents that occurred pre- and post-training intervention. Part of the AL training addressed the importance of trust and transparency as leadership skills and highlight empirical leadership. One of the primary antecedents to crews with positive safety outcomes has been high levels of support to report minor incidents and mistakes that create near-miss situations (Tharaldsen et al., 2008).

Data Analysis Plan

For the pre- and post-training measurement, study participants were asked to complete a survey combining the NORSCI, ALQ, and one researcher-developed question regarding the willingness to report a near-miss incident. Electronic surveys were made available through SurveyMonkey with results downloaded into both Excel and SPSS formats. SPSS was programed to calculate the subscale and total scores for the ALQ and NORSCI. Collected demographic information included gender, ethnicity, age, skill level, and trade as part of the completed survey. Missing or erroneous data were examined for patterns and, based on that analysis, an appropriate method of handling missing data was selected and maintained throughout the data collection process. The two valid and

reliable instruments employed in this study utilized Likert-type scales; the scoring of subscales and total scores was performed per the published literature. The large sample size was to allow for the assumption that the results could display elements essential to parametric testing (e.g., normal distribution).

Research Question 1

Do supervisors who complete safety training emphasizing integration of AL and communication skills during leader-member exchanges have significantly higher worker safety climate perceptions?

Null Hypothesis. There will be no difference in the safety climate perceptions of the workers between employees reporting to supervisors who have completed safety training and employees reporting to supervisors who have not completed safety training emphasizing integration of AL and communication skills.

Alternative Hypothesis. There will be a significant difference in safety climate perceptions of the workers whose supervisors have completed safety training compared to workers whose supervisors have not completed safety training emphasizing integration of AL and communication skills.

Research Question 2

Do workers' perception of their supervisor's AL improve significantly after their supervisors are trained to integrate AL and communication skills during leader-member interactions?

Null Hypotheses. There will be no significant difference in the workers' perception of their supervisor's AL after they are trained when compared to workers' perception measured before their supervisors were trained to integrate AL and communication skills.

Alternative Hypothesis. There will be a significant change in the workers' perception of the supervisor's AL after training when compared to workers' perception measured before their supervisors were trained to integrate AL and communication skills.

Given that choosing safety behavior often competes with the perception of being productive, minor injuries and near-miss incidents often go unreported in crews with poor safety climates (Probst & Estrada, 2010). The proposed study attempted to measure the likelihood of reporting near-miss or minor incidents that occurred following the training intervention. Part of the AL training addressed the importance of trust and transparency as leadership skills as well as highlight empirical leadership. One of the primary antecedents to crews with positive safety outcomes has been high levels of support to report minor incidents and mistakes that create near-miss situations (Tharaldsen et al., 2008).

Research Question 3

Do workers' willingness to report safety concerns increase following the supervisor training?

Null Hypothesis. Workers' willingness to report safety concerns will be the same when measure before and after supervisor training.

Alternate Hypothesis. Workers' willingness to report safety concerns will increase significantly following the supervisor training when compared to surveys taken before supervisor training.

Threats to Validity

Despite the quasi-experimental design and plans for consistency taken when conducting the study, there remained several possible threats to validity from both external and internal determinants.

External Threats to Validity

Communication among supervisors and between the supervisors and workers could not be controlled. The researcher was aware that external validity could be threatened if those participating in the training discussed the workshop contents with those members who were not exposed and that information could change their behavior accordingly. To mitigate this effect, the researcher informed training participants of the possibility of the threat and request confidentiality of the training material until the end of the study (Jones, 1992).

Additionally, all participants were informed of the research study taking place at their jobsite; information that has historically given rise to concerns about the Hawthorne Effect (HE) or other "research participation effects caused by participant knowledge of the research" (McCambridge, Witton, & Elbourne, 2014, p. 276), specifically with participant willingness to conduct near-miss reporting. If the training participants were made aware that the behavior of near-miss reporting was being closely monitored, there

was a possibility of behavior change due to that knowledge alone. In attempt to discourage participant knowledge bias, participants were informed that the study would not report specific details about who or which crew improved the near-miss reporting. Generalized results were reported after the study as long as the withholding of reporting did not cause harm to any of the participants or create risks or concerns that were not already part of the environment.

As previously mentioned, the training was scheduled in the natural environment and relied on scheduling practices that were familiar to participants; this reduced the cognitive threat that has been documented in experimental studies conducted in laboratories or simulated environments (Jones, 1992). Secondly, the participants who completed the safety climate perception surveys were not observed or given individual attention from the researcher. There was little empirical evidence that guided reduction of the HE in quasi-experimental design and self-report surveys (O'Sullivan, Orbell, Rakow, & Parker, 2004). Finally, the threat from resentful demoralization or other social interaction threats to validity (Trochim, 2006) were given consideration as the random sampling was developed to include training all participants, including the control group leaders, after the final data collection for the study.

Internal Threats to Validity

Statistically significant results could suggest an association between the training and a safer work environment. Nevertheless, the process of data analysis might confound variables that had not yet been identified and could also influence the results. Historical,

events, such as a catastrophic occurrence on the jobsite during the study, might change perception and actions related to safety. Furthermore, threats could include maturation and regression to the mean. Sufficient intervening time, in this case 4 weeks, separated the survey collection at T0 and T1, helping to reduce the threat of maturation (Cook & Campbell, 1979).

Although the researcher was aware of the possibility that participants might display targeted behavior shortly after safety training then regress to pre-intervention behavior, the follow up survey was timed to capture habitual behavior in place several weeks after the training; that was when the final perception of safety climate was measured. Finally, there was a possibility that those who volunteered for a safety study might already be safety conscious or afraid to express genuine critique of safety on the jobsite. Assurance from management and the researcher that identities would not be shared with the company under any circumstance helped to alleviate fear of negative consequences or job loss for honest participation in the study.

Ethical Procedures

Formal agreements were secured prior to any training sessions or data collection at the pilot and study sites, as guided by the University Institutional Review Board (IRB) at Walden University. The IRB approval number for this study is: 09-08-17-0107839. The Program Initiative/Oversite and Data Use Agreement outlined the ethical procedures, oversite responsibilities, researcher role and responsibly, timeline of the data collection, storage, and reporting (Appendix D).

Participants did not face any ethical concerns that were not already part of a safety training environment. Although the small group coaching techniques included some techniques that were similar to those used in therapeutic behavior change endeavors, such as motivational interviewing (MI) techniques, guidelines established by Passmore (2013) were followed to protect all participants if topics were brought up that might cause psychological harm, effect liability, or damage the organizations reputation, such as disclosing details about serious incidents under investigation at the time of the training session.

Confidentiality of perception surveys, OSHA reports, and/or near-miss reports were protected by the researcher on a secure server for the duration of the study. The company's oversite executive removed names from reports and OSHA logs before sharing archival data.

The decision to refuse to participate or withdrawal for any reason was treated with confidentially and respect. Participants were removed from study confidentially to avoid any form of retaliation, perception of unfair treatment, or other negative consequences from the employer.

Summary

The study adhered to all ethical guidelines and oversite provided by Walden University as well as federal, state, and local laws where the training and data collection took place. Naturalistic, respectful, and open communication with the company oversite and all participants were built into all aspects of the study and data collection procedures.

The study created minimal disruption to operations, utilized validated instruments to measure perceptions, and was scheduled and conducted in small groups similar to the standard OSHA-based training already familiar to company field personnel to minimize disruption of operations and threats to validity. All data including participant perceptions and participation throughout the study were carefully guarded by the researcher; reports to the company were made in general terms, protecting the confidentiality of the participants.

In Chapter 4, the results of this quasi-experimental design will be described.

Chapter 4: Results

Introduction

A quantitative, quasi-experiment design was implemented to determine whether AL development training could improve workforce perceptions of safety climate in a cost-effective and meaningful way, particularly on large, heavy, civil and public works projects in the construction industry. As detailed in Chapter 3, the approach was similar to Zohar's (2014) successful safety climate improvement interventions in the manufacturing industry: It was a brief intervention that sought improvements in communication and safety climate. Furthermore, application of PdT and coaching methods were used as the intervention framework to discuss AL development in a small group setting. The basic framework has the potential for replication in various industries and organizations with similar hierarchies or work groups to improve safety climate. Research in AL and safety climate benefits both practitioners and researchers in the field of organizational psychology, and it may further reduce severe injury or possibly lower fatality rates in high-risk work environments. The study was conducted as planned, using the instrumentation and framework as designed, which led to a significant change in one important measure of safety climate regarding the perception of equipment maintenance having an impact on safety climate.

Data Collection

The actual data collection was conducted as described in Chapter 3. Some pretest surveys where collected from individuals who may have traveled to other work areas of

the project by the second data collection. Posttest data were collected solely from the work crews that were stationed at jobsite Segment D and working for the trained supervisors.

The number of field employees estimated at the time of the original proposal included the projections for a 4-year, $1 billion, 22-mile urban freeway expansion project. It was anticipated that the project population would have been 220 workers and 30 supervisors. During the initial data collection points of September 19, 2017 to October 9, 2017, there were 108 field craft employees on the project and 18 supervisors; a low point due to environmental permit delays and negotiations with Native Americans over sacred land. Skeleton crews were employed for portions of work that could be completed during the wait time. The number of employees increased slightly on the final collection date and went to full capacity in the weeks that followed the final collection date of November 17, 2017. The researcher was advised during the final collection date that the core leaders from the study would be distributed throughout the four segments; therefore, the timing of the leadership training had been excellent in terms of training impact for the other segments, but the scattering of survey participants would halt data collection as there would be no means of identifying employees of trained supervisors after the week of November 13-17, 2017, when the final data collection took place.

Managers and superintendents who requested to take the survey were given access to the link. Because the survey asked the participant to identify a position in the

company, survey responses for managers and superintendents were removed from the data before the detailed analysis.

Characteristics of the Survey Participants

Table 1

Position Held by Survey Respondents

Position	Pretest	Posttest	Superintendents	Total
Apprentice	15	7	0	22
Journeyman	54	18	0	72
Foreman	10	3	2	15
Superintendent	1	1	4	6
Management	7	3	0	10
Total	87	32	6	125

Once the superintendents and management staff were removed from the data, the study participants comprised the crafts shown below.

Table 2

Crafts Represented in Survey Responses

Craft	Pretest	Posttest	Total	%
Carpenter	32	18	50	46.3
Ironworker	7	0	7	6.5
Laborer	10	7	17	15.7
Operator	29	2	31	28.7
Missing data	2	1	3	2.8
Total	80	28	108	100

The age of survey participants was fairly distributed. Participants were asked to identify their age within a range of numbers so as to minimize potential identification.

Table 3

Age Range of Participants

Age Range	Pretest	Posttest	Total	%
18-25	10	5	15	13.9%
26-30	14	3	17	15.7%
31-40	19	8	27	25.0%
41-50	19	8	27	25.0%
51-60	13	3	16	14.8%
Over 60	5	1	6	5.6%
	80	28	108	100%

Participants were also asked to identify their race and/or ethnicity. Table 4 reports these results.

Table 4

Race/Ethnicity of Study Participants

Race/ethnicity	Pretest	Posttest	Total	Percent
Caucasian	28	6	34	31.5%
Hispanic	41	17	58	53.7%
African American	1	0	1	0.9%
Other	9	5	14	13.0%
Prefer not to answer	1	0	1	0.9%
Total	80	28	108	100%

The entire project employed 18 to 20 superintendents at the time of the surveys and through mid-November 2017; nine of those superintendents worked consistently on the segment where the training took place (i.e., Segment D), then could possibly be spread throughout the other segments (i.e., Segments A, B, & C). Given the changing conditions of the field project, the researcher focused the training and second data collection (T1) on a single segment chosen by project management (i.e., Segment D) as a means to isolate the study group and create a snapshot of the safety climate post intervention. The reduction of comparative surveys will be discussed further in the limitation section.

Treatment and/or Intervention Fidelity

The AL development program was implemented as described in Chapter 3 with minor adjustments for participant size, grouping, and training emphasis. Best practices recommended by the NIH Behavior Change Consortium were used throughout the design and implementation, including the development and use of a workbook to aid in participant enactment of the communication skills learned (Bellg et al., 2004).

Of note, the survey and training framework were highly structured but could be implemented by a company instructor or safety professional to maximize the benefits. The survey developed for this study was constructed from two separate instruments. The NORSCI survey was in the public domain and did not need permission to use it in the research setting. The ALQ did require permission; however, that permission was limited to a maximum of three questions. The training intervention created for this study was heavily grounded in the safety coaching literature (Gellar, 2004), standardized organizational training (Cherniss et al., 2012), and emerging organizational coaching literature (Fusco et al., 2011; Grant et al., 2010; Kinsler, 2014).

One-half of the 18 superintendents on the project at the time of the study were assigned to training; all of the superintendents in training were dedicated to the segment where the majority of craft workers were assigned at the data collection time T1 in Segment D. Only one supervisor did not show up as scheduled; all participating superintendents were allocated by the segment project manager.

The emphasis of the training was adapted in response to the initial data collection (Bellg et al, 2004). The superintendents selected by the company were rated very high by participants in the perception of authenticity leaving little room for improvement, specifically in the areas of integrity, listening, and self- awareness. Although the training included reflection and discussion of the developmental areas listed above, the emphasis in the training shifted to focus on the actionable areas of safety climate that were not as highly rated by the survey participants in the T0 surveys (e.g., communicate near-miss reporting, creating an empowered climate of communication among the crew members and foreman). In addition, superintendents discussed incidents that concerned them.

Supervisors assigned to jobsite Segment D were the only supervisors trained at the time of this writing. The consequence was increased fidelity in the implementation by providing a single group in training before the post survey results were obtained, thereby removing any question of consistency of the training within groups.

The diversity of the superintendent group selected by project management was worth noting for future studies because it appeared to create an ideal training situation for a joint-venture project. This project was staffed by employees from three parent companies that traditionally compete with each other. The project was bid and awarded under a new corporate structure and name, blending a mix of employees from each construction company; a frequent practice of shared resources on mega project joint ventures. What was unusual about this group was the similar assortment of field leadership from two of the parent companies dedicated to this project; typically, one

contractor provides the field craft in joint ventures. The training session included a mix of superintendents from each of the parent companies. The cultural differences were striking and conspicuous in the group discussions and communication exercises.

Study Results

The confidential instrument used to measure the safety climate on the project (Appendix B) was assembled from three sources. The first three questions were from the Authentic Leadership Questionnaire (ALQ; Avolio et al., 2007). Questions 4 to 11 were from the Brief Norwegian Offshore Risk and Safety Climate Inventory (NORSCI; Nielsen et al., 2013b) and the near-miss question was designed by the researcher. Further statistical detail follows for each of the questions included on the electronic survey.

Comparative/Relative Percentages of Authentic Leadership in Pretest and Posttest-Surveys

Many workers appeared to agree that leadership throughout all segments of the project demonstrated the core characteristics associated with authentic leaders from the outset. Although there was a slight improvement in AL perceptions at T1, it was not statistically significant.

Table 5

Authentic Leadership Questions

Survey Questions	Pre/ Post	Strongly Disagree Percent (*N*)	Disagree	Neither	Agree	Strongly Agree	Total *N*
Q.1 My Leader says exactly what he or she means.	T0:	4.65% (4)	5.81% (5)	12.79% (11)	47.67 % (41)	29.07% (25)	86
	T1:	9.38 % (2)	3.31% (1)	6.25% (2)	65.63% (21)	15.63% (5)	32
Q.2 My Leader listens carefully to different points of view before coming to conclusions.	T0:	2.33% (2)	8.14% (7)	11.63 (10)	54.65% (47)	23.26% (20)	86
	T1:	3.13% (1)	9.38% (3)	12.50 (4)	68.75% (22)	6.25% (2)	32
Q.3 My Leader shows he or she understands how specific actions impact others.	T0:	4.65% (4)	3.59% (3)	18.6% (16)	51.16% (44)	22.09% (19)	86
	T1:	3.13% (1)	3.13% (1)	12.50 (4)	71.88 (23)	9.38% (3)	32

Note. Questions based on Authentic Leadership Questionnaire by B. J. Avolio, W. L. Gardner, & F. O. Walumbwa (2007). Used with permission.

Perceptions of Leadership Authenticity

The first three questions on the survey measured authentic leader perceptions of workers on the project pre- (T0) and post- (T1) authentic leader development training. As 80 preintervention surveys and 28 postintervention surveys comprised the study, the comparison is displayed by the relative proportion of responses for each survey question. The selection of responses for the three questions extracted from the ALQ denoted a 5-point Likert-type scale from 1(*strongly disagree*) to 5 (*strongly agree)*. Utilizing this ordinal scale, statistical significance was calculated pre- and postintervention by

computing a Mann-Whitney *U* for independent samples. The *U* distribution for all questions was approximately normal, therefore *z* values are reported.

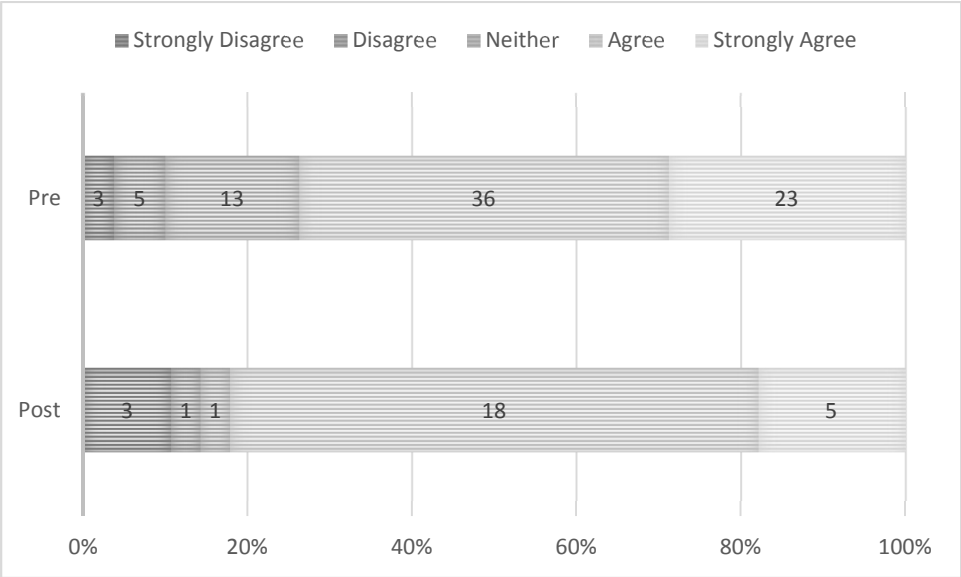

Figure 1. Survey Question 1: My leader says exactly what he or she means.

Pre-intervention, leaders were already ranked positively by their workers for honest communication. The proportion of positive responses grew from 73.8% to 82.1%, but that increase did not achieve statistical significance ($z = 0.354$, $p = .726$).

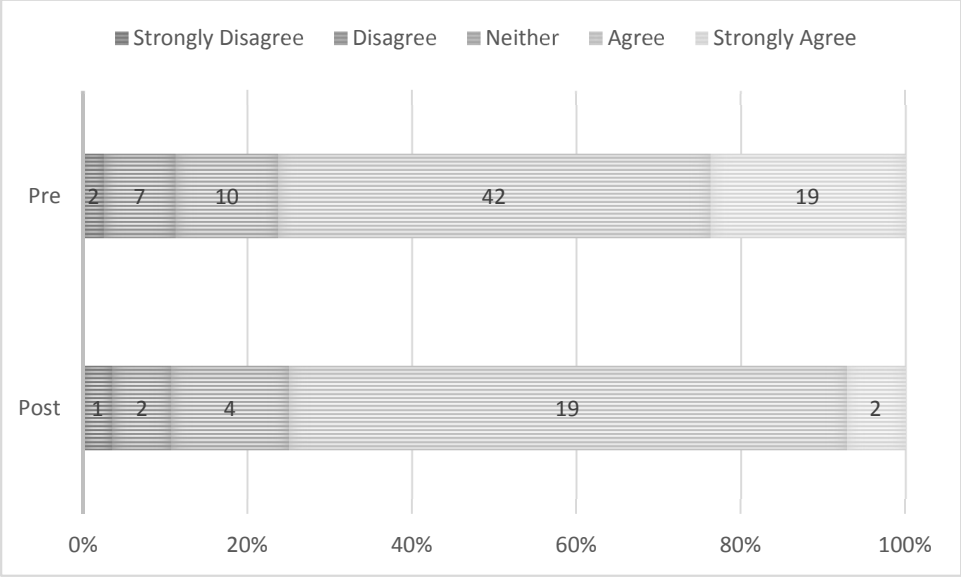

Figure 2. Survey Question 2: My leader listens carefully to different points of view before coming to conclusions.

Both pre- and postintervention responses were primarily positive for this listening question (76.3% vs. 75.0%). However, no statistical difference was seen between the two survey collection points ($z = 0.002$, $p = 1.0$).

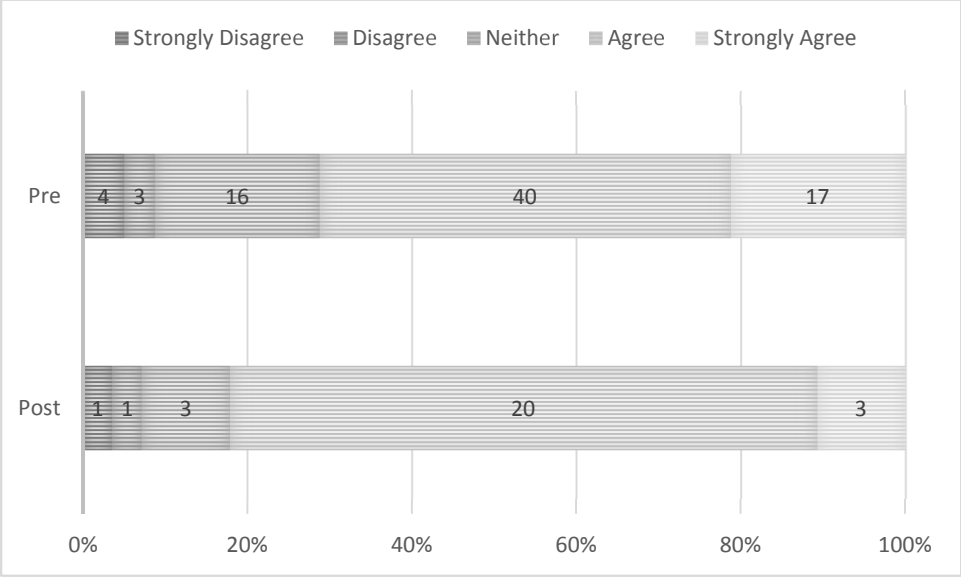

Figure 3. Survey Question 3: My Leader shows he or she understands how specific actions impact others.

Similar to Question 1, the leader's understanding of how actions might affect others was largely positive pre-intervention. On the postintervention survey, a larger proportion of respondents agreed with the statement (71.3% vs. 82.1%); however, this result was not statistically significant (z = -0.046, p = .960).

Composite Score for Authentic Leadership. The first three AL questions were combined to represent an AL subscale score. Collectively, there was no statistical difference in these elements of AL measurement.

Table 6

Authentic Leadership Composite Score

Time	*N*	*M*	*SD*	*t*	*p*
Pre	80	11.54	2.360	0.548	.585
Post	28	11.25	2.474		

Safety Climate Perceptions T1 and T0

Questions 4 through 14 represented all of the questions in the NORSCI. Subscale scores of this inventory included (a) motivation and intention to work safely, (b) management prioritization of safety, and (c) safety routines established by management. The selection of responses was designated on a 5-point Likert-type scale from *Not at all* (1) to *Frequently if not always* (5). Utilizing this ordinal scale, statistical significance was calculated pre- and postintervention by computing a Mann-Whitney *U* for independent samples. The *U* distribution for all questions was approximately normal, therefore *z* values are reported.

Individual motivation and intention to work safely. Questions 4 to 7 on the survey represented an individual's motivation and intention to work safely. These questions queried the respondents in what they as workers would do to promote safety in the workplace.

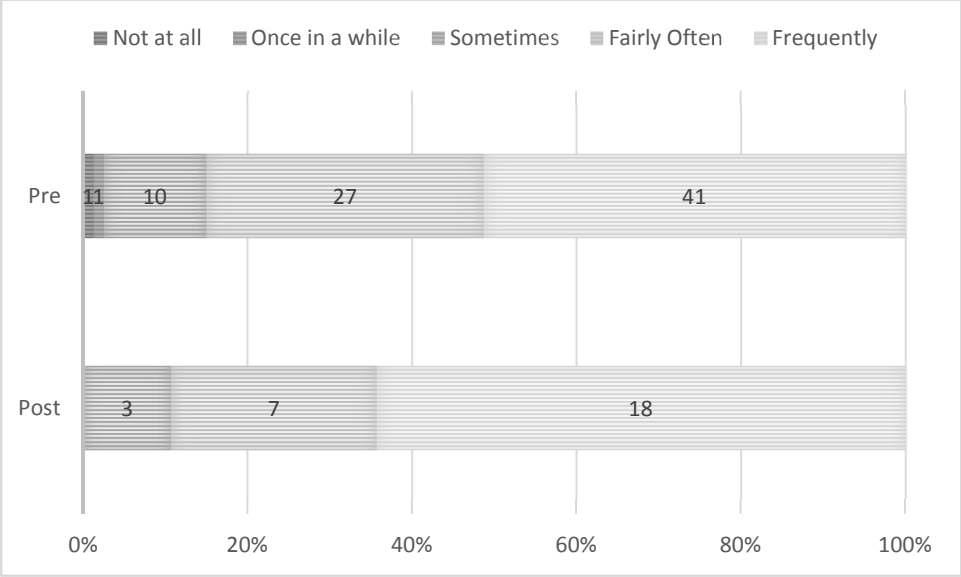

Figure 4. Survey Question 4: I report any dangerous situations I see.

Reporting dangerous situations was seemingly habitual in nearly all respondents. The differences pre- and post- were seen in the Frequently category (51.3% vs. 64.3%), but this was not a statistically significant shift in responses (z = -1.052, p = .294).

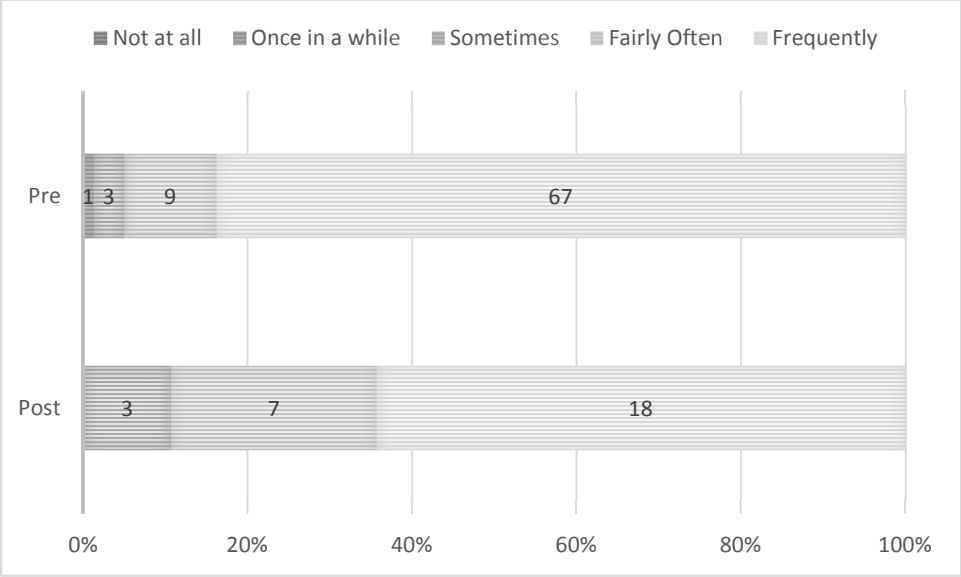

Figure 5. Survey Question 5: Safety is my Number 1 priority when I work.

In this question, a noticeable shift downward was seen in the responses postintervention, particularly for the Frequently if not Always category (83.8% vs. 64.3%) These changes in proportions were not statistically significant ($z = 0.489$, $p = .624$).

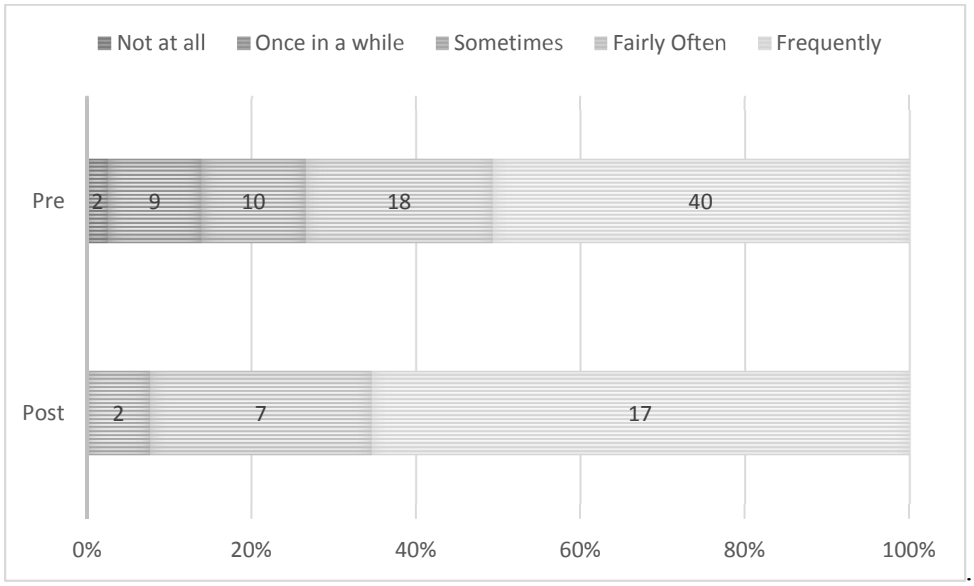

Figure 6. Survey Question 6: I ask my colleagues to stop work which I believe is performed in an unsafe manner

Responses to Question 6 appeared to improve in the top rating (50.6% vs. 65.4%) and no postintervention responses were in either of the two lower categories. This change, however, was not statistically significant (z = -1.615, p = .107).

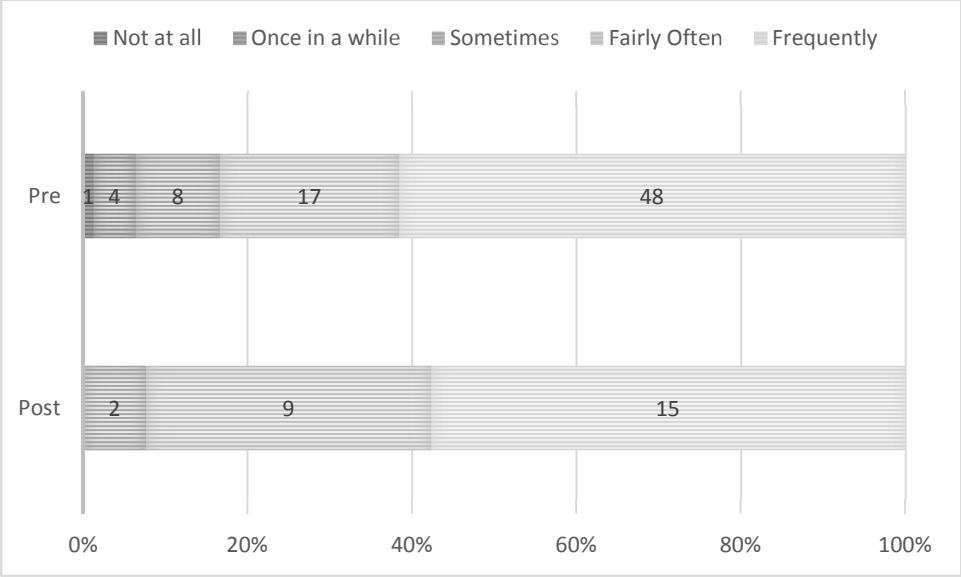

Figure 7. Survey Question 7: I stop work if I believe it may be dangerous for me or others to continue.

The noticeable difference pre- and postintervention was the shift up in self-reporting the need to stop work. No postintervention responses were in the Not at all or Once in a while categories; however, this was not statistically significant (z = -0.053, p = .960).

Composite subscale score for individual motivation and intention to work safely. Summing the scale scores for individual motivation and intention yielded slightly higher scores postintervention. This difference was not statistically significant (Table 7).

Table 7

Composite Subscale Score for Individual Motivation

Time	*N*	*M*	*SD*	*t*	*p*
Pre	77	17.56	2.849	-1.248	.215
Post	25	18.32	1.887		

Perception of management's prioritization of safety. Questions 8 to 11 measuring management's prioritization of safety were designed as negatively worded questions. Unlike other questions on the survey, a lower score indicated increased safety consciousness on the part of the employer.

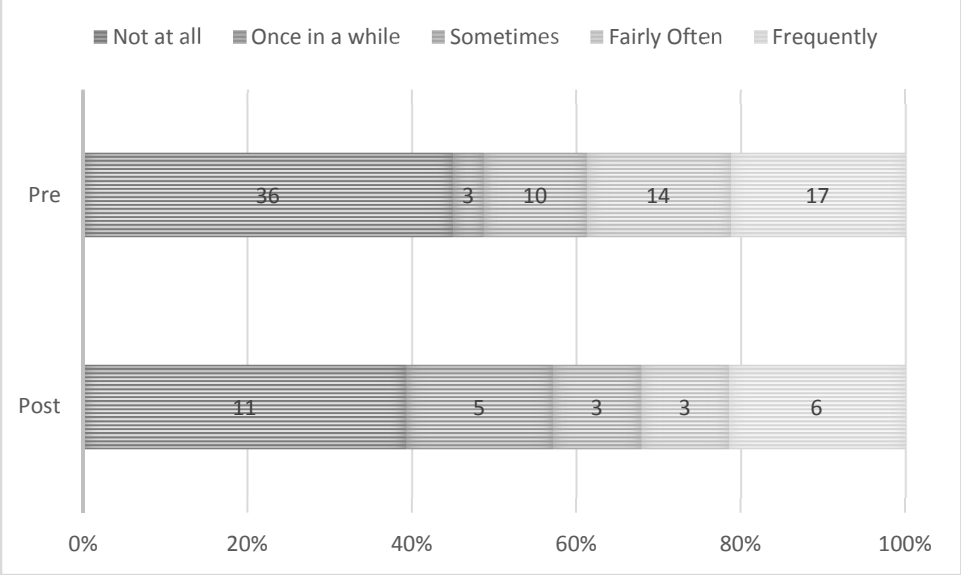

Figure 8. Survey Question 8: In practice, production takes priority over health, environment and safety.

Question 8 appeared to have proportionally fewer responses in the top three ratings (51.3% vs. 42.9%) but the preferred, safety-conscious response of *Not at all* was also proportionally less. This difference was not statistically significant ($z = 0.035$, $p = .968$).

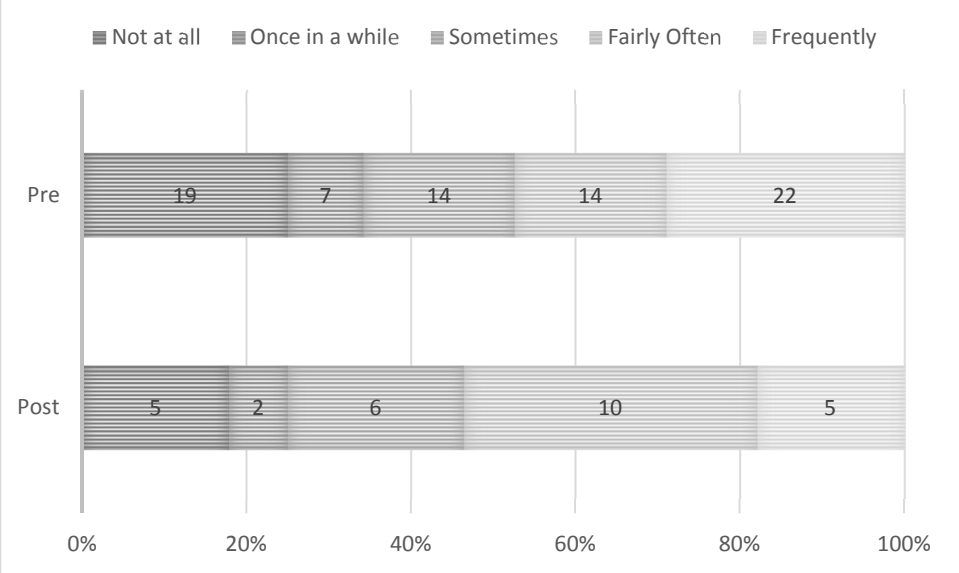

Figure 9. Survey Question 9: Reports about accidents or dangerous situations are often ‘‘embellished.’’

For Question 9, there appeared to be a broadening of the middle responses (i.e., Sometimes, Fairly Often; 36.8% vs 57.1%). This shift in proportions was not statistically significant ($z = 0.154$, $p = .881$).

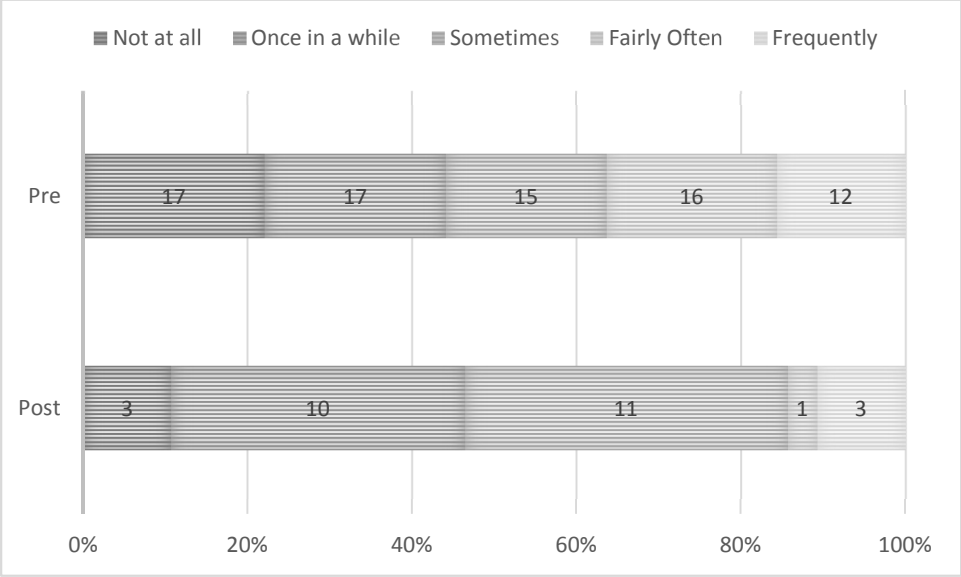

Figure 10. Survey Question 10: There are often concurrent work operations which lead to dangerous situations.

Question 10 also appeared to have a widening of the middle responses, this time for Once in a while and Sometimes (41.6% vs. 75.0%). This shift was not statistically significant ($z = 0.511$, $p = .610$).

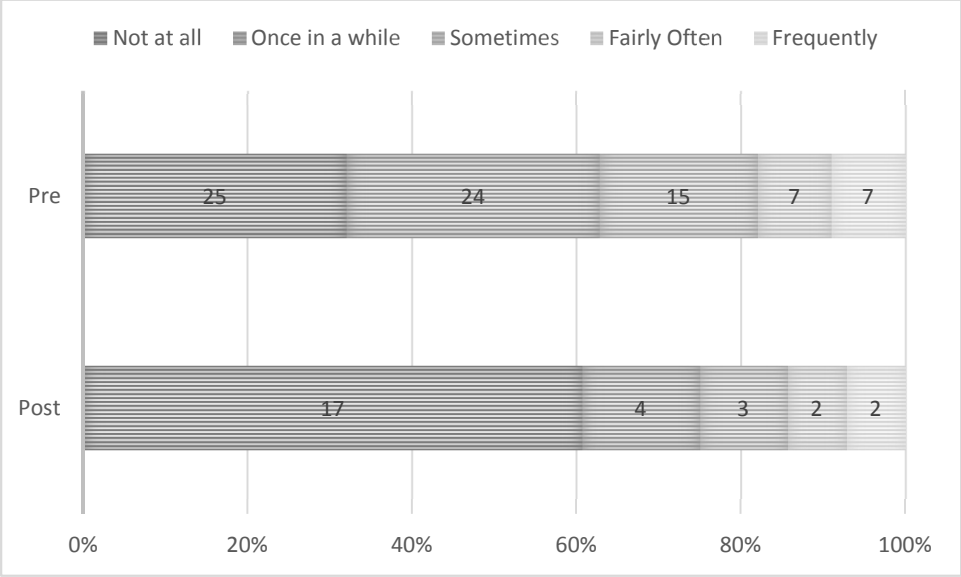

Figure 11. Survey Question 11: Deficient maintenance has caused poorer safety.

The question about deficient maintenance illustrated a dramatic, positive shift with 60.7% postintervention respondents reporting Not at all (vs. pre-intervention of 32.1%). These results were statistically significant ($z = 1.989$, $p = .047$).

Composite subscale score for perception of management's prioritization of safety. Combining all of the negatively worded questions examining workers' perceptions of how management prioritizes safety with other competing needs, a subscale score was calculated. To compare all of the subscale scores, responses were recoded to account for the negative statements (e.g., Not at all = 5, Frequently = 1) so that a higher number would represent a more safety-conscious environment. The resulting statistics for this subscale are displayed in Table 8.

Table 8

Composite Subscale Score for Management's Prioritization of Safety

Time	*N*	*M*	*SD*	*t*	*p*
Pre	75	13.01	4.326	-0.647	.519
Post	28	13.61	3.604		

Perception of safety routines established by management. Questions 12–14 asked respondents to gage safety routines that have been established by management. After discussing each question, the subscale scores will be displayed.

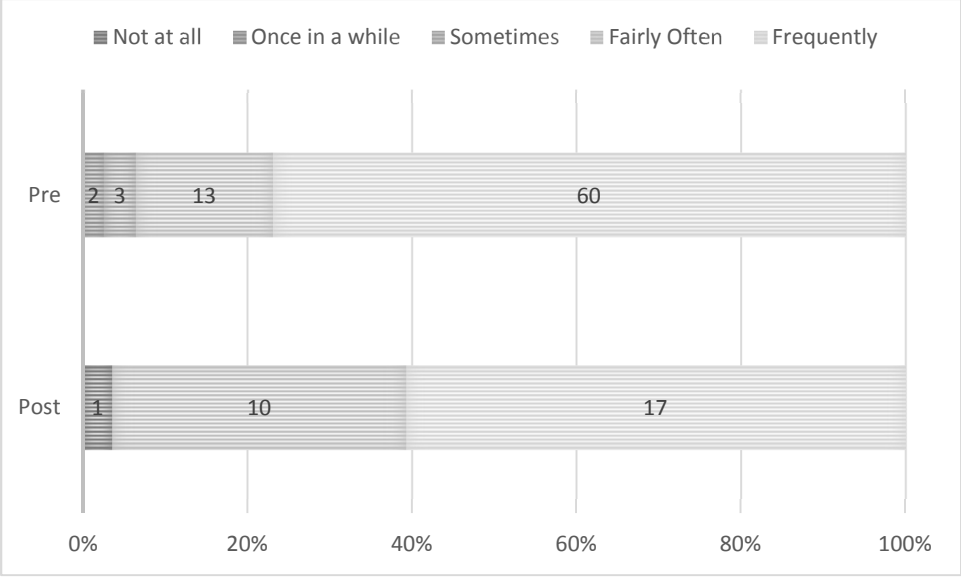

Figure 12. Survey Question 12: I have the necessary competence to perform my job in a safe manner.

In the postintervention, all but one respondent indicated competence to work safely Fairly Often or Frequently if not always; however, the proportion of Frequently if

not always was lower than on the pre-intervention survey (76.9% vs. 60.7%). This difference was not statistically significant ($z = 1.150$, $p = .250$).

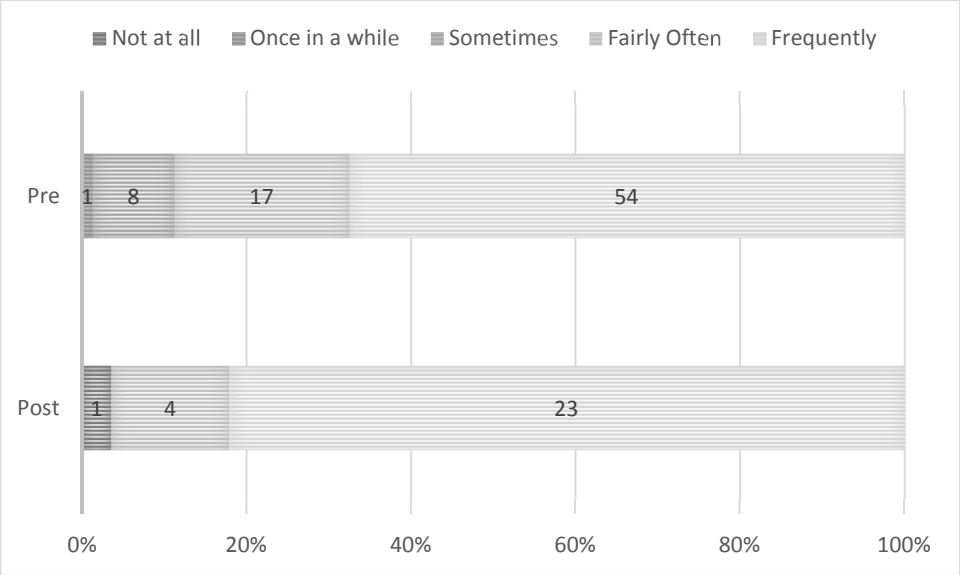

Figure 13. Survey Question 13: I have easy access to personal protective equipment.

As seen in Question 12, all but one employee indicated simple access to personal safety equipment and the proportion of *Frequently if not always* was greater in the postintervention group (67.5% vs. 82.1%). This difference was not statistically significant ($z = -1.181$, $p = .238$).

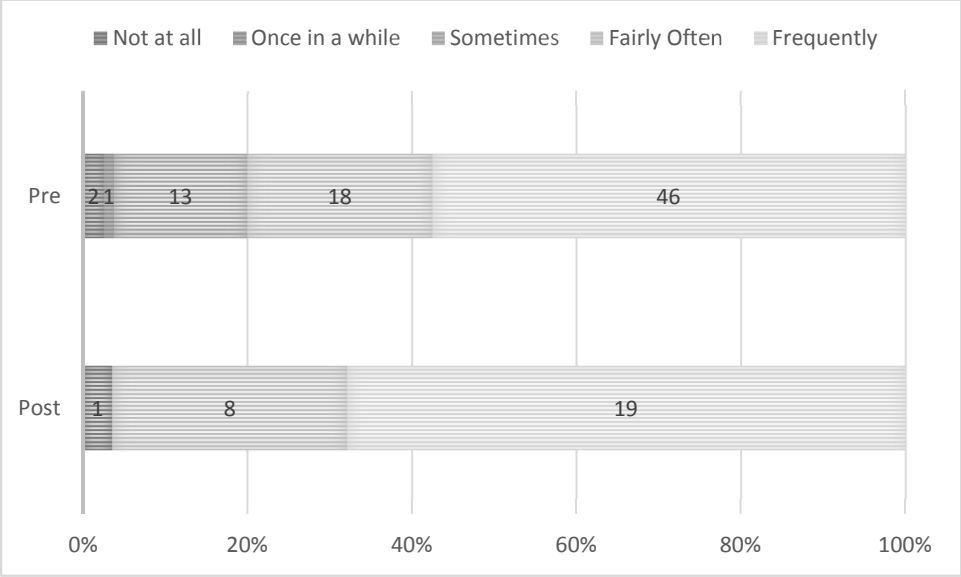

Figure 14. Survey Question 14: The management takes input from the safety delegates seriously.

Again, all but one worker felt that management took safety-delegate feedback seriously in the postintervention survey and the proportion of *Frequently if not always* was larger postintervention (57.5% vs. 67.9%). This difference was not statistically significant (z = -1.146, p = .250).

Composite score for perception of safety routines established by management. The third subscale for the NORSCI indicated relatively high scores pre-intervention that tended to increase postintervention, but not at a level to be statistically significant. Table 9 outlines the data for this subscale.

Table 9

Composite Subscale Score for Perception of Safety Routines Established by Management

Time	*N*	*M*	*SD*	*t*	*p*
Pre	78	13.51	1.807	-0.689	.492
Post	28	13.79	1.771		

Worker's ability to be heard. The last survey question was designed to capture the perception of the workers' personal safety to risk speaking up when otherwise unreported near miss incidents occurred. The following measured the likelihood of reporting near-miss or minor incidents that occurred pre- and post-training intervention.

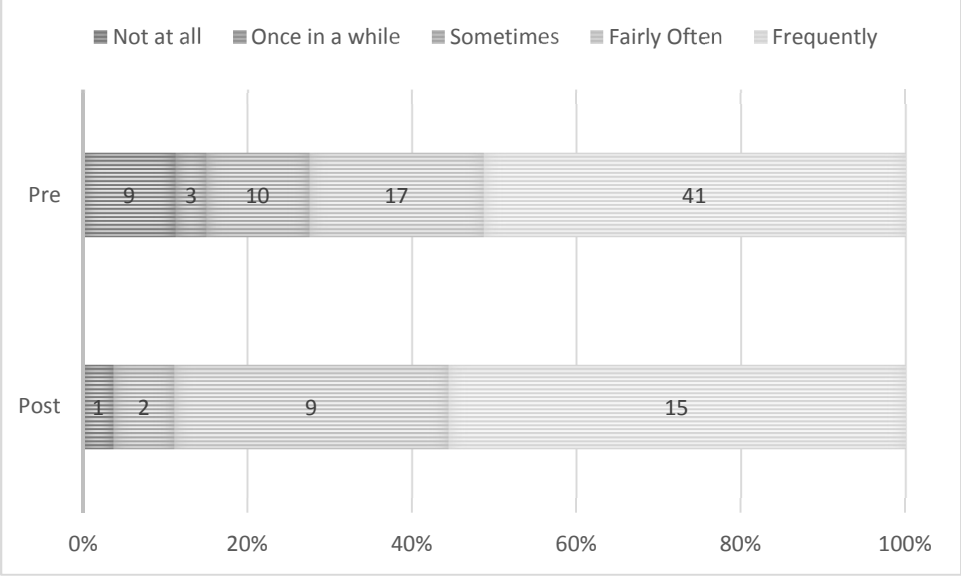

Figure 15. Survey Question 15: I feel safe reporting events that could have caused damage or injury but did not.

Pre-intervention, more than one-quarter of employees (27.5%) reported feeling less than safe reporting near-miss incidences; postintervention, this proportion was only 10.7%. This broadening of feeling safe in reporting near-misses nonetheless was not statistically significant (z = -0.897, p = .368).

Total Score for Study Survey

A total score for all survey questions was computed and tested for homogeneity of variance to ensure appropriate statistical testing. As four of the questions (i.e., Questions 8-11) were negatively worded, they were reverse-scored to be on par with the 11 positively-worded statement. The results of that comparison between the pre- and postintervention surveys is displayed in Table 10.

Table 10

Total Score Comparison for Study Survey

Time	*N*	*M*	*SD*	*t*	*p*
Pre	74	59.45	7.454	-1.080	.283
Post	24	61.33	7.400		

Project Incident Records

The safety administrator for the project provided comprehensive records of all incidents that had occurred in Calendar Year 2017 through December, a time when the project slowed down for the holidays. All four segments (i.e., A, B, C, D) are summarized below. The first column displays Segments A, B, and C for the year. Column

2 lists the incidents that occurred only in Segment D prior to the study. The last two columns provide a snapshot of incidents that occurred 2 months prior and 2 months post supervisor intervention.

Incidents were categorized into types representing property loss, bodily injury, regulatory reporting, or the potential of financial loss. These categories were:

- *Equipment damage* – an incident that resulted in the need to repair or replace personal property owned by the company: heavy equipment roll-overs, company truck accidents on the job site, and any other incidents that involved company owned property with damage valued at $1,000 or more.
- *OSHA recordable* –worker injury requiring medical (physician) intervention and/or work restrictions; reported to state and/or federal authorities according to regulatory requirements
- *First aid* – minor workplace injury, generally treatable on the job site
- *Utility damage or hit* - utility conduits of any type that are damaged or struck during construction operations (e.g., electric, gas, cable, water)
- *Formal near miss report* – formal reports of incidents that had a potential for damage or injury but did not incur physical or monetary loss.

Situations and potential for negative outcome are described on a company incident form.

Table 11

Injuries, Equipment Damage, and Public Utility Hit Summary

Incident Type	Jan - Dec Seg. A, B, and C	Jan – Dec Seg. D Only	Jan-Aug Seg. D Only	2 Months Pre-Training Seg D	2 Months Post-Training Seg D
Equipment Damage	17	14	10	4	0
OSHA Recordable	6	4	4	0	0
First Aid (On-site)	4	8	6	1	1
Utility Damage/Hit	0	8	5	3	0
Formal Near Miss Report	3	1	0	0	1
Total	27	34	24	8	2

As the study was underway, the company requested AL intervention in Segment D for reasons that were clear after reviewing the company incident records.

Summary

Research Question 1 is as follows: Do supervisors who complete safety training emphasizing integration of AL and communication skills during leader-member exchanges have significantly higher worker safety climate perceptions? Although the total score of the survey did not show any significant change in the safety climate perceptions overall, there was a significantly higher safety-climate perception in regard to maintenance of equipment post intervention ($p < .047$). This finding was supported by the sharp reduction in equipment damage reports. The overall reduction of incidents across

all categories in the segment that participated in the AL training at Segment D was significant (Fisher's Exact, p = .007) and supports rejecting the null hypothesis.

Research Question 2 is as follows: Do workers' perception of their supervisor's AL improve significantly after their supervisors are trained to integrate AL and communication skills during leader-member interactions? With no significant change in the perception of supervisors AL in the workers following the training, Research Question 2 must fail to reject the null hypothesis. Further interpretation of the proportional/percentage shift from strongly agree to agree in the workers perceptions of supervisors AL improvements will be articulated in Chapter 5

Research Question 3 is as follows: Does worker willingness to report safety concerns increase significantly following the supervisor training? This question was tested by combining the responses of Questions 4, 6, and 15; however, it was not statistically significant and must therefore fail to reject the null hypothesis. Nevertheless, based on the incident reports and anecdotal information from the safety department regarding an upsurge in informal near-miss reporting, there is a need for further investigation in this area as detailed in Chapter 5.

In summary, the initial research questions remained valid and withstood the testing process suggesting implications for the influence of a focused approach to AL at one jobsite. Although only one question measured a significant change in the safety climate perception of the workers, the project incident reports post survey augmented the

significance of that change. Further exploration of the results and possible conclusions will be discussed in the next chapter.

Chapter 5 will discuss the findings of this study as well as the limitations for generalization of the results. Additionally, implications for social change and suggestions for future research will be presented.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

This study builds on the evidence that positive safety climates influence the work environment by increasing positive safety outcomes, reducing incidents, and improving preventive communication (Zohar, 2014). The overarching purpose of this study was to test the ability of AL and communication development to make a positive change in safety climate. From the outset, the design of this study was to effect immediate behavior change and improve communication at the staff level of high-risk, heavy highway construction sites following a brief, low-cost, and inconspicuous AL and safety communication intervention. The total scores from the survey did not measure significant change in safety climate as designed. However, the significance of one key facet of the safety climate, the incident trends postsurvey and an informal increase in near-miss safety reporting, suggest that the model warrants further implementation and study in the construction safety field.

The significant change in the perception of improved equipment maintenance on Segment D may have the greatest immediate impact on continuous improvement of safety climate, performance, and reducing the frequency, severity, and probability of fatalities on the jobsite. Despite the lack of statistical evidence, there were several relevant, positive shifts in perceptions and a few moves downward, suggesting perceptible changes had been ignited in other areas of communication and worker empowerment to express their experiences and concerns.

The survey and implementation model designed for this study could be used for further inquiry into AL and communication improvements on large construction projects and a myriad of other complex organizational structures and high-hazard workplaces such as the military, police organizations and hospitals.

Interpretation of Findings

The one area of statistical significance in the safety climate survey was measured in Question 11, Deficient maintenance has caused poorer safety. The initial response flagged maintenance as a concern that colored the safety climate in the preintervention phase (T0). Postintervention (T1), 60.7% of respondents did not see maintenance related to poorer safety ($p < .047$). Although the supervisors in training broached equipment maintenance and the large number of incidents in Segment D, in the group roundtable discussion during the intervention, project management was reporting focused improvements in the maintenance area.

For this study, the supervisors were heavily encouraged by upper management to improve their leadership skills. The commitment on the part of project management to support the supervisors in this change endeavor, especially at Segment D, was impressive. This was evident by the investment in training time and opportunity cost of taking top-pay leadership out of the field to attend the AL training. The researcher observed corporate and segment safety personnel as a major source of support for the supervisors and the crews. Managers were observed actively and habitually implementing all of the standard practices noted by Esmaeili et al. (2012) found in organizations that

are considered world class. Each segment was staffed with a safety manager and spent the majority of the workday in the field with the workforce; a safety administrator and regional safety manager coordinated recordkeeping and insurance issues, allowing the safety managers to interact with the craft workers on a daily basis.

Although there was an increase in the frequency of reporting dangerous situations (Questions 4 and 6), the perception of workers to feel secure in reporting near-miss incidents also increased (Question 15). Unfortunately, these changes did not achieve statistical significance. The increased proportion of positive perception post training, as evidenced by the first formal near-miss reported at Segment D and antidotal reports of informal near miss discussions that began to occur, would be indicative of positive actions and increased communication on the project in the weeks and months following the training event. Similar effects were discovered following Zohar and Polocheck's (2014) brief communication intervention in the manufacturing field in which inspection scores improved in the areas of the plant where the experimental supervisors' intervention took place. An interesting shift surrounding Question 3 (i.e., My leader shows he or she understands how specific actions impact others) warrants further discussion and perhaps future investigation. A large portion of the workers' perception shifted from *strongly agree* to *agree* and a higher percentage moved from a neutral response to *agree*, although the resulting shift was not statistically significant. Without further testing or follow up interviews, it is difficult to determine the reasons for the mixed changes. Based on the large number of workers who started informally revealing

safety issues and acting with a sense of empowerment to verbally report near-miss incidents on Segment D following the intervention, there is concern that perhaps the lack of follow-up actions or policy supporting a feedback loop led to the slight change in perception for some workers. Other workers may have experienced swift follow up from the supervisor or safety officer and that shifted their perception more favorably.

Another area of incident reporting should be noted to avoid the misrepresentation of the data in Table 11. The reduction of utility damage and hits cannot be attributed to the training intervention, although these incidents were discussed in the group session among the supervisors at the training. The excavation work around the heavily congested utilities of Segment D was essentially completed when the report data for the 2-month postintervention were collected.

The measured safety climate had an interesting negative shift following the training, albeit not significant, in the responses to Question 5 (the individual prioritization of safety) dropped in frequency and is worth further inspection. A heightened awareness of safety descriptors could serve as a potential explanation of the downward shift in perception following the first survey collection (McCambridge, Butor-Bhavsar, Witton, & Elbourne, 2011). In their meta-analysis of the Hawthorne effect on quasi-experimental studies, McCambridge, Kalaitzaki et al. (2011) found evidence of bias in either direction when participants were introduced to information on surveys that could influence their thinking or provide information about the behaviors under assessment. Another possible explanation is that the change was precipitated by the project manager's announcement

just prior to the T1 collection at the safety meeting that work would be accelerating. Several studies have suggested that the priority of the frontline management and attitudes are greatly influenced by local leadership (Barling et al., 2002; Høivik, Tharaldesen, Baste, & Moen, 2009; Mearns, Flin, Gordon, & Fleming, 2001). Announcements that production would be a priority have historically undermined safety perceptions; therefore, the workers may have lowered their own prioritizing of safety in response.

The present study expanded on Zohars (2000) and Zohar and Polochek (2014) safety climate research demonstrating again that safety climate is heavily influenced by direct safety feedback from supervisors. Direct and authentic communication about safety was a key part of the AL workshop and stated goals of the majority of the supervisors before leaving the training.

A measured approach for developing authentic leadership did not exist in the literature before the current study, as the majority of existing programs are long and drawn out with no empirical support of effectiveness (Glowacki-Dudka & Griswold, 2016; Granerud & Rocha, 2011). The training model, AL and safety climate measurement framework that were fused together in the current study would fit a wide variety of high risk organizations that would benefit from AL (Bass, Jung, Avolio, & Berson, 2003; Borgersen et al., 2014). Industries such as hospitals, police, fire departments, and the military would benefit from any intervention that would help improve safety climate for crews on the front lines as it did in this study (Cherniss et. al, 2010; Zohar and Polocheck, 2014).

Limitations of the Study

There were several limitations to this study in both data collection and measuring the change in near-miss reporting. These limitations included the transient nature of the crews; the method used to collect, code, and match pre-and post-survey data; and the readability level of language used in the survey.

The researcher invited a variety of small and large groups to complete the surveys on smart phones. Although most were eager to have their voices heard, many participants asked for word meanings or technical help to get the survey opened on their phones. This made the collection process more time consuming than originally anticipated. The ethnic background of the participants included 53.7% Hispanic, but the survey was available only in English and may have been a barrier for some participants. Another barrier might have been the absence of paper-and-pencil as an option. As 70.4% of participants were over 30 years of age, many participants needed help using cell phones to open and access the survey. Including a Spanish version on paper and online may have elicited a higher response. Construction projects are generally dynamic workplaces.

According to O'Sullivan, Orbell, Rakow, and Parker (2004), little empirical evidence exists that the Hawthorne effect could be controlled in quasi-experimental studies. It is impossible to discern if the workers in this study were biased regarding any of the questions asked in the second survey, especially when the ability to isolate the crews into a 4-way test was not possible for this project (Campbell, 1957; Solomon, 1947). Further study would be needed with controlled groups and an increased number of

participants to detect this potential confounder. However, if there was any bias introduced by the survey content, it clearly had a positive effect on the overall safety outcomes based on both the frequency and the severity of the incidents post study.

Finally, although it is undeniable that the jobsite under study was the only project that had a major shift in incident number and severity, without the ability to match participants, there was no way to isolate the precise effect of this group from other crews that would not have been under the influence AL trained supervisors.

Recommendations for Research

Future research could easily replicate the model used in this study but should allow for more time and control to maximize the use of the mixed-effects statistical designs originally planned. Using raffle tickets might increase the survey participants' motivation and created a mechanism to link the pre-and post-groups allowing for matched-pairs testing instead of independent samples. The creation of a four-way analysis with control and experimental groups has been recommended as the best method for eliminating bias (Cook, et al, 1979; Solomon, 1949). Other "research participation effects caused by participant knowledge of the research" (McCambridge, Witton, & Elbourne, 2014, p. 276) may have limited the results of this study when it was reduced to one jobsite with one measure before and one measure after supervisor training. As infrastructure projects of this scale with delimitation of segmented projects could accommodate a mixed design, further value could be added by linking supervisors to the specific crew members. This type of research would need to be conducted under the

control of the company's management as a leadership development endeavor and could allow linking workers to their supervisors to identify needs for further individualized AL development.

Recommendations for Practice

For practical reasons, further research in organizations with highly evolved safety programs should implement the survey as an organization-wide endeavor and include additional recognition or small incentives for participation. Additionally, providing surveys in Spanish as well as paper-and-pencil options would also increase participation; many participants mentioned these elements during the T1 collection. This could also aid in studying any influences of culture on the worker's perception of AL and safety climate.

Future training interventions should include a between-group analysis to isolate the effects of training on safety climate perceptions (McCambridge et al., 2014). The training should remain grounded in AL as outlined in Chapter 2 (Avolio et al, 2004) although the supervisors who participated in this study had high AL scores prior to the intervention. The basis of AL training outlines the cornerstones of the concept – trust, actionable values (e.g., moral behavior, integrity), balanced processing, and transparency – then leads participants to reflect on their own values and to examine leadership models that resonate with them personally. Following the AL session, connections between AL and crew empowerment to report were used as an example to start a group discussion among participants about goals to improve the workplace based on current production

and issues brought from the field; in this case, equipment damage. The final segment was a hands-on communication exercise that was followed by information and reflective discussions about improving communication. Throughout the intervention, the training facilitator allowed time for participants to update personal workbooks and make notes. The session ended with supervisors committing to communication goals of their own design based on their individual values, communication style, and development needs. The supervisors who participated in this study were perceived to possess the key skills associated with AL before the development intervention, leaving little room for measured improvement in the rating that specifically targeted AL; however, based on the qualitative feedback of the training participants and the participants' immediate application of self-defined goals with their respective crews (Zohar, 2014), the focus on AL for leadership improvement appeared to be a basic, repeatable PdT framework that provided a consistent foundation for training as recommended by Cherniss et. al. (2010) and the NIH Behavior Change Consortium (Bellig et. al., 2004). Operationalizing the values and goals developed by the group was aided by following the original training design, AL foundation, methods of safety coaching (Gellar, 2004; Passmore et. al, 2015), and organizational psychology group methods borrowed from Yalom (2005) and further refined by Spence and Deci (2016).

The AL development model designed for this study did make a difference in one area of safety climate and appeared to influence the incident rate on Segment D where the training was implemented. It is conceivable that a larger sample size at T1 might have

added significance in other areas of safety climate where the proportional shifts suggested change. Also, designing a system to link supervisors and crew members could allow for identifying members of the control group and the experimental group without revealing individual identity, as mentioned earlier, and could add further evidence that this training could be associated with a shift in the safety climate.

Finally, according to the site safety manager, workers began openly approaching him about near-miss events and situations on the job following the training date, indicating that supervisors were talking to the crews and encouraging this behavior. Moreover, one crew member approached the researcher at T1 collection asking about follow up to a safety issue that was informally reported. After discussing the situation with the safety manager, it was learned that there was no formal process in place for investigating near-miss reports unless the foreman completed a regular incident report. Creating efficient investigations or forming simple follow-up feedback loops to address any near miss could be another line of research to improve safety climate over time.

Implications for Social Change

The present study tested a field-based model for developing AL leadership and effecting safety climate change that has been missing in the organizational literature. It is the first model of its kind to fuse the well-established construct of AL (Avilio, et. al, 2004), safety climate, and communication improvement methods (Zohar, 2014) to improve safety climate. Similar to Zohar and Polocheck's (2014) study, this research study adds credibility to brief field leadership interventions to improve safety climate that

goes beyond the typical leadership training offered at most major construction companies, such as learning OSHA standards, company policies and procedures, and other common practices cited by Esmaeili et.al. (2012). Offering the opportunity to reflect on personal values, to set personal leadership and safety goals, and to discuss their experiences in small groups appeared to benefit field leaders in tangible ways that effected the perception of safety climate in their followers. Although this study demonstrated statistical significance in one aspect of the safety climate, the training framework has potential to facilitate participatory change efforts. The change in the number of incidents and increase in near miss discussions has potential for long-range influences and positive social change directly effecting people in the work environment by reducing the number and severity of incidents that occur.

Per the literature previously discussed, apparent AL qualities have positive influences in several areas of leadership (Wong, 2016). An unplanned result of the training workshop was what appeared to be the bonding of these leaders during the group work. Although no quantitative measure was included in the study designed to capture this improvement, comments were observed and qualitatively noted about the benefits of working together in the workshop environment during the closing session of training. The high level of engagement could have resulted from the majority of the group participants already deemed to be ALs (Giallonardo, Wong, et al., 2010; Wong, 2010). Another area of research could test the AL development model to improve joint venture collaboration and partnerships measured in terms of safety climate improvement in joint venture,

public-private partnerships, and other projects that depend on interorganizational cooperation.

The company studied in this project was the epitome of safety modeling making any AL improvement challenging. Nevertheless, strong safety support from top management also allowed quick action on the part of the trained supervisors in implementing the communication goals they set for themselves in their workbooks. Results might vary in other organizations; therefore, the trainer must adapt the training focus to align with the needs of the organization.

This framework is adaptable to many facets of safety climate improvement without losing the fidelity of the intervention. Topics for improvement are participant driven (Yalom, 2005). The use of structured-flexibility in group coaching is encouraged and will likely be easier to implement in organizations with highly evolved safety cultures and supervisors embodying AL characteristics from the onset. Further testing on smaller projects, supervisors who initially rank low in AL, or organizations that are still developing a positive safety culture could test the model at different levels of the organization to potentially speed the development of both safety culture and safety climates throughout the organization.

Conclusion

In spite of the adjustments that were required to complete the study, the original objective was met; AL did have an impact on the safety climate of a high-risk, heavy highway construction project. In addition, incidents and accident reduction were isolated

to the project that participated in the AL development program created for this study. Positive change in all aspects of the safety climate on a construction project can have long-term positive effects on the project's financial and commercial success as well as the health and livelihood of people who work in high-risk occupations. Developing leaders using an AL framework provides new opportunities in research and improved safety climate has rapidly become a reliable measure of an organization's safety performance and risk of injury, surpassing other leading indicator measures (Borgereson et al, 2014; Christian et al 2009; Gardener et al, 2005; Zohar 1980, 2000, 2002, 2010; Zohar & Polacheck, 2014). The primary intent of this field-tested implementation was to contribute to the safety leadership and safety climate literature to benefit both practitioners and researchers in the field of organizational psychology. Those goals were met and there is now a field test for safety climate that expands the lifelong work of Zohar (1980; 2000; 2002; 2010; Zohar & Polachek, 2014). In addition, a model for developing AL now exists as defined, utilizing the four cornerstones of the AL construct as developed, validated, and used in the ALQ) Avolio et al., 2007) for frontline leadership in the building trades.

The combination of two theories proven to influence positive social change have now been combined in a new way. This new process may lead to positive safety climate and improved working conditions by improving communication between crews and leadership and reducing the incidence of accidents and injuries on a major public-works construction project.

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