CHANGE-ORIENTED SAFETY BEHAVIOR IN HIGH RELIABILITY ORGANIZATIONS:
META-ANALYZING THE SOCIAL CONTEXT

by

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A thesis submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Master of Arts in
Industrial/Organizational Psychology

Charlotte

2017

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ABSTRACT

KRISTA NOELLE ENGEMANN. Change-oriented safety behavior in high reliability organizations: Meta-analyzing the social context. (Under the direction of Dr. George C. Banks).

Workplace safety is a concern for both scholars and practitioners because of the potential for substantial loss of organizational resources. The high reliability organization, and the theory that guides our understanding of this unique organizational context, contends that errors that threaten safety are systemic, dynamic workplace conditions. This paper emphasizes employees as valuable organizational assets and highlights the role of their change-oriented safety behavior in managing reliability in light of uncertain organizational environments. This paper then posits a theoretical framework that considers the relationship between forms of social support and change-oriented safety behavior in the high reliability setting, and these organizational, leader, and peer antecedents are meta-analyzed. Following an examination of 41 papers, results indicate that organizational support has the strongest relationship with change-oriented safety behavior. Such focus on the social context illustrates the complex procedures and practices of high reliability organizations, which rely on both improvisation and standardization.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

In 2015, over 1.1 million nonfatal occupational injuries and illnesses involving days away from work were recorded in the United States (Bureau of Labor Statistics, 2017). Such strain on organizational resources propels workplace safety to the forefront of concerns among scholars and practitioners alike, who are united around a consensus that behavioral interventions can bolster positive safety behaviors and prevent error and accidents. These implications are particularly critical for high reliability organizations, which sustain nearly error-free operations in light of hazardous and error-prone surroundings (Roberts, 1990; Weick & Roberts, 1993). While communication contextualizes perceived norms and inform attitudes and behaviors about safety (e.g., post-incident discussion, error reporting) (Fugas, Meliá, & Silva, 2011), the role of social and normative factors that affect workplace safety remains underdeveloped (Tesluk & Quigley, 2003). To better understand how communication and subsequent discussion-based learning interventions can be effectively used to promote positive safety behaviors, research must observe the social context within which employees of high reliability organizations voice their problem-focused, change-oriented, and constructive opinions and suggestions.

The real or perceived importance of voice and related change-oriented behaviors in influencing important individual- and firm-level outcomes drives organizational research. Recent works have concluded that different types of social support enhance voice and related change-oriented behaviors (e.g., creative performance, adaptive performance, positive proactive behavior, personal initiative to solve problems, and taking charge) (Bettencourt, Gwinner, & Meuter, 2001; Frese & Fay, 2001; Griffin, Neal,

& Parker, 2007; Han & Williams, 2008; Morrison & Phelps, 1999; Pulakos, Arad, Donovan, & Plamondon, 2000; Zhou & George, 2001). Nevertheless, scholars are unsure as to why the positive relationships among these antecedents of related change-oriented behaviors persist as they do (Chiaburu, Lorinkova, & Van Dyne, 2013).

Change-oriented behaviors are important for the practice of high reliability organizations, as well. Consider, for example, Collinson's (1999) ethnographic case study of accident reporting at an oceanic oil rig. Collinson noted how positive safety behaviors deteriorated as the organization transitioned from a shared understanding of 'safety first' to an understanding of 'efficiency first' after incentivizing employees to primarily act quickly in addition to acting safely. That is, while safety was valued across the organization, employees were often compelled to withhold information on accidents, injuries, and near-misses. In this instance, employees collectively made sense of the values, practices, and procedures of their organization in a manner that violated prescribed safety practices which, in turn, shaped, created and reinforced new behavior. Thus a critical question emerges, namely: how are the values, practices, and procedures around safety communicated to employees?

In response to this question, this paper reviews prior work and considers conceptually and empirically how change-oriented safety behavior is related to organizational, leader, and peer support in both safety and general (i.e., not safety-specific) domains (e.g., Chiaburu et al., 2013; Conchie, Taylor, & Donald, 2012; Hofmann & Morgeson, 1999; Ng & Feldman, 2012; Tucker, Chmiel, Turner, Hershcovis, & Stride, 2008). We provide a theoretical framework wherein these constructs and relationships are specifically targeted in the context of the high reliability organization.

By examining a more complete picture of the environment that both supports and anticipates an employee to voluntarily voice their problem-focused, change-oriented, and constructive opinions and suggestions in a high reliability setting, the present meta-analytic approach seeks to further the importance of the social context in predicting change-oriented safety behavior.

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1. Change-Oriented Safety Behavior: Conceptual Clarification

Hirschman's seminal work, *Exit, Voice, and Loyalty*, (1970) asserts that voice is a response to deteriorating conditions, in which there is "any attempt at all to change, rather than to escape from, an objectionable state." (p. 30). Central to this definition of voice is the attempt to change the status quo. Accordingly, voice reflects the formal and informal articulation of one's critical and constructive opinion, through which one intends to improve issues that affect their work and their organization (LePine & Van Dyne, 2001). Hirschman nonetheless admitted to the 'messiness' of this construct; not only can voice range from "faint grumblings to violent protest" (1970, p. 16), but the construct has expanded since its introduction to be associated with a range of literatures.

The initial construct has since been subject to clarification and validation. Presently, voice is both an expression as well as a behavior. While voice is not limited to verbal behavior (Hirschman, 1970), not all expressive behavior may be characterized as voice (Van Dyne, Ang, & Botero, 2003). Such openly communicated, organizationally relevant, and work-focused expression that is received by someone within the organization may be either promotive (i.e., aimed at advocating or encouraging) or prohibitive (i.e., aimed at stopping or blocking) (Gorden, 1988; Hirschman, 1970; Liang, Farh, & Farh, 2012). Voice can be conceptualized further by a preservation or a challenge orientation to the status quo, resulting in a validated four-way typology: supportive, constructive, defensive, and destructive voice (Maynes & Podsakoff, 2014).

Voice in a safety setting generally adheres to Maynes and Podsakoff's (2014) concept of constructive voice, where voice is "the voluntary expression of ideas,

information, or opinions focused on affecting organizationally functional change to the work context" (p. 5). For instance, Tucker et al.'s (2008) and Tucker and Turner's (2011, 2015) construct of "safety voice" captures such behaviors as raising safety concerns with a manager, speaking before a safety committee, dissent, reporting dangerous working conditions to officials, or offering to teach co-workers safety work techniques. Because this conceptualization emphasizes a proactive response to deterioration, similar behaviors have also been articulated in Hofmann, Morgeson, and Gerras' (2003) definition of "safety citizenship behavior." This discretionary helping behavior is centered on improving the safety performance of oneself and others through stewardship, voicing one's opinions, helping co-workers, reporting unsafe acts, initiating workplace change, and keeping informed of safety policy and practices. Conchie et al. (2012) later articulate a "safety voice citizenship behavior" construct in an effort to narrow the scope of Hofmann et al.'s (2003) term. Such behavior, while performed to improve safety by identifying limitations and possibilities for positive change, may ultimately be a risk; suggestions may be construed negatively and regarded as criticism of the organization's safety management. Thus there is some conceptual overlap in behaviors representative of prohibitive voice (e.g., vocally opposing changes to work policies), though the negative and deviant connotation of the prohibitive voice construct is not necessarily suggested in the safety domain. On the basis of these attributes, and to evoke consistency for the remainder of this paper, we introduce an umbrella term, change-oriented safety behavior, as the communication of one's critical and constructive opinion, through which one intends to challenge and/or influence safety issues that affect their work, the work of others, and their organization.

While Hirschman's original concepts and their expansions have practical appeal for the study of change-oriented safety behavior, they have ultimately been inconsistently applied to the topic. Tucker and Turner (2011) report 17 studies in the workplace safety literature that evoke and systematically test Hirschman's concepts. Further, constructs related to voice and change-related safety behaviors have not been consistently defined or applied (see Table 1 in Appendix I for an overview of the conceptualizations of relevant voice and change-oriented behaviors). Present typologies and measures in the safety domain generally classify safety-related behaviors as broadly compliant (e.g., wearing personal protective equipment on the job) or participative (e.g., participating in voluntary safety activities) (Griffin & Neal, 2000). While this distinction within the safety behavior construct is useful and, as such, widely adopted (Burke, Sarpy, Tesluk, & Smith-Crowe, 2002), it may nonetheless underrepresent change-oriented behaviors in the workplace safety domain. For instance, 'compliant' safety behavior may reflect a requirement to participate in after-action reviews, an active feedback procedure in which employees gather, analyze, cross-validate and integrate information about an event and then retain these lessons learned for use in the future. The meta-analytic approach will serve to integrate primary research on different change-oriented behaviors in the safety domain.

2.2. High Reliability Organizations and High Reliability Organization Theory

Hirschman asserts that "organizations are conceived to be permanently and randomly subject to decline and decay, that is, to a gradual loss of rationality, efficiency, and surplus-producing energy, no matter how well the institutional framework within which they function is designed" (1970, p. 15). His perspective on deterioration parallels arguments made about the role of error in organizations. If we accept that humans are, by nature, fallible and error prone, errors are to be expected, even in the 'best' organizations.

Errors may be not consequences of failed coupled system structures or of aberrant mental processes like forgetfulness or negligence (cf., Perrow, 1984; Reason, 2000), but rather of systemic, dynamic workplace conditions. In the instance that human fallibility cannot be wholly cured or eliminated, the organization can continuously mitigate the effects of these conditions through feedback (Weick, Sutcliffe, & Obstfeld, 1999).

A lapse in safety, such as that experienced by employees of a high reliability organization, is a specific and salient objectionable state that can prompt employees to respond. A high reliability organization, or HRO, is one that functions in the regular maintenance of safe and reliable operations in light of a dynamic and high-risk environment (Roberts, 1990; Weick & Sutcliffe, 2007). This type of organization spans a variety of professions, including firefighters, nuclear aircraft carrier operators, air traffic controllers, and emergency medical teams. Such an organization must be attentive and responsive to weak operational signals. Moreover, change-oriented safety behavior in the setting of a high reliability organization maintains an emphasis on positive change. Raising safety concerns with a supervisor or co-worker is an instance in which such behavior is aimed to make the workplace less accident- and injury-prone and, in turn, safer (Tucker et al., 2008; Tucker & Turner, 2011).

While voice in the safety domain has an "attention focusing effect" (Hirschman, 1970, p. 45) because it targets and critiques imminent problems as well as offers suggestions for improvement, this behavior and others like it are nonetheless conceptualized as singular and transitory. Furthermore, the colloquial use of "reliability" and "safety" fails to acknowledge the reality that a high reliability organization must unvaryingly perform in the face of unforeseen changes to working conditions. For

instance, while decision making in "high efficiency" organizations (Weick & Roberts, 1993), – or, in other words, non-high reliability organizations – are incremental, errors are non-lethal, and preoccupation with operations is limited, high reliability organizations operate with the potential of facing such great consequences from failed operations that their associated costs are greater than the value of their lessons learned. The high reliability organization thus cannot necessarily afford to learn from past failures through processes of trial and error. In this case, neither safety nor reliability is discernable until an unanticipated lapse. Safety is consequently defined here as a dynamic non-event, where reliability is then the management of the organization's dynamic environment in an effort to forestall unintended outcomes (Weick, 1987).

The communicative processes that ultimately sustain the dynamic non-event of safety remain unarticulated in traditional organizational theory. High reliability organization theory, on the other hand, articulates that interrelated communicative processes perpetuate and manage safety during normal operations. The subsequent goal of the high reliability organization is to promote mindfulness. Mindfulness is the capability of enriched awareness that is enabled by a set of interrelated and aggregated cognitive processes which, in turn, contribute to an organization's safety culture (Vogus, Sutcliffe, & Weick, 2010; Weick et al., 1999). Mindfulness is characterized by a preoccupation with failure, a reluctance to simplify interpretations, sensitivity to operations, a commitment to resilience, and deference to expertise (Weick et al., 1999; Weick & Sutcliffe, 2007). In this sense, frontline employees and supervisors engage one another to develop and refine an intersubjective, or shared, understanding of a recent lapse in operations. This not only includes the discussion of what the problem is or was,

but also the awareness of one's own attribution to the outcome at hand. These actions not only serve the organization's and employees' capacity to identify and communicate operational failures, but also contribute to and perpetuate a collective commitment to mindfulness. As such, employees and supervisors of high reliability organizations commit to continually notice failures of any magnitude and to retain and elaborate upon the distinctiveness of these failures. Moreover, they commit to not only being aware of ongoing operations and failures, but also of any potential pathways to recovery. Mindfulness thus enables the high reliability organization to prepare for otherwise new or unforeseen vulnerabilities by continually managing deteriorating conditions.

Because high reliability organizations function on the basis of continuous evaluation and improvement through interaction, communication and learning from the frontline must be ongoing for these practices to critically impact the organization's functioning. Moreover, the organization and its leaders must support and be receptive to such communication. This is best articulated by Roberts, Bea, and Bartles (2001) who assert that, "while the importance of communication may seem self-evident to most managers, HROs truly emphasize it…[and] they spend time and money developing and maintaining an effective communication capability that allows them to shape and share the big picture of what the organization should be looking for and worrying about as they do their jobs" (p. 76). Without an overarching culture that places such value on the experiences of the employee, and that relies on that employee to communicate them, the high reliability organization would not develop the competencies required to remain competitive and sustainable.

The adoption of high reliability organization theory can also deliver value to the study of non-high reliability organizations. High reliability organizations operate at a state of awareness that is not only critical to identifying gaps in what employees and management may not know, but also to recognizing and valuing the experiences of employees that would enable the group to perform safely and reliably. As asserted, again, by Roberts et al. (2001) "[high reliability organizations] are better at finding out what they don't know than are organizations that have higher accident frequencies" (p. 72). As such, high reliability organizations highly regard communication and learning from the frontline. This relationship is particularly important given the role of the employee's unique, situated experience and the knowledge that grows from it. Such individualized insights supplement learning and problem solving through interpersonal interactions and, in turn, have positive implications for higher level performance (Eisenhardt & Martin, 2000; Zollo & Winter, 2002). By introducing high reliability organization theory into an organization, its processes and culture may accelerate the value of awareness and knowledge to the forefront of its competencies.

2.3. Social Context and Change-Oriented Safety Behavior in High Reliability Organizations

In light of the central role that communication plays in the viability of a high reliability organization, it is critical to understand the supportive conditions under which these employees choose to voice their critical, constructive opinions. While there is support for relationships among the organization, leaders, peers and change-oriented behaviors in a general workplace setting (e.g., Baer & Frese, 2003; Griffin et al., 2007; Van Dyne, Kamdar, & Joireman, 2008), research in this area is hindered by an overabundance of disparate literature streams (Mowbray et al., 2015). Some recent work

has investigated the role of supportive climate on voice behavior (e.g., Morrison, Wheeler-Smith, & Kamdar, 2011) and furthered a more integrated conceptual framework and empirical comparison of the relative importance of these different forms of support (Chiaburu et al., 2013). This research may nonetheless obscure how or why employees behave in critical, constructive ways in a particular work setting like a high reliability organization. In a specified work setting, sources of support may present different patterns of covariation than previously identified (cf., Chiaburu et al., 2013). Furthermore, social context is particularly important in an organization that emphasizes safety because proactively voicing (Van Dyne & LePine, 1998) or initiating change (Frese, Fay, Hilburger, Leng, & Tag, 1997) may be risky above and beyond other altruistic or compliant behaviors (Conchie et al., 2012; Organ, Podsakoff, & MacKenzie, 2006; Van Dyne & Ellis, 2004). Thus support from various sources can critically influence employees' decisions to engage in change-oriented safety behaviors.

Responding to the need for a more integrated, contextually specific, and theoretically reoriented approach to social support and change-oriented behaviors, we present an initial framework of the social context and change-oriented safety behaviors in high reliability organizations (see Figure 1, Appendix II). Meta-analysis should provide a more integrative perspective on the overall pattern of these relationships.

2.4. Organizational Support

A supportive organization in terms of safety reflects this in its core values (DeJoy, Della, Vandenberg, & Wilson, 2010). Employees' beliefs about their organization's concern for and commitment to them are associated with reciprocal actions by the employees (Eisenberger, Huntington, Hutchison, & Sowa, 1986; Rhoades & Eisenberger, 2002). Thus when employees believe that their organization provides resources in support

of new ideas, they are inclined to provide suggestions for improvement and constructive change (Fuller, Marler, & Hester, 2006). As such, organizational support in the safety domain is linked to increased colleague assistance and danger reporting (Mearns & Reader, 2008), improved safety communications (Hofmann & Morgeson, 1999), and increased confidence and willingness to speak up about safety issues (Tucker et al., 2008). Given that employees tend to reciprocate relationships with their peers and supervisors by engaging in behaviors that are valuable to the organization, and because high reliability organizations value safety and the communicative processes that support mindfulness, it is likely that employees would choose to perform the behaviors that support this, namely, change-oriented safety behaviors. Therefore:

> *Hypothesis 1: Organizational support has a positive relationship with change-oriented safety behavior in high reliability organizations.*

2.5. Leader Support

A supportive leader is capable of enhancing employees' change-oriented behavior in a variety of ways, particularly as a result of the style of leadership employed, the relationship between leader and follower, and the accountability established by and trust in the leader (Nahrgang, Morgeson, & Hofmann, 2007). Transformational leaders enhance employees' feelings of responsibility (Detert & Burris, 2007; Liu, Zhu, & Yang, 2010; Wang, Oh, Courtright, & Colbert, 2011) as well as their willingness to engage in voice behavior (Edmondson, 2003; Van Dyne et al., 2008). Similarly, leader support, coaching, and fairness facilitate independence, taking charge, and voice among employees (Edmondson, 2003; Moon, Kamdar, Mayer, & Takeuchi, 2008; Morrison & Phelps, 1999) as well as a sense of responsibility for constructive change (Fuller et al., 2006) and proactive behavior (Strauss, Griffin, & Rafferty, 2009). Further, leader vision

enhances adaptive and proactive performance (Griffin, Parker, & Mason, 2010). Where

leadership in a turbulent, dynamic setting is characterized by interaction to appraise

hazards, risks, and potential solutions (Scott & Trethewey, 2008), it follows that leader

support in the safety domain is positively associated with safety participation (Clarke,

2013). Moreover, leaders who promote shared group values, a vision for the future, and

individualized support to employees to achieve safety goals see increased safety

citizenship behaviors and safety communication (Conchie & Donald, 2009; Conchie et

al., 2012; Hofmann & Morgeson, 1999). Therefore:

> *Hypothesis 2: Leader support has a positive relationship with change-oriented*
>
> *safety behavior in high reliability organizations.*

2.6. Peer Support

Peer support is also important to change-oriented behavior. Demonstrating

mechanisms of social exchange and reciprocity, and confirming that peers are effectively

conduits of safety information and new safety rules (Laurence, 2005), employees were

found to speak out more about safety-related issues when their direct peers supported

workplace safety (Tucker et al., 2008). This has also been observed in general work

environments, where support from peers led to positive citizenship and proactive

behaviors (Chiaburu & Harrison, 2008; Griffin et al., 2007). Further, the amount of

perceived support from peers is significantly related to making suggestions to improve

internal policies and practices (Zhou & George, 2001). Consistent with the nature of

social exchange, it follows that peers of a high reliability organization who, given the

demands of a turbulent environment, work closely and depend on each other to create a

safer workplace are more likely to hold each other accountable for safe work (Tucker et

al., 2008). In turn, they create a group sense of concern and shared responsibility. Therefore:

> *Hypothesis 3: Peer support has a positive relationship with change-oriented*
>
> *safety behavior in high reliability organizations.*

2.7. Distinctions within the Social Context

Integrating the primary studies that have supported the importance of organizational, leader, and peer support in varying combinations alongside a variety of change-oriented safety behaviors, we posit that organizational, leader, and peer support have positive relationships with change-oriented safety behavior in high reliability organizations. Despite the relative importance and conceptual distinctiveness of leader support (Burris, Detert, & Chiaburu, 2008; Van Dyne et al., 2008), peer support (LePine & Van Dyne, 1998, 2001), and organizational support (Choi, 2007), they can occur concurrently (Ng & Sorensen, 2008; Rhoades & Eisenberger, 2002). Further investigation is needed to determine the varying degrees to which different forms of social support influence change-oriented safety behavior in high reliability organizations.

The importance of examining the predictive validity of different types of support is twofold. First, it is important to understand the extent to which differences in power within the social context of high reliability organizations substantively influence change-oriented safety behaviors. In general work settings, leaders are considered more powerful than peers in this regard (Detert & Burris, 2007; Morrison & Rothman, 2009). Furthermore, many groups that operate in turbulent, dynamic environments interact within prespecified hierarchies (e.g., rank structures), which ultimately shapes behavior. While leadership in dangerous, dynamic settings requires decisive and directive action, it also occurs as a confluence of improvisation and cross-rank peer interaction (Baran &

Scott, 2010). Thus it is also important to tease out the differential effects of these forms of support to better inform future research and practice of high reliability organizations. For instance, if the effects of peer and leader support differ, not only should scholars distinguish them in design and execution of future research, but practitioners should craft interventions designed to enhance change-oriented safety behavior with respect to these more nuanced relationships.

In general workplace settings, leaders appear to wield substantive control over employee behavior. Leaders shape the psychological processes that influence employees' perception of voice in terms of instrumentality, costs, and benefits (Ashford, Sutcliffe, & Christianson, 2009) as well as their perception of safe behavior (Zohar, 2002; Clarke & Ward, 2006). Furthermore, safety is described in this paper as a dynamic non-event, and as such, it must be continually reaccomplished in the everyday communicative practices of leaders (Scott & Trethewey, 2008).

This notion of a reaccomplished understanding of organizational values and practices stems from Weick's theory of organizing (1995), which contends that we communicate with one another to create a collective and intersubjective understanding of our immediate environment. We first bracket some portion of our experience for further attention, impose some finite set of interpretations on that bracketed portion, and assemble and re-assemble frameworks that seem analogous to the current situation to shape future actions and interpretations. Thus when we face uncertainty, we seek information by means of strategies which are improvisational (Daft & Weick, 1984). While there are natural boundaries that constrain our ability to collect and process information from the environment in an optimal way, we are still able to maintain

decisions through satisficing. In this sense, the high reliability organization operates within an environment that is effectively unanalyzable. Members' interpretations of their environment eschews linearity in favor of improvisation to inform a collective understanding which is accomplished – and then re-accomplished – in order to manage perpetual uncertainty.

In the instance that leaders facilitate these sensemaking processes among employees, change-oriented safety behaviors will likely emerge. For instance, employees who observe their supervisors communicating about safety in an earnest, consistent, and committed manner are more likely to engage in safe behavior (Hofmann & Morgeson, 1999). In this case, leaders frame the discussion of safety practices and hazards in a manner that appropriately amplifies or attenuates risk perceptions (Baran & Scott, 2010; Weick & Roberts, 1993). Leaders ultimately play an active role in continually re-accomplishing what safety and change-oriented safety behaviors mean to the organization at large. Therefore:

> *Hypothesis 4: In high reliability organizations, leader support has a stronger relationship with change-oriented safety behavior than do peer support and organizational support.*

CHAPTER 3: METHODS

3.1. Literature Search

      A search was executed to find both published and unpublished samples that investigated social support antecedents of change-oriented safety behaviors. The present analysis and discussion is based on samples retrieved in the first of two phases of data collection. The first phase consisted of the systematic search of *metaBUS* and *Google Scholar* databases. Databases were searched using combinations of *safety* and *employee voice* paired with *social support*, *leader support, leadership, peer support, organizational support, organizational citizenship behavior, voice climate,* and *safety climate*. This electronic search was then supplemented by a manual forward and backward reference search through the reference lists of empirical and theoretical articles on safety, including the references of recent reviews and meta-analyses of employee voice and safety-related constructs (i.e., Beus, Dhanani, & McCord, 2015; Chiaburu & Harrison, 2008; Chiaburu, Oh, Berry, Li, & Gardner, 2011; Chiaburu, Peng, Oh, Banks, & Lomeli, 2013; Chiaburu, et al., 2013; Chiaburu, Smith, Wang, & Zimmerman, 2014; Christian, Bradley, Wallace, & Burke, 2009; Clarke & Robertson, 2005; Clarke & Robertson, 2008; Clarke, 2006; Clarke, 2010; Clarke, 2012; Clarke 2013; Marinova, Peng, Lorinkova, Van Dyne, & Chiaburu, 2015; Nahrgang Morgeson, & Hofmann, 2007; Nahrgang, Morgeson, & Hofmann, 2011; Parker, Baltes, Young, Huff, Altmann, LaCost, & Roberts, 2003). The search was conducted using keywords, titles, abstracts, and full papers and conceded to a cut-off date of January 1st, 2017.

3.2. Inclusion and Exclusion Criteria

      The full papers obtained as a result of the first systematic search phase were reviewed for appropriate content and considered for inclusion in the analyses, and several criteria were implemented. First, included studies must have sampled from organizations related to the safety domain. Specifically, included studies were drawn from organizations that may face occupational hazards that, if not handled correctly, could result in accidents and injuries (see Figure 2 in Appendix II for the types of industries represented). To improve generalizability, participants of included primary studies must have also been of the age of working adults. These determinations were made by examining the title, abstract, and text of the study in question. Of those meeting this high reliability setting requirement, studies were further sorted by their measures. Included studies must have clearly specified their measures of a change-oriented behavior and at least one measure of the social context. Included studies also had to report sufficient statistics that could be converted into correlation coefficients (e.g., Cohen's *d*). Thus studies without data (i.e., theoretical work or literature reviews) were not included. These included studies also reported sufficient results to calculate an effect size for the relationships of interest.

      Detection heuristics were also used to examine studies for potential duplicates, such as a conference paper that had been later published in a peer-reviewed journal (Wood, 2008). A doctoral student independently coded a subsample of studies (e.g., reliabilities, sample sizes, effect sizes, proxies that the variable in question represents, whether measures of the social context captured support for safe operating procedures or support for improvement, learning, and feedback). Using Cohen's kappa (Cohen, 1960), inter-rater reliability was calculated across 227 coding decisions. Estimates of Cohen's

kappa of less than .40 are considered to be poor, .40 to .75 is acceptable, and .75 or higher is thought to be excellent. Cohen's kappa estimates in this study were excellent (Cohen's kappa = .80 between the author and doctoral student).

3.3. Coding Procedures

Manuscripts were coded according to coding schemes to classify sources of support and change-oriented safety behavior variables. The coding scheme for social support evoked those constructs used in Chiaburu et al.'s (2013) meta-analysis of the employee's social context. This includes constructs such as empowering leadership, leader–member exchange (LMX), transformational leadership, leader fairness, openness, and consideration to be coded as leader support, intrateam support, team learning climate, group cohesiveness, work-group involvement, and team–member exchange to be coded as peer support, and perceived organizational support and organizational fairness to be coded as organizational support. Change-oriented safety behavior included those rated and classified constructs that operationalize Chiaburu and colleagues' (2011; 2013) change-oriented citizenship, including voice (LePine & Van Dyne, 1998), creative performance (Zhou & George, 2001), adaptive performance (Pulakos et al., 2000), personal initiative (Frese & Fay, 2001), proactive performance (Griffin et al., 2007), and taking charge (Morrison & Phelps, 1999). Change-oriented safety behavior also includes such safety-specific constructs as employee safety voice (Tucker et al., 2008), safety citizenship behavior (Hofmann et al., 2003), safety behavior and compliance (Griffin & Neal, 2000), and safety voice citizenship behavior (Conchie et al., 2012). We treated the reporting of more than one of these outcome measures in one sample as multiple measures of the change-oriented safety behavior construct, and thus these correlations were averaged.

Other safety-specific, or even manuscript-specific, measures which were utilized in the included studies were also assessed for their contribution to the employee's social context. This determination was made by examining the items of the measure in question. Measures which established the organization's, leader's, or peer group's concern for and commitment to employees and/or its provision of resources and communication in support of any measure of the change-oriented safety behavior construct were coded as organizational support, leader support, and peer support, respectively.

Correlations reported in studies with multiple measures of the same construct were averaged. Further, studies that include multiple independent samples were separately coded. This approach resulted in 41 studies with 30 cases of organizational support (39,964 participants), 43 cases of leader support (17,929 participants), and 27 cases of peer support (18,488 participants).

3.4. Meta-Analytic Procedures

Following established practices, multiple estimates of correlations within a single sample were combined into one correlation coefficient by calculating composite correlations. Composite correlations were calculated for each sample with several same-source measures of organizational support and change-oriented safety behavior, leader support and change-oriented safety behavior, and peer support and change-oriented safety behavior.

Upon examination of the items of included measures, measures of the social context were subsequently coded in terms of their support for safe operating procedures or their support for improvement, learning, and feedback. While the preceding literature review nonetheless asserts that discussing and learning from error and safely following operating procedure are effectively one and the same, it may be appropriate to tease apart

their conceptualization, or at least to investigate further the extent to which these concepts are necessarily distinct in predicting change-oriented safety behavior in the high reliability setting. Moreover, there is increasing momentum in the safety literature domain to distinguish additional perceptions about organizational life from those specifically concerning the procedures that are rewarded and supported with regard to safe operations (Zohar, 2010). Thus composite correlations were also calculated for each sample with several same-source measures of support for safe operating procedures as well as support for improvement, learning, and feedback by the organization, leaders, and peers. Finally, because the examination of measures used in the included studies yielded great variety, we subsequently analyzed the correlations between specific measures or scales that capture organizational, leader, or peer support and change-oriented safety behavior.

Psychometric meta-analysis was used to analyze the primary samples identified (Schmidt & Hunter, 2015). In doing so, we derived true-score correlation coefficients corrected for unreliability and measurement error and random sampling error. Predictor and outcome variables were corrected for measurement unreliability by using the coefficient alphas reported by the included primary studies. The present dataset did not include any original studies which did not report reliability estimates. We calculated the standard deviation of the estimated population correlation corrected for unreliability to determine the 80% credibility interval. Based on this corrected standard deviation, 80% credibility intervals around the corrected effect size estimates tested the potential of moderating variables, where wider intervals or the inclusion of zero within the intervals suggest potential moderating effects (Schmidt & Hunter, 2015). To aid in the

interpretation of potential moderating effects, we also computed the percentage of variance accounted for by sampling and measurement error; a lower percentage indicates potential moderating effects. 95% confidence intervals also provided an estimate of variability in mean effect sizes, where wider intervals or the inclusion of zero within the intervals suggest that the effect size does not differ from zero or is not statistically significant.

3.5. Sensitivity Analyses

To assess the robustness of the meta-analytic results, we conducted sensitivity analyses. We first performed a one-sample removed analysis (Borenstein, Hedges, Higgins, & Rothstein, 2009). This approach calls for removing each sample one at a time and re-computing the effect size estimate, thereby assessing the potential for influential cases to lead to instability in the effect size estimates. A range of estimates thus provides a better understanding of the stability of the estimate (see Table 2 in Appendix I).

Publication bias analysis (e.g., trim and fill) (Harrison, Banks, Pollack, O'Boyle, & Short, 2017; Kepes, Banks, & Oh, 2014) is also important for assessing effect size estimate stability. This iterative procedure 'trims' extreme values, re-computes effect sizes at each iteration to yield a symmetric plot about a (new) effect size, and then 'fills' the original values back into the analysis to correct the variance (Duval & Tweedie, 2000). By juxtaposing both observed studies and imputed studies, this analysis reveals how the effect size shifts when the imputed studies are included.

CHAPTER 4: RESULTS

Table 2 illustrates the relationships between organizational support, leader support, and peer support and change-oriented safety behavior. These results reflect composite correlations for each sample with several same-source measures of organizational support and change-oriented safety behavior, leader support and change-oriented safety behavior, and peer support and change-oriented safety behavior. First, the findings illustrate that the true-score correlation ($\hat{\bar{\rho}}$) between each of the three composite antecedents and change-oriented safety behavior (COSB) are relatively high. Using Bosco, Aguinis, Singh, Field, and Pierce's (2015) standards to judge the magnitude of these relationships, we view correlations of .10, .30, and .50 to be small, medium, and large in magnitude. The relationship between organizational support ($\hat{\bar{\rho}} = .79$, $k = 30$, $N = 39,964$), leader support ($\hat{\bar{\rho}} = .55$, $k = 43$, $N = 17,929$), and peer support ($\hat{\bar{\rho}} = .46$, $k = 27$ $N = 18,488$) with change-oriented safety behavior appear to provide support for the positive direction of the relationships posited by hypotheses 1 through 3. Organizational support appears to have the strongest relationship with change-oriented safety behavior, thus hypothesis 4 is not supported.

A relative weights analysis was conducted to provide a clearer understanding of the relative importance of the social context variables when predicting change-oriented safety behavior (Johnson & LeBreton, 2004). The analysis allows for the calculation of epsilon weights for each of the predictors, which sum to an estimated R^2, and allow for a comparison via ratios. We created a meta-analytic correlation matrix using the estimates from the current study, which served as input into an SPSS matrix regression macro for relative weights analyses (Johnson, 2001). We focus on rescaled relative weights, which

are estimates of relative importance using the percentage of predicted variance in change-oriented safety behavior attributed to organizational, leader, and peer support. For instance, a weight of 0.40 is twice as important as a weight of 0.20, which together sum to 0.60, the total variance explained (Tonidandel & LeBreton, 2015). In summary, organizational support accounted for approximately 64% of the predicted variance in change-oriented safety behavior, whereas leader support and peer support accounted for approximately 21% and 15% of the predicted variance in change-oriented safety behavior, respectively (see Table 3 in Appendix I). This again demonstrates that the relationship posited in hypothesis 4 is not supported.

Sensitivity analyses informed the robustness of the present estimates. A one-sample removed analysis using comprehensive meta-analysis (Borenstein et al., 2009) revealed relatively robust ranges of estimates. That is, the removal of individual studies resulted in a range of estimates that was small; thus one can have greater confidence in the findings. For instance, the organizational support/change-oriented safety behavior relation illustrated a range of .06. Leader and peer support estimates also reflected small ranges (i.e., .03 and .07, respectively). Similarly, shifts in effect sizes via publication bias analysis were trivial, suggesting confidence that reported effect sizes are valid.

Table 4 (Appendix I) illustrates the relationships between support for safe operating procedures by the organization, leaders, and peers with change-oriented safety behavior as well as support for improvement, learning, and feedback by the organization, leaders, and peers with change-oriented safety behavior. The relationship between organizational support of safe operating procedure ($\hat{\bar{\rho}} = .78$, $k = 20$, $N = 24,628$) and of improvement, learning, and feedback ($\hat{\bar{\rho}} = .73$, $k = 25$, $N = 37,625$) with change-oriented

safety behavior demonstrate the strongest relationships. In contrast, leader support of safe

operating procedure ($\hat{\bar{\rho}} = .01$, $k = 18$, $N = 10,497$) and peer support of safe operating

procedure ($\hat{\bar{\rho}} = .02$, $k = 4$, $N = 2,883$) demonstrate noticeably smaller relationships with

change-oriented safety behavior. However, by Bosco et al.'s (2015) standards, the true-

score correlations between leader support of improvement, learning, and feedback ($\hat{\bar{\rho}}$

$= .57$, $k = 31$, $N = 13,474$) and change-oriented safety behavior and peer support of

improvement, learning, and feedback ($\hat{\bar{\rho}} = .58$, $k = 18$, $N = 10,123$) and change-oriented

safety behavior are much more substantive in magnitude. Notably, these true-score

correlations of improvement, learning, and feedback from both the leader and peer

contexts reflect similar positive relationships.

Table 5 (Appendix I) illustrates the correlations between specific measures or

scales that capture organizational, leader, or peer support and change-oriented safety

behavior. Such validated measures of organizational support as Eisenberger et al.'s

(1986) perceived organizational support scale, the Norwegian Safety Climate Inventory

(NORSCI), and the Hospital Survey on Patient Safety Culture (HSOPSC) generally

demonstrated stronger relationships with change-oriented safety behavior than other

measures specific to the manuscript or adapted for the setting where data were sampled

(e.g., Hsu, Lee, Wu, & Takano, 2008). However, this pattern is seemingly reversed for

measures of leader support, where manuscript-specific or setting-adapted ones generally

demonstrate stronger relationships with change-oriented safety behavior than validated

measures like the Authentic Leadership Questionnaire, the Multifactor Leadership

Questionnaire, and the LMX-7. With the exception of one (i.e., Miller, Ellis, Zook &

Lyles, 1990), different measures of peer support demonstrate comparable relationships with change-oriented safety behavior.

CHAPTER 5: DISCUSSION

Within the dynamic and intersubjectively defined environment of a high reliability organization, one's perception of safe behavior is socially constructed and may come from multiple levels within the organization. In addition to formal statements that transmit the overarching values that inform the organization's approach to safety, leaders' and peers' efforts to address safety may also be integral to the development and maintenance of reliability. While some works have concluded that, indeed, different types of social support enhance voice and related change-oriented behaviors, there is uncertainty as to why such positive relationships persist. Given that high reliability organization theory suggests that accidents occur because those who operate and manage complex systems are themselves not sufficiently complex enough to anticipate the problems generated by those systems (Weick, 1993), we reorient how traditional organizational theory may approach the social context. Thus the objective of this study was to adopt a context-specific lens to examine the social environment that both supports and anticipates an employee to behave in a problem-focused, change-oriented, and constructive manner.

Beginning with a review of the various ways that voice and related change-oriented behaviors have been conceptualized in both general and safety-specific settings, we then illustrated the construct space of change-oriented safety behavior. We proceeded to conduct a meta-analysis of antecedents of change-oriented safety behavior, namely, organizational, leader, and peer support. Specifically, our findings identified organizational support as the strongest predictor of change-oriented safety behavior relative to leader and peer support. Leader support and peer support where nonetheless

additional positive influences of change-oriented safety behavior in the high reliability setting.

High reliability organizations function on the basis of continuous evaluation and improvement through interaction, thus communication and learning from frontline employees are of particular importance. We contend that the extent of support for discussing and learning from error and the extent of support for safely following operating procedure may reflect distinct relationships with change-oriented safety behavior in this setting. Whereas organizational support for safe operating procedure and for improvement, learning, and feedback demonstrated the strongest relationships with change-oriented safety behavior, both leader and peer support of improvement, learning, and feedback were more strongly related to change-oriented behavior than leader and peer support of safe operating procedure. Moreover, support for improvement, learning, and feedback from both the leader and peer contexts reflected similar positive relationships.

These findings may reflect how the high reliability organization operates and, ultimately, manages error in light of the ambiguity of its surrounding environment. The continually changing and hazardous environment is such that any event could presumably result in substantial failure or loss. To maintain reliable performance, a high reliability organization may have specific operational procedures, extensive training, comprehensive debriefings, and other deliberate safety measures. Such preoccupation with failure (Weick et al., 1999) effectively permeates the high reliability organization, such that all levels of the organization act appropriately for the situation at hand. While the potential for danger prescribes heavily regulated operations in order to standardize

activities and, moreover, to provide a basis with which to evaluate performance, rules that manage safety in this setting cannot be totally prescriptive (Jahn, 2016). Firefighters or aircraft carrier operators, for instance, may face changing and unpredictable circumstances which culminate in a manner that ultimately renders current rules and routines obsolete (La Porte, 1996; Weick & Sutcliffe, 2007). Although the members of a high reliability organization in the face of emergent, unpredictable crises cannot follow as much as they cannot break safety rules, they must ultimately rely on their own discretion to make sense of their environments (La Porte, 1996; Rochlin, 1993).

Thus we begin to see the paradox of the high reliability organization emerge from the data. The paradox emerges as we recognize the high reliability setting as one in which trial and error is dangerous, present procedure set forth by the organization may at any time become obsolete, and safe operations must nonetheless be maintained (Milosevic, Bass, & Combs, 2015). The strength of the high reliability organization is in its maintenance of interdependent structures, which enable both the reapplication of present procedures as well as communication about, and subsequent learning from, the present scenario (Weick, 1976). Support for improvement, learning, and feedback by both leaders and peers are thus critical to the maintenance of safety and reliability. That is, one's inquiry about the routine (or, for that matter, non-routine) nature of a scenario mobilizes coordinated action among leaders and peers, and all involved become receptive to multiple interpretations of what is happening by interweaving their insights with that of others (Weick & Roberts, 1993). Such interactions within the group not only serve as a search for ways with which to assign meaning to the scenario, but also as a reinforcement and challenge of the group's understanding of its codified procedures and routines. In

turn, these coordinated actions expand the base of knowledge with which the group will work and, consequently, reduce error.

5.1. Theoretical Implications

Change-oriented safety behaviors are of substantial relevance to researchers in the safety domain, as demonstrated by a number of theoretical models and frameworks (e.g., Zohar, 2010; Vogus et al., 2010; Casey, Griffin, Flatau, & Neal, 2017) and cumulative empirical tests (e.g., Clarke, 2006; Clarke, 2010; Nahrgang et al., 2011). This conceptual and empirical interest in alleviating problems of workplace safety through a human resource-oriented lens nonetheless contrasts with a lack of cumulative *and* theoretically appropriate research. Critically, Zohar (2010) acknowledges that the mechanisms which enable safe, problem-focused, change-oriented, constructive behaviors are indeed social and communicative in nature and, as such, are likely connected to such concepts as sensemaking, shared mental models, and cognitive interdependence (Brandon & Hollingshead, 2004). The present work is thus an attempt to cumulatively examine social relationships through the lens of the theory of the high reliability organization.

Furthermore, this paper addresses the problem of the safety-specific and general literature domains in classifying behaviors which are problem-focused, change-oriented, and constructive. Because the present meta-analytic approach treated the reporting of more than one of these behaviors in one high reliability sample as multiple measures of the change-oriented safety behavior construct, we begin to narrow in on this safety-specific construct space amidst a variety of overlapping concepts.

5.2. Practical Implications

Given that onsite accidents and injuries strain organizational resources, managers often express interest in ways to improve workplace safety. By focusing on the social

context of the high reliability organization, the present research may provide some insight as to how communication and subsequent discussion-based learning interventions can be effectively used to promote positive, safe behavior. The relative weight of organizational support in predicting change-oriented safety behavior suggests that support must invariably persist at this level. For instance, formal statements by the high reliability organization ought to transmit the values that inform the organization's approach to safe procedure as well as to learning, feedback, and improvement. Leaders and peers are nonetheless critical to the maintenance of safety, as their support for learning, feedback, and improvement also positively influenced change-oriented safety behavior. Thus high reliability organizations may consider systematizing opportunities for post-incident discussion, such that leaders and peers have a space to collectively re-negotiate what it means to act safely.

Managers also often struggle with what they already know and what they need to discover in order for their organizations to remain competitive. They look for ways to uniquely integrate, build, and reconfigure their organizations' internal and external competences in order to address a changing environment and glean competitive advantage (e.g., Teece, 2007; Teece, Pisano, & Shuen, 1997). The high reliability organization, while unique in its goals and operations, provides a setting that captures these ubiquitous organizational concerns. Thus to maintain that only a high reliability organization manages "a complex social activity system in which fluctuations in comprehension seem to be consequential" (Weick & Roberts, 1993, p. 374) is perhaps to limit the scope of application of this study's findings. Despite the present work's focus on deteriorating conditions and error, mindful attention to and discussion of both failures

and successes can advance rich and useful insights (Ellis & Davidi, 2005). Therefore,
there is great utility for non-high reliability organizations in adopting the mindful
competencies of the high reliability organization.

5.3. Limitations and Future Directions

        As with all research, this study is not without its limitations. First, a variety of
different scales were used for the measurement of organizational support, leader support,
and peer support in this meta-analysis. This included a combination of questionnaires
formulated by researchers working in isolation for the particular purpose of their studies
and more commonplace, validated measures like Eisenberger et al.'s (1986) perceived
organizational support scale, the Norwegian Safety Climate Inventory (NORSCI), the
Hospital Survey on Patient Safety Culture (HSOPSC), the Authentic Leadership
Questionnaire, the Multifactor Leadership Questionnaire, and the LMX-7. Although
meta-analysis is capable of triangulating multiple settings, samples, and scales (Jick,
1979; Schmidt & Hunter, 2015), predominant use of these validated studies within this
present meta-analysis might have afforded a more robust interpretation of the
relationships of the social context which support change-oriented safety behavior.

        Interestingly, the extent to which validated measures demonstrated stronger
relationships with change-oriented safety behavior than other measures specific to the
manuscript or adapted for the setting where data were sampled appeared to have varied.
Whereas such validated measures of organizational support as the Norwegian Safety
Climate Inventory (NORSCI) and the Hospital Survey on Patient Safety Culture
(HSOPSC) generally demonstrated stronger relationships with change-oriented safety
behavior, validated measures of leader support like the Authentic Leadership
Questionnaire, the Multifactor Leadership Questionnaire, and the LMX-7 demonstrated

weaker relationships with change-oriented safety behavior. This pattern may reflect the extent to which the questionnaires' items were specific to the work setting. If context is indeed important to the study of voice and related change-oriented behaviors (e.g., Bashshur & Oc, 2015), we advocate for greater exploration of the distinctions between general and safety-specific work with regard to the social setting.

Second, because the cases included in the present meta-analysis were field studies rather than experiments, causal relationships remain undetermined. Moreover, it is possible that other important antecedents and mediators were not investigated. For instance, support may influence change-oriented safety behavior citizenship though such mediators as increased organizational identification or commitment (e.g., Barling & Hutchinson, 2000; DeJoy et al., 2010). Such models can be tested when more primary studies become available.

Third, the analyses reported high effect sizes, some wide credibility and confidence intervals, and the occasional inclusion of zero. To clarify the statistical significance of the posited relationships as well as to reveal potential moderating effects, the present model may be reevaluated with more cases. This may bolster our ability to test potential theoretical and methodological moderating variables. Future research may also explore more complex models.

Finally, it is possible that voicing problem-focused, change-oriented, and constructive opinions and suggestions may still be perceived as a risk to the individual. For instance, suggestions received in an organization that operates within an asymmetrical power structure could be construed negatively and regarded as criticism of the organization's safety management (e.g., Conchie et al., 2012). While some works

articulate the role of individual risk perceptions in making decisions (e.g., Slovic, 1999), such a focus may ultimately run counter to the theoretical approach of this particular study. This is nonetheless a potential consideration for future models.

5.4. Conclusion

While the literature supporting voice and related change-oriented behaviors is rich, it requires reorientation through the lens of a new context. High reliability organizations are unique in their regard and support for communication and learning from frontline employees. We reviewed previous conceptual and empirical demonstrations of how voice and related change-oriented behavior are related to organizational, leader, and peer support in both general and safety-specific work settings. We targeted these constructs and relationships specifically in the context of the high reliability organization. The current meta-analysis provides estimates that reflect our best understanding of the population parameter estimate from the cases included. While organizational support was the strongest predictor of change-oriented safety behavior, leader and peer support of improvement, learning, and feedback were notably strong, as well. These relationships illustrate the complex, nearly paradoxical procedures of the high reliability organizations, which rely on continuous evaluation and improvement through interaction despite heavily standardized operations. This research demonstrates the importance of the social context in influencing change-oriented safety behaviors in high reliability organizations.

REFERENCES

*References marked with an asterisk indicate studies included in the meta-analysis.

Ashford, S. J., Sutcliffe, K. M., & Christianson, M. K. (2009). Speaking up and speaking out: The leadership dynamics of voice in organizations. In J. Greenberg, M. S. Edwards, & C. T. Brinsfield (Eds.), *Voice and silence in organizations* (pp. 175-202). Bingley: Emerald.

Baer, M. & Frese, M. (2003). Innovation is not enough: climates for initiative and psychological safety, process innovations, and firm performance. *Journal of Organizational Behavior, 24(1)*, 45-68.

Baran, B. E. & Scott, C. W. (2010). Organizing ambiguity: A grounded theory of leadership and sensemaking within dangerous contexts. *Military Psychology, 22(Suppl. 1)*, S42-S69.

*Barling, J., Kelloway, E. K., & Iverson, R. D. (2003). Accidental outcomes: Attitudinal consequences of workplace injuries. *Journal of Occupational Health Psychology, 8(1)*, 74-85.

*Barling, J., Loughlin, C., & Kelloway, E. K. (2002). Development and test of a model linking safety-specific transformational leadership and occupational safety. *Journal of Applied Psychology, 87(3)*, 488-496.

Bashshur, M. R., & Oc, B. (2015). When Voice Matters: A Multilevel Review of the Impact of Voice in Organizations. *Journal of Management, 41(5)*, 1530-1554.

*Birkeland Nielsen, M., Eid, J., Mearns, K., & Larsson, G. (2013). Authentic leadership and its relationship with risk perception and safety climate. *Leadership & Organization Development Journal, 34(4)*, 308-325.

Bureau of Labor Statistics. (2017). *Injuries, illnesses, and fatalities*. Retrieved from
    http://www.bls.gov/iif/.

Bettencourt, L. A., Gwinner, K. P., & Meuter, M. L. (2001). A comparison of attitude,
    personality, and knowledge predictors of service-oriented organizational
    citizenship behaviors. *Journal of Applied Psychology, 86(1),* 29-41.

Beus, J. M., Dhanani, L. Y., & McCord, M. A. (2015). A meta-analysis of personality
    and workplace safety: Addressing unanswered questions. *Journal of Applied
    Psychology, 100(2)*, 481-498.

Brandon, D. P., & Hollingshead, A. B. (2004). Transactive memory systems in
    organizations: Matching tasks, expertise, and people. *Organization Science,
    15(6)*, 633-644.

*Bommer, W. H., Miles, E. W., & Grover, S. L. (2003). Does one good turn deserve
    another? Coworker influences on employee citizenship. *Journal of
    Organizational Behavior, 24(2)*, 181-196.

Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2009). *Introduction to
    meta-analysis.* West Sussex: Wiley.

Bosco, F. A., Aguinis, H., Singh, J., Field, J. G., Pierce, C. A. (2015). Correlation effect
    size benchmarks. *Journal of Applied Psychology, 100,* 431-449.

Burke, M. J., Sarpy, S. A., Tesluk, P. E., & Smith-Crowe, K. (2002). General Safety
    Performance: A Test of a Grounded Theoretical Model. *Personnel Psychology,
    55(2),* 429-457.

Burris, E. R., Detert, J. R., & Chiaburu, D. S. (2008). Quitting before leaving: The mediating effects of psychological attachment and detachment on voice. *Journal of Applied Psychology, 93(4),* 912-922.

Casey, T., Griffin, M. A., Flatau, H. H., & Neal, A. (2017). Safety Climate and Culture: Integrating Psychological and Systems Perspectives. *Journal of Occupational Health Psychology.*

*Cavazza, N. & Serpe, A. (2009). Effects of safety climate on safety norm violations: Exploring the mediating role of attitudinal ambivalence toward personal protective equipment. *Journal of Safety Research, 40(4)*, 277-283.

*Chiaburu, D. S. & Baker, V. L. (2006). Extra-role behaviors challenging the status-quo: Validity and antecedents of taking charge behaviors. *Journal of Managerial Psychology, 21(7)*, 620-637.

Chiaburu, D. S. & Harrison, D. A. (2008). Do peers make the place? Conceptual synthesis and meta-analysis of coworker effects on perceptions, attitudes, OCBs, and performance. *Journal of Applied Psychology, 93(5)*, 1082-1103.

Chiaburu, D. S., Lorinkova, N. M., & Van Dyne, L. (2013). Employees' Social Context and Change-Oriented Citizenship: A Meta-Analysis of Leader, Coworker, and Organizational Influences. *Group & Organization Management, 38(3)*, 291-333.

Chiaburu, D. S., Oh, I.S., Berry, C. M., Li, N., & Gardner, R. G. (2011). The five-factor model of personality traits and organizational citizenship behaviors: A meta-analysis. *Journal of Applied Psychology, 96(6)*, 1140-1166.

Chiaburu, D. S., Peng, A. C., Oh, I.S., Banks, G. C., & Lomeli, L. C. (2013). Antecedents and consequences of employee organizational cynicism: A meta-analysis. *Journal of Vocational Behavior, 83(2)*, 181-197.

Chiaburu, D. S., Smith, T. A., Wang, J., & Zimmerman, R. D. (2014). Relative importance of leader influences for subordinates' proactive behaviors, prosocial behaviors, and task performance: A meta-analysis. *Journal of Personnel Psychology, 13(2)*, 70-86.

Choi, J. N. (2007). Change-oriented organizational citizenship behavior: Effects of work environment characteristics and intervening psychological processes. *Journal of Organizational Behavior, 28(4),* 467-484.

Clarke, S. (2006). The relationship between safety climate and safety performance: A meta-analytic review. *Journal of Occupational Health Psychology, 11(4)*, 315-327.

Clarke, S. (2010). An integrative model of safety climate: Linking psychological climate and work attitudes to individual safety outcomes using meta-analysis. *Journal of Occupational and Organizational Psychology, 83(3)*, 553-578.

Clarke, S. (2012). The effect of challenge and hindrance stressors on safety behavior and safety outcomes: A meta-analysis. *Journal of Occupational Health Psychology, 17(4)*, 387-397.

Clarke, S. (2013). Safety leadership: A meta-analytic review of transformational and transactional leadership styles as antecedents of safety behaviors. *Journal of Occupational and Organizational Psychology, 86(1),* 22-49.

Clarke, S. & T. Robertson, I. (2005). A meta-analytic review of the Big Five personality factors and accident involvement in occupational and non-occupational settings. *Journal of Occupational and Organizational Psychology, 78(3)*, 355-376.

Clarke, S. & Robertson, I. (2008). An Examination of the Role of Personality in Work Accidents Using Meta-analysis. *Applied Psychology, 57(1)*, 94-108.

Clarke, S. & Ward, K. (2006). The role of leader influence tactics and safety climate in engaging employees' safety participation. *Risk Analysis, 26(5),* 1175-1185.

Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. (2009). Workplace safety: A meta-analysis of the roles of person and situation factors. *Journal of Applied Psychology, 94(5)*, 1103-1127.

Collinson, D. L. (1999). 'Surviving the Rigs': Safety and Surveillance on North Sea Oil Installations. *Organization Studies, 20(4)*, 579-600.

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement, 20*, 37-46.

Conchie, S. M. & Donald, I. J. (2009). The moderating role of safety-specific trust on the relation between safety-specific leadership and safety citizenship behaviors. *Journal of Occupational Health Psychology, 14(2)*, 137-147.

Conchie, S. M., Taylor, P. J., & Donald, I. J. (2012). Promoting safety voice with safety-specific transformational leadership: The mediating role of two dimensions of trust. *Journal of Occupational Health Psychology, 17(1)*, 105-115.

Daft, R. L. & Weick, K. E. (1984). Toward a model of organizations as interpretation systems. *Academy of Management Review, 9*(2), 284-295.

DeJoy, D. M., Della, L. J., Vandenberg, R. J., & Wilson, M. G. (2010). Making work safer: Testing a model of social exchange and safety management. *Journal of Safety Research, 41(2),* 163-171.

*DeJoy, D. M., Schaffer, B. S., Wilson, M. G., Vandenberg, R. J., & Butts, M. M. (2004). Creating safer workplaces: assessing the determinants and role of safety climate. *Journal of Safety Research, 35(1)*, 81-90.

*DeJoy, D. M., Searcy, C. A., Murphy, L. R., & Gershon, R. R. (2000). Behavior–diagnostic analysis of compliance with universal precautions among nurses. *Journal of Occupational Health Psychology, 5(1)*, 127-141.

Detert, J. R. & Burris, E. R. (2007). Leadership Behavior and Employee Voice: Is the Door Really Open? *Academy of Management Journal, 50(4)*, 869-884.

Dunn, A. M., Scott, C., Allen, J. A., & Bonilla, D. (2016). Quantity and quality: Increasing safety norms through after action reviews. *Human Relations*, *69(5),* 1-24

Duval, S. & Tweedie, R. (2000). Trim and fill: a simple funnel-plot–based method of testing and adjusting for publication bias in meta-analysis. *Biometrics, 56(2),* 455-463.

Edmondson, A. C. (2003). Speaking Up in the Operating Room: How Team Leaders Promote Learning in Interdisciplinary Action Teams. *Journal of Management Studies, 40(6)*, 1419-1452.

Eisenberger, R., Huntington, R., Hutchison, S., & Sowa, D. (1986). Perceived Organizational Support. *Journal of Applied Psychology, 71*, 500-507.

Eisenhardt, K. M. & Martin, J. A. (2000). Dynamic Capabilities: What are they? *Strategic Management Journal, 21(10/11)*, 1105-1121.

*Ek, A. & Akselsson, R. (2007). Aviation on the ground: Safety culture in a ground handling company. *The International Journal of Aviation Psychology, 17(1)*, 59-76.

Ellis, S. & Davidi, I. (2005). After-event reviews: drawing lessons from successful and failed experience. *Journal of Applied Psychology, 90(5),* 857-871.

Frese, M. & Fay, D. (2001). Personal initiative: An active performance concept for work in the 21st century. *Research in Organizational Behavior, 23*, 133-187.

Frese, M., Fay, D., Hilburger, T., Leng, K., & Tag, A. (1997). The concept of personal initiative: Operationalization, reliability and validity in two German samples. *Journal of Occupational and Organizational Psychology, 70(2)*, 139-161.

Fugas, C. S., Meliá, J. L., & Silva, S. A. (2011). The "is" and the "ought": How do perceived social norms influence safety behaviors at work? *Journal of Occupational Health Psychology, 16(1)*, 67-79.

Fuller, J. B., Marler, L. E., & Hester, K. (2006). Promoting felt responsibility for constructive change and proactive behavior: exploring aspects of an elaborated model of work design. *Journal of Organizational Behavior, 27(8)*, 1089-1120.

*Fuller, J. B., Barnett, T., Hester, K., Relyea, C., & Frey, L. (2007). An exploratory examination of voice behavior from an impression management perspective. *Journal of Managerial Issues*, 134-151.

*George, J. M. & Zhou, J. (2007). Dual tuning in a supportive context: Joint

    contributions of positive mood, negative mood, and supervisory behaviors to

    employee creativity. *Academy of Management Journal, 50(3)*, 605-622.

*Gibbons, A. M., von Thaden, T. L., & Wiegmann, D. A. (2006). Development and

    initial validation of a survey for assessing safety culture within commercial flight

    operations. *The International Journal of Aviation Psychology, 16(2)*, 215-238.

Gorden, W. I. (1988). Range of employee voice. *Employee Responsibilities and Rights*

    Journal, 1(4), 283-299.

Griffin, M. A. & Neal, A. (2000). Perceptions of safety at work: A framework for linking

    safety climate to safety performance, knowledge, and motivation. *Journal of*

    Occupational Health Psychology, 5(3), 347-358.

Griffin, M. A., Neal, A., & Parker, S. K. (2007). A New Model of Work Role

    Performance: Positive Behavior in Uncertain and Interdependent Contexts.

    Academy of Management Journal, 50(2), 327-347.

Griffin, M. A., Parker, S. K., & Mason, C. M. (2010). Leader vision and the development

    of adaptive and proactive performance: A longitudinal study. *Journal of Applied*

    Psychology, 95(1), 174-182.

Han, T. Y. & Williams, K. J. (2008). Multilevel Investigation of Adaptive Performance:

    Individual- and Team-Level Relationships. *Group & Organization Management,*

    33(6), 657-684.

Harrison, J. S., Banks, G. C., Pollack, J. M., O'Boyle Jr., E. H., & Short, J. C. (2017).

    Publication bias in strategic management research. *Journal of Management,*

    43(2), 400-425.

Hirschman, A. O. (1970). *Exit, voice, and loyalty: Responses to decline in firms, organizations, and states*. Cambridge, Massachusetts: Harvard University Press.

*Hofmann, D. A. & Mark, B. (2006). An investigation of the relationship between safety climate and medication errors as well as other nurse and patient outcomes. *Personnel Psychology, 59(4),* 847-869.

*Hofmann, D. A. & Morgeson, F. P. (1999). Safety-Related Behavior as a Social Exchange: The Role of Perceived Organizational Support and Leader-Member Exchange. *Journal of Applied Psychology, 84(2)*, 286-296.

*Hofmann, D. A., Morgeson, F. P., & Gerras, S. J. (2003). Climate as a moderator of the relationship between leader-member exchange and content specific citizenship: Safety climate as an exemplar. *Journal of Applied Psychology, 88(1)*, 170-178.

*Hofmann, D. A. & Stetzer, A. (1996). A cross-level investigation of factors influencing unsafe behaviors and accidents. *Personnel Psychology, 49(2)*, 307-339.

*Hsu, S. H., Lee, C. C., Wu, M. C., & Takano, K. (2008). A cross-cultural study of organizational factors on safety: Japanese vs. Taiwanese oil refinery plants. *Accident Analysis & Prevention, 40(1)*, 24-34.

Jahn, J. L. (2016). Adapting safety rules in a high reliability context: How wildland firefighting workgroups ventriloquize safety rules to understand hazards. *Management Communication Quarterly, 30(3)*, 362-389.

Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly, 24*, 602-611.

Johnson, J. W. (2001). Computer program exchange: Rweight: Computing the relative

    weight of predictors in a regression. *Applied Psychological Measurement, 25(4),*

    342-342.

Johnson, J. W. & LeBreton, J. M. (2004). History and use of relative importance indices

    in organizational research. *Organizational Research Methods, 7*, 238-257.

Kapp, E. A. (2012). The influence of supervisor leadership practices and perceived group

    safety climate on employee safety performance. *Safety Science, 50(4)*, 1119-1124.

Kepes, S., Banks, G. C., & Oh, I.S. (2014). Avoiding bias in publication bias research:

    The value of "null" findings. *Journal of Business and Psychology, 29*, 183-203.

*Konovsky, M. A. & Pugh, S. D. (1994). Citizenship behavior and social exchange.

    Academy of Management Journal, 37(3), 656-669.

*Kudo, Y., Satoh, T., Kido, S., Watanabe, M., Miki, T., Miyajima, E., Saegysa,Y.,

    Tsunoda, M., & Aizawa,. (2008). *A Pilot Study Testing the Dimensions of Safety*

    Climate among Japanese Nurses. Industrial Health, 46(2), 158-165.

La Porte, T. R. (1996). High Reliability Organizations: Unlikely, Demanding and At

    Risk. *Journal of Contingencies and Crisis Management, 4(2)*, 60-71.

Laurence, D. (2005). Safety rules and regulations on mine sites – The problem and a

    solution. *Journal of Safety Research, 36(1)*, 39-50.

LePine, J. A. & Van Dyne, L. (1998). Predicting voice behavior in work groups. *Journal*

    of Applied Psychology, 83(6), 853-868.

LePine, J. A., & Van Dyne, L. (2001). Voice and cooperative behavior as contrasting

    forms of contextual performance: Evidence of differential relationships with Big

Five personality characteristics and cognitive ability. *Journal of Applied Psychology, 86(2),* 326-336.

Liang, J., Farh, C. I. C., & Farh, J. L. (2012). Psychological Antecedents of Promotive and Prohibitive Voice: A Two-Wave Examination. *Academy of Management Journal, 55(1),* 71-92.

Liu, W., Zhu, R., & Yang, Y. (2010). I warn you because I like you: Voice behavior, employee identifications, and transformational leadership. *The Leadership Quarterly, 21(1)*, 189-202.

*Madjar, N. (2008). Emotional and informational support from different sources and employee creativity. *Journal of Occupational and Organizational Psychology, 81(1)*, 83-100.

Marinova, S. V., Peng, C., Lorinkova, N., Van Dyne, L., & Chiaburu, D. (2015). Change-oriented behavior: A meta-analysis of individual and job design predictors. *Journal of Vocational Behavior, 88*, 104-120.

*Matsubara, S., Hagihara, A., & Nobutomo, K. (2008). Development of a patient safety climate scale in Japan. *International Journal for Quality in Health Care, 20(3)*, 211-220.

Maynes, T. D., & Podsakoff, P. M. (2014). Speaking more broadly: An examination of the nature, antecedents, and consequences of an expanded set of employee voice behaviors. *Journal of Applied Psychology, 99(1),* 87-112.

Mearns, K. J. & Reader, T. (2008). Organizational support and safety outcomes: An un-investigated relationship? *Safety Science, 46(3)*, 388-397.

*Miller, K. I., Ellis, B. H., Zook, E. G., & Lyles, J. S. (1990). An integrated model of communication, stress, and burnout in the workplace. *Communication Research, 17(3)*, 300-326.

Milosevic, I., Bass, A. E., & Combs, G. M. (2015). The Paradox of Knowledge Creation in a High-Reliability Organization: A Case Study. *Journal of Management.*

Moon, H., Kamdar, D., Mayer, D. M., & Takeuchi, R. (2008). Me or we? The role of personality and justice as other-centered antecedents to innovative citizenship behaviors within organizations. *Journal of Applied Psychology, 93(1)*, 84-94.

*Moorman, R. H., Blakely, G. L., & Niehoff, B. P. (1998). Does perceived organizational support mediate the relationship between procedural justice and organizational citizenship behavior?. *Academy of Management Journal, 41(3)*, 351-357.

Morrison, E. & Phelps, C. C. (1999). Taking Charge At Work: Extrarole Efforts to Initiate Workplace Change. *Academy of Management Journal, 42(4),* 403-419.

Morrison, E., Wheeler-Smith, S. L., & Kamdar, D. (2011). Speaking up in groups: A cross-level study of group voice climate and voice. *Journal of Applied Psychology, 96(1)*, 183-191.

Morrison, E. W., & Rothman, N. B. (2009). Silence and the dynamics of power. In J. Greenberg, M. S. Edwards, & C. T. Brinsfield (Eds.), *Voice and silence in organizations* (Vol. 111-133). Bingley: Emerald.

*Mossholder, K. W., Settoon, R. P., & Henagan, S. C. (2005). A relational perspective on turnover: Examining structural, attitudinal, and behavioral predictors. *Academy of Management Journal, 48(4)*, 607-618.

Mowbray, P. K., Wilkinson, A., & Tse, H. H. M. (2015). An Integrative Review of Employee Voice: Identifying a Common Conceptualization and Research Agenda. *International Journal of Management Reviews, 17(3)*, 382-400.

*Mullen, J., Kelloway, E. K., & Teed, M. (2017). Employer safety obligations, transformational leadership and their interactive effects on employee safety performance. *Safety Science, 91*, 405-412.

Nahrgang, J. D., Morgeson, F. P., & Hofmann, D. A. (2007). Predicting Safety Performance: A Meta-analysis of Safety and Organizational Constructs. Paper presented at the 22nd Annual Conference of the Society for Industrial and Organizational Psychology.

Nahrgang, J. D., Morgeson, F. P., & Hofmann, D. A. (2011). Safety at work: A meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. *Journal of Applied Psychology, 96(1)*, 71-94.

Ng, T. W. H. & Feldman, D. C. (2012). Employee voice behavior: A meta-analytic test of the conservation of resources framework. *Journal of Organizational Behavior, 33(2),* 216-234.

Ng, T. W. H. & Sorensen, K. L. (2008). Toward a Further Understanding of the Relationships Between Perceptions of Support and Work Attitudes: A Meta-Analysis. *Group & Organization Management, 33(3)*, 243-268.

*Oldham, G. R. & Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Journal, 39(3)*, 607-634.

*Olsen, E. (2010). Exploring the possibility of a common structural model measuring

    associations between safety climate factors and safety behaviour in health care

    and the petroleum sectors. *Accident Analysis & Prevention, 42(5),* 1507-1516.

Organ, D. W., Podsakoff, P. M., & MacKenzie, S. B. (2006). *Organizational citizenship*

    behavior: Its nature, antecedents, and consequences. Thousand Oaks: SAGE.

*Parker, S. K., Axtell, C. M., & Turner, N. (2001). Designing a safer workplace:

    importance of job autonomy, communication quality, and supportive supervisors.

    Journal of Occupational Health Psychology, 6(3), 211-228.

Parker, C. P., Baltes, B. B., Young, S. A., Huff, J. W., Altmann, R. A., LaCost, H. A., &

    Roberts, J. E. (2003). Relationships between psychological climate perceptions

    and work outcomes: a meta-analytic review. *Journal of Organizational Behavior,*

    24(4), 389-416.

*Paul, P. S. & Maiti, J. (2005). Development and test of a sociotechnical model for

    accident/injury occurrences in underground coalmines. *Journal of the South*

    African Institute of Mining and Metallurgy, 105(1), 43-53.

Perrow, C. (1984). *Normal accidents: Living with high-risk technologies*. New York:

    Basic Books.

*Petitta, L., Probst, T. M., Barbaranelli, C., & Ghezzi, V. (2017). Disentangling the roles

    of safety climate and safety culture: Multi-level effects on the relationship

    between supervisor enforcement and safety compliance. *Accident Analysis &*

    Prevention, 99, 77-89.

*Pfeiffer, Y. & Manser, T. (2010). Development of the German version of the Hospital Survey on Patient Safety Culture: Dimensionality and psychometric properties. *Safety Science, 48(10)*, 1452-1462.

*Probst, T. M. & Estrada, A. X. (2010). Accident under-reporting among employees: Testing the moderating influence of psychological safety climate and supervisor enforcement of safety practices. *Accident Analysis & Prevention, 42(5),* 1438-1444.

Pulakos, E. D., Arad, S., Donovan, M. A., & Plamondon, K. E. (2000). Adaptability in the workplace: Development of a taxonomy of adaptive performance. *Journal of Applied Psychology, 85(4)*, 612-624.

Reason, J. (2000). Human error: models and management. *Western Journal of Medicine, 172(6),* 393-396.

Rhoades, L. & Eisenberger, R. (2002). Perceived organizational support: A review of the literature. *Journal of Applied Psychology, 87(4)*, 698-714.

Roberts, K. H. (1990). Some Characteristics of One Type of High Reliability Organization. *Organization Science, 1(2)*, 160-176.

Roberts, K. H., Bea, R., & Bartles, D. L. (2001). Must accidents happen? Lessons from high-reliability organizations. *Academy of Management Executive, 15(3)*, 70-78.

Rochlin, G. I. (1993). Defining high reliability organizations in practice: A taxonomic prologue. In K. H. Roberts (Ed.), *New challenges to organization research: High reliability organizations* (pp. 11-32). New York: Macmillan.

Schmidt, F. L. & Hunter, J. E. (2015). *Methods of meta-analysis: Correcting error and bias in research findings* (3rd Ed.). Newbury Park: Sage.

Schneider, B., Ehrhart, M. G., & Macey, W. H. (2011). Perspectives on organizational climate and Culture. *APA Handbook of Industrial and Organizational Psychology, Vol 1: Building and Developing the Organization* (pp. 373-414). Washington, DC: American Psychological Association.

Scott, C. W. & Trethewey, A. (2008). Organizational Discourse and the Appraisal of Occupational Hazards: Interpretive Repertoires, Heedful Interrelating, and Identity at Work. *Journal of Applied Communication Research, 36(3),* 298-317.

*Siu, O. L., Phillips, D. R., & Leung, T. W. (2003). Age differences in safety attitudes and safety performance in Hong Kong construction workers. *Journal of Safety Research, 34(2)*, 199-205.

Slovic, P. (1999). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk Analysis, 19(4),* 689-701.

Strauss, K., Griffin, M. A., & Rafferty, A. E. (2009). Proactivity Directed Toward the Team and Organization: The Role of Leadership, Commitment and Role-breadth Self-efficacy. *British Journal of Management, 20(3),* 279-291.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28(13)*, 1319-1350.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal, 18(7),* 509-533.

Tesluk, P. E. & Quigley, N. (2003). Group and normative influences on health and safety: Perspectives from taking a broad view on team effectiveness. In D. A. Hofmann

& L. E. Tetrick (Eds.), *Health and Safety in Organizations: A multi-level perspective* (pp. 131-172). San Francisco: Jossey-Bass.

*Tharaldsen, J. E., Olsen, E., & Rundmo, T. (2008). A longitudinal study of safety climate on the Norwegian continental shelf. *Safety Science, 46(3)*, 427-439.

*Tierney, P., Farmer, S. M., & Graen, G. B. (1999). An examination of leadership and employee creativity: The relevance of traits and relationships. *Personnel Psychology, 52(3)*, 591-620.

Tonidandel, S. & LeBreton, J. M. (2015). RWA web: A free, comprehensive, web-based, and user-friendly tool for relative weight analyses. *Journal of Business and Psychology, 30(2)*, 207-216.

*Trombetta, J. J. & Rogers, D. P. (1988). Communication climate, job satisfaction, and organizational commitment the effects of information adequacy, communication openness, and decision participation. *Management Communication Quarterly, 1(4)*, 494-514.

*Tucker, A. L. (2007). An empirical study of system improvement by frontline employees in hospital units. *Manufacturing & Service Operations Management, 9(4)*, 492-505.

Tucker, S., Chmiel, N., Turner, N., Hershcovis, M. S., & Stride, C. B. (2008). Perceived organizational support for safety and employee safety voice: The mediating role of coworker support for safety. *Journal of Occupational Health Psychology, 13(4)*, 319-330.

Tucker, S. & Turner, N. (2011). Young worker safety behaviors: Development and validation of measures. *Accident Analysis & Prevention, 43(1)*, 165-175.

Tucker, S., & Turner, N. (2015). Sometimes it hurts when supervisors don't listen: The antecedents and consequences of safety voice among young workers. *Journal of Occupational Health Psychology, 20(1)*, 72-81.

Van Dyne, L., Ang, S., & Botero, I. C. (2003). Conceptualizing Employee Silence and Employee Voice as Multidimensional Constructs. *Journal of Management Studies, 40(6),* 1359-1392.

Van Dyne, L. & Ellis, J. B. (2004). Job creep: A reactance theory perspective on organizational citizenship behavior as over-fulfillment of obligations. In. In J. A. M. Coyle-Shapiro, L. M. Shore, M. S. Taylor, & L. E. Tetrick (Eds.), *The Employment Relationship: Examining psychological and contextual perspectives* (pp. 181-205). Oxford: Oxford University Press.

Van Dyne, L., Kamdar, D., & Joireman, J. (2008). In-role perceptions buffer the negative impact of low LMX on helping and enhance the positive impact of high LMX on voice. *Journal of Applied Psychology, 93(6)*, 1195-1207.

Van Dyne, L. & LePine, J. A. (1998). Helping and Voice Extra-Role Behaviors: Evidence of Construct and Predictive Validity. *Academy of Management Journal, 41(1)*, 108-119.

*Vigoda-Gadot, E. & Beeri, I. (2012). Change-oriented organizational citizenship behavior in public administration: The power of leadership and the cost of organizational politics. *Journal of Public Administration Research and Theory, 22(3)*, 573-596.

Vogus, T. J., Sutcliffe, K. M., & Weick, K. E. (2010). Doing No Harm: Enabling, Enacting, and Elaborating a Culture of Safety in Health Care. *Academy of Management Perspectives, 24(4)*, 60-77.

Wang, G., Oh, I.S., Courtright, S. H., & Colbert, A. E. (2011). Transformational Leadership and Performance Across Criteria and Levels: A Meta-Analytic Review of 25 Years of Research. *Group & Organization Management, 36(2),* 223-270.

*Watson, G. W., Scott, D., Bishop, J., & Turnbeaugh, T. (2005). Dimensions of interpersonal relationships and safety in the steel industry. *Journal of Business and Psychology, 19(3)*, 303-318.

Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly*, 1-19.

Weick, K. E. (1987). Organizational Culture as a Source of High Reliability. *California Management Review, 29(2)*, 112-127.

Weick, K. E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly, 38(4)*, 628-652

Weick, K.E., (1995). *Sensemaking in Organizations*. Thousand Oaks: Sage.

Weick, K. E. & Roberts, K. H. (1993). Collective mind in organizations: Heedful interrelating on flight decks. *Administrative Science Quarterly, 38(3)*, 357-381.

Weick, K. E. & Sutcliffe, K. M. (2007). *Managing the unexpected: Resilient performance in an age of uncertainty*. San Francisco: Jossey-Bass.

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (1999). Organizing for high reliability: Processes of collective mindfulness. In R. Staw & R. Sutton (Eds.), *Research in organizational behavior* (pp. 81-117). Stamford: JAI Press.

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (2008). Organizing for high reliability: Processes of collective mindfulness. *Crisis Management, 3(1)*, 81-123.

*Wilson, K. A. (2005). *Does safety culture predict clinical outcomes?* (Dissertation). University of Central Florida, Orlando, FL.

*Wong, C. A., Spence Laschinger, H. K., & Cummings, G. G. (2010). Authentic leadership and nurses' voice behavior and perceptions of care quality. *Journal of Nursing Management, 18(8)*, 889-900.

Wood, J. (2008). Methodology for Dealing With Duplicate Study Effects in a Meta-Analysis. *Organizational Research Methods, 11*(1), 79-95.

Zhou, J., & George, J. M. (2001). When Job Dissatisfaction Leads to Creativity: Encouraging the Expression of Voice. *Academy of Management Journal, 44(4)*, 682-696.

Zohar, D. (2002). The effects of leadership dimensions, safety climate, and assigned priorities on minor injuries in work groups. *Journal of Organizational Behavior, 23(1)*, 75-92.

Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. *Accident Analysis & Prevention, 42(5)*, 1517-1522.

Zohar, D. (2014). Safety climate: conceptualization, measurement, and improvement. In B. Schneider & K. M. Barbera (Eds.), *The Oxford Handbook of Organizational Climate and Culture* (pp. 317-334). Oxford: Oxford University Press.

*Zohar, D. & Polachek, T. (2014). Discourse-based intervention for modifying supervisory communication as leverage for safety climate and performance improvement: A randomized field study. *Journal of Applied Psychology, 99(1)*, 113-124.

Zollo, M. & Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science, 13(3)*, 339-351.

APPENDIX I: TABLES

Table 1. *Summary of Voice and Related Change-Oriented Behaviors*

Literature Domain	Term	Study	Conceptualization of Behavior	Examples
Safety-specific	Employee safety voice	Tucker et al. 2008	"Communication motivated toward changing perceived unsafe working conditions that have implications for individual and organizational health, can flow through formal or informal channels, and can be directed toward numerous targets (e.g., supervisors/managers, coworkers, union officials, government officials)." (p. 320)	Raising safety concerns, speaking before a safety committee, dissent, reporting dangerous working conditions to officials, offering to teach coworkers safety work techniques
	Safety citizenship behavior	Hoffman, Morgeson, & Gerras, 2003	Discretionary behavior, not directly or explicitly recognized by the formal reward system, which aggregates to promote effective functioning of the organization.	Helping coworkers, promoting safety programs, demonstrating initiative, and suggesting changes for improving safety
	Safety voice citizenship behavior	Conchie, Taylor & Donald, 2012	"Behaviors that seek to improve safety by identifying current limitations and possibilities for positive change." (p. 105)	Expressing opinions on safety matters (whether or not someone may disagree), offer safety-related recommendations about work activities
	Safety participation	Griffin & Neal, 2000	Discretionary behaviors that may not directly contribute to workplace safety, but that ultimately develop an environment that supports safety.	Participating in voluntary safety activities, attending safety meetings
	Safety compliance	Griffin & Neal, 2000	Required safety activities that are critical to the maintenance of workplace safety.	Adhering to specified, required safety procedures
General	Employee voice	Van Dyne & LePine, 1998	Constructive change-oriented communication intended to improve a situation at hand.	Suggesting positive organizational improvements, making constructive suggestions, persuading others to accept these suggestions
	Change-oriented citizenship behavior	Chiaburu, Oh, Berry, Li, & Gardner, 2011; Chiaburu, Lorinkova, & Van Dyne, 2013	"Proactive actions aimed at identifying and implementing changes in work processes, products, and services...intended to change and enhance organizational aspects by bringing about positive modifications." (p. 2)	Speaking up with suggestions for change, creative performance, adaptive performance, proactive behavior, personal initiative to solve problems, and taking charge

Table 2. *Composite Antecedents of Change-Oriented Safety Behavior (COSB)*

Variable	k	N	$\bar{r}$	SD_r	$\hat{\bar{\rho}}$	SD_ρ	CV_{LL}	CV_{UL}	CI_{LL}	CI_{UL}	%Var	*One-sample removed*
Composite Antecedents → COSB												
Organizational Support	30	39,964	.54	.29	.79	.70	[-.10	.99]	[.54	.99]	0%	.06
Leader Support	43	17,929	.39	.23	.55	.37	[.07	.99]	[.43	.66]	3%	.03
Peer Support	27	18,488	.35	.23	.46	.39	[-.04	.95]	[.31	.60]	1%	.07

Note. k = number of independent samples; N = total sample size; $\bar{r}$ = sample-size-weighted mean observed correlation; SD_r= sample-size-weighted observed standard deviation of correlations; $\hat{\bar{\rho}}$ = mean true-score correlation (corrected for unreliability); SD_ρ= standard deviation of corrected correlations; CV_{LL} and CV_{UL} = lower and upper bounds, respectively, of the 80% credibility interval; CI_{LL} and CI_{UL} = lower and upper bounds, respectively, of the 95% confidence interval around the mean true-score correlation; %Var = percentage of variance attributable to statistical artifacts. One-sample removed reports the ranges of effect size estimates, which are calculated in a tradition that is slightly different (i.e., Borenstein et al., 2009) from the psychometric tradition (i.e., Schmidt & Hunter, 2015) used to calculate the reported correlations.

Table 3. *Relative Importance of Organizational, Leader, and Peer Support as Predictors of Change-Oriented Safety Behavior (COSB)*

	Change-Oriented Safety Behavior	
	Raw relative weights	Relative weights as a % of predicted variance in COSB
Organizational Support	.48	63.7
Leader Support	.15	21.1
Peer Support	.11	15.1
	$R^2=0.699$	

Note. Meta-analytic correlation matrix includes true-score correlations (fully corrected estimated population correlations) between leader support and organizational support ($\hat{\rho} = .80$, k = 19, N = 11,916), between peer support and organizational support ($\hat{\rho} = .74$, k = 11, N = 10,080), and between peer support and leader support ($\hat{\rho} = .53$, k = 18, N = 10,994).

Table 4. *Select Composite Antecedents of Change-Oriented Safety Behavior (COSB)*

Variable	k	N	$\bar{r}$	SD_r	$\hat{\bar{\rho}}$	SD_ρ	CV_{LL}	CV_{UL}	CI_{LL}	CI_{UL}	%Var
Select Composite Antecedents→ COSB											
Organizational Support											
Organizational Support of Safe Operating Procedure	20	24,628	.57	.32	.78	.79	[-.24	.99]	[.43	.99]	0%
Organizational Support of Improvement, Learning, & Feedback	25	37,625	.50	.21	.73	.43	[.19	.99]	[.57	.90]	1%
Leader Support											
Leader Support of Safe Operating Procedure	18	10,497	.44	.19	.01	.12	[-.14	.17]	[-.04	.07]	0%
Leader Support of Improvement, Learning, & Feedback	31	13,474	.42	.23	.57	.37	[.09	.99]	[.43	.70]	2%
Peer Support											
Peer Support of Safe Operating Procedure	4	2,883	.05	.28	.02	.37	[-.44	.48]	[-.34	.38]	2%
Peer Support of Improvement, Learning, & Feedback	18	10,123	.44	.2	.58	.39	[.09	.99]	[.40	.75]	2%

Note. k = number of independent samples; N = total sample size; $\bar{r}$ = sample-size-weighted mean observed correlation; SD_r= sample-size-weighted observed standard deviation of correlations; $\hat{\bar{\rho}}$ = mean true-score correlation (corrected for unreliability for both variables); SD_ρ = standard deviation of corrected correlations; CV_{LL} and CV_{UL} = lower and upper bounds, respectively, of the 80% credibility interval; CI_{LL} and CI_{UL} = lower and upper bounds, respectively, of the 95% confidence interval around the mean true-score correlation; %Var = percentage of variance attributable to statistical artifacts.

Table 5. *Select Antecedents of Change-Oriented Safety Behavior (COSB)*

Variable	Measure, or Citation of Measure	k	N	$\bar{r}$	SD_r	$\hat{\rho}$	SD_ρ	CV_LL	CV_UL	CI_LL	CI_UL	%Var
Select Antecedents→ COSB												
				Organizational Support								
Management Commitment to Safety	Hsu, Lee, Wu, & Takano, 2008	2	551	.50	.14	.59	.16	[.40	.78]	[.38	.81]	12%
Employee Empowerment	Hsu, Lee, Wu, & Takano, 2008	2	551	.62	.18	.79	.02	[.79	.79]	[.74	.85]	99%
Safety Management System	Hsu, Lee, Wu, & Takano, 2008	2	551	.63	.04	.76	.04	[.76	.76]	[.71	.81]	99%
Safety Management and Involvement	NORSCI	3	12,170	.69	.15	.99	.11	[.99	.99]	[.99	.99]	2%
Safety versus Production	NORSCI	3	12,170	.54	.13	.99	.09	[.99	.99]	[.99	.99]	8%
Management Support for Safety	HSOPSC	3	3,948	.35	.19	.52	.34	[.09	.95]	[.14	.90]	1%
Feedback, Learning, and Improvement	HSOPSC	3	3,948	.55	.23	.82	.43	[.26	.99]	[.33	.99]	0%
Perceived Organizational Support	Eisenberger, Huntington, Hutchison, Sowa,1986	2	2,345	.64	.09	.98	.23	[.68	.99]	[.66	.99]	2%
				Leader Support								
Supervision	Hsu, Lee, Wu, & Takano, 2008	2	551	.55	.05	.66	.08	[.59	.74]	[.56	.76]	42%
Supervisor Expectations and Actions Promoting Safety	HSOPSC	4	5,754	.45	.19	.62	.34	[.19	.99]	[.29	.95]	1%
Social Support from Supervisor	Miller, Ellis, Zook & Lyles, 1990	2	417	.57	.00	.70	.01	[.70	.70]	[.63	.76]	99%
Perceived Priority of Safety Displayed by Direct Supervisor	Zohar & Polacheck, 2014	4	684	.51	.12	.59	.12	[.45	.72]	[.47	.70]	28%
Authentic Leadership	ALQ	2	573	.89	.18	.32	.27	[-.02	.66]	[-.06	.70]	6%

		k	N	$\bar{r}$	SD_r	$\hat{\rho}$	SD_ρ	CV_{LL}	CV_{UL}	CI_{LL}	CI_{UL}	%Var
Transformational Leadership	MLQ	5	812	.33	.18	.39	.24	[.10	.67]	[.18	.59]	12%
Leader-Member Exchange	LMX-7	3	337	.37	.05	.41	.15	[.26	.57]	[.25	.58]	40%
Peer Support												
Interpersonal Relationships	Hsu, Lee, Wu, & Takano, 2008	2	551	.68	.21	.85	.32	[.44	.99]	[.42	.99]	2%
Teamwork_a	Hsu, Lee, Wu, & Takano, 2008	2	551	.56	.01	.78	.07	[.73	.82]	[.70	.85]	72%
Social Support from Coworkers	Miller, Ellis, Zook & Lyles, 1990	2	417	.21	.05	.26	.06	[.26	.26]	[.17	.35]	99%
Teamwork_b	Zohar & Polacheck, 2014	4	684	.52	.07	.65	.09	[.58	.73]	[.58	.73]	59%

Note. k = number of independent samples; N = total sample size; $\bar{r}$ = sample-size-weighted mean observed correlation; SD_r= sample-size-weighted observed standard deviation of correlations; $\hat{\rho}$ = mean true-score correlation (corrected for unreliability for both variables); SD_ρ = standard deviation of corrected correlations; CV_{LL} and CV_{UL} = lower and upper bounds, respectively, of the 80% credibility interval; CI_{LL} and CI_{UL} = lower and upper bounds, respectively, of the 95% confidence interval around the mean true-score correlation; %Var = percentage of variance attributable to statistical artifacts; NORSCI= Norwegian Safety Climate Inventory; HSOPSC= Hospital Survey on Patient Safety Culture; ALQ= Authentic Leadership Questionnaire; MLQ= Multifactor Leadership Questionnaire; LMX=Leader-Member Exchange; Teamwork_a reflects the extent to which peers help each other finish their work, whereas Teamwork_b reflects the extent to which peers interact with one another and share information.
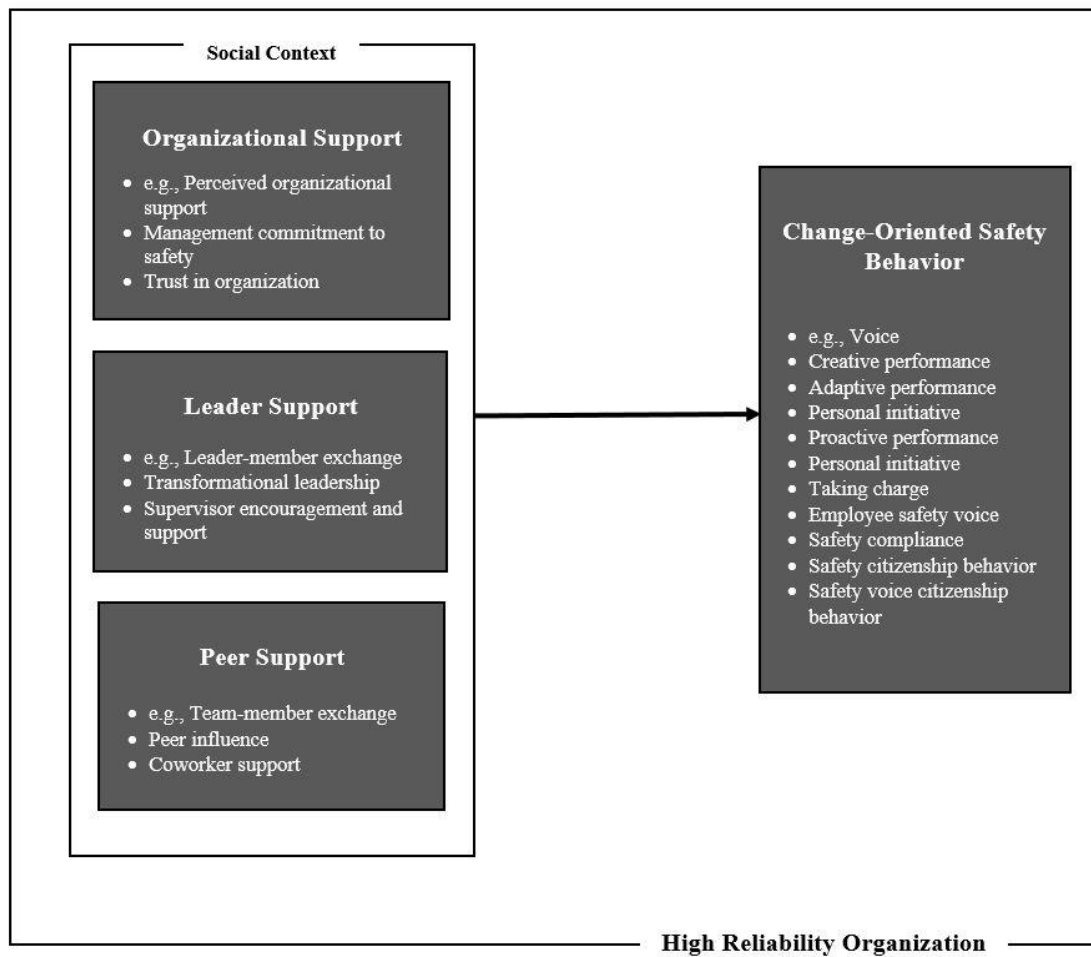
APPENDIX II: FIGURES

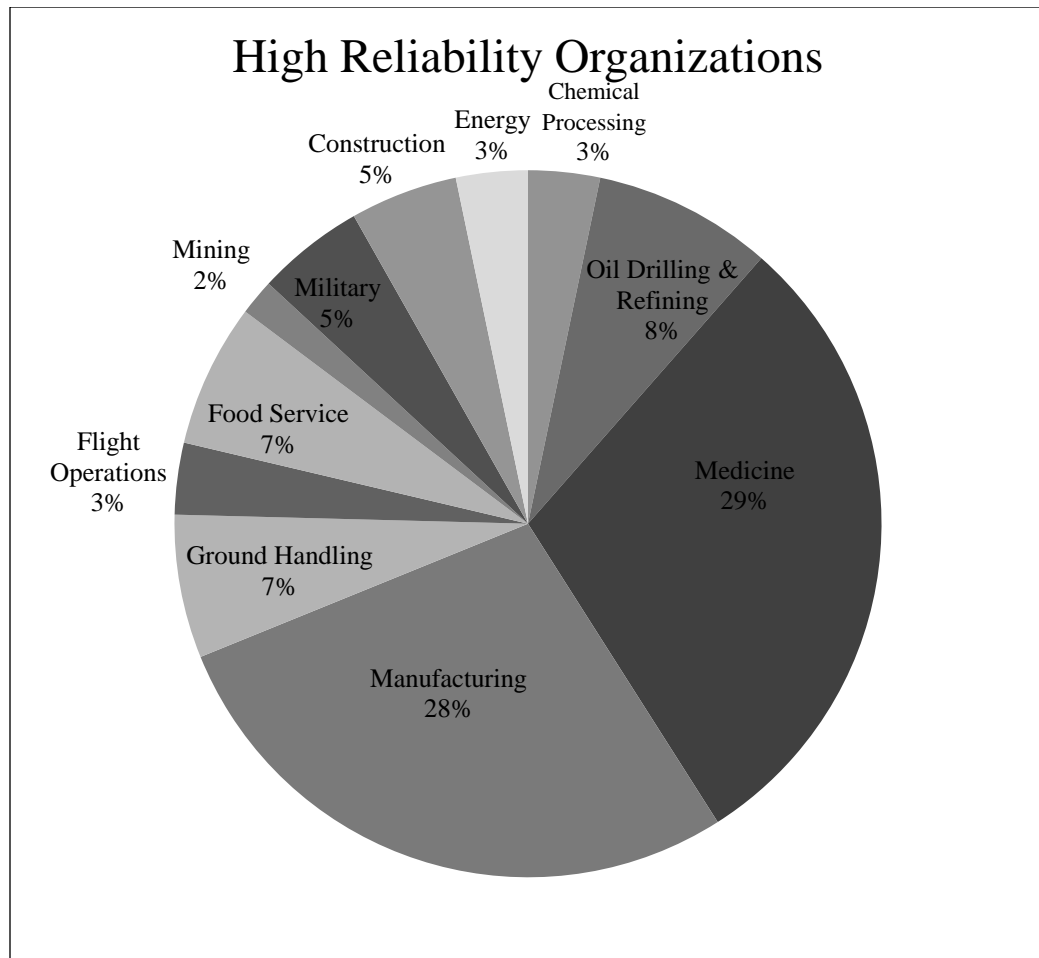FIGURE 1. A Model of Change-Oriented Safety Behavior in High Reliability Organizations

FIGURE 2. Industries of the high reliability organizations represented in the 41 meta-analyzed studies.

Note. Papers included in the meta-analysis may have sampled from one or more of these industries at a time. For example, Probst and Estrada (2010) sample across organizations in both manufacturing and medicine.