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Human Performance Improvement: Towards a Framework for Linking Workplace Spirituality, Mindfulness, Workers' Engagement, and Safety Outcomes

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HUMAN PERFORMANCE IMPROVEMENT: TOWARDS A FRAMEWORK

FOR LINKING WORKPLACE SPIRITUALITY, MINDFULNESS,

WORKERS' ENGAGEMENT, AND SAFETY OUTCOMES

A Dissertation

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree

Doctor of Philosophy

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Title: Human Performance Improvement: Towards a Framework for Linking Workplace
         Spirituality, Mindfulness, Workers' Engagement, and Safety Outcomes

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In response to the calls for more research into integrated organizational and psychological

approaches to managing workplace safety (Huang, Lee, McFadden, Rinner, & Robertson 2017;

Klockner, 2013), the overarching aim of this study was to develop a framework for linking

workplace spirituality, mindfulness, workers' safety engagement, and safety outcomes using

structural equation modeling (SEM). An important specific objective of this research was to

determine the impacts workplace spirituality and mindfulness have on safety outcomes and to

determine if the degree and type of workers' engagement mediate the effects of workplace

spirituality and mindfulness on safety outcomes.

The research was delimited to workers in five organizations in the Niger Delta region of

Nigeria. Convenience, descriptive and cross-sectional survey research methods were used to

collect data from 251 shop floor or "sharp-edge" workers who had worked for their present

companies for at least one year.

The results show that mindfulness and workplace spirituality positively predict worker

compliance and worker participation, and negatively predict injury frequency. However, when

workers' emotional and cognitive engagements were introduced into the model as mediators,

cognitive engagement is the predominant mechanism through which mindfulness and workplace

spirituality influence/mediate safety outcomes. Emotional engagement did not mediate the

relationship between the antecedent variables and safety outcomes, but the mediating effect of

emotional engagement on the relationship of the antecedent variables and safety participation was still somewhat significant. Further comparisons of models show that emotional engagement and cognitive engagement are important mechanisms through which mindfulness and workplace spirituality influence safety outcomes.

However, relative to similar studies, the result of this study suggests the design and implementation of future safety intervention studies through the lenses of national culture, and remotely questions multinational companies' one-size-fits-all approach to adopting safety intervention programs.

This study is significant given that it is the first study ever to link in tandem the organizational and psychological constructs of workplace spirituality and mindfulness to safety outcomes, and equally explains the possible mechanisms through which workplace spirituality and mindfulness influence safety outcomes. It therefore provides a baseline framework upon which organizations can base the improvement of safety outcomes.

ACKNOWLEDGEMENTS

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CHAPTER ONE

INTRODUCTION

Workplace spirituality and mindfulness are organizational and psychological

constructs whose usefulness has been explored in the fields of organizational management,

psychiatry, psychology, and physiotherapy (e.g., Elliot, 2011; Larson & Merrit, 1991).

However, in the field of occupational health and safety, very little is known on how these

latent constructs can be used to improve human safety performance, such as achieving

positive safety outcomes.

Many organizations are already reaping the benefits of research findings on these

constructs in other fields of inquiry (Daniel, 2010; Paul & Saha, 2015). According to Reb and

Choi (2014), some of the eminent organizations like Google, Apple, General Mills, and

McKinsey Consulting Group are working with mindfulness, by instituting mindfulness

enhancement programs. As far back as the 1990s, Cavanagh (1999) and Burack (1999) had

asserted that resilient organizations like AT&T, DuPont, and Ford Motor Companies had

initiated structures that encouraged workplace spirituality. But can a human performance

improvement framework that takes into account workplace spirituality and mindfulness be

developed towards the improvement of workplace safety? This research explores the

potential usefulness of workplace spirituality and mindfulness in achieving positive safety

outcomes by improving safety performance through cognitive and emotional safety

engagement of workers, thereby opening new frontiers for enhancing human performance

and building future research.

The following sections of this chapter present the historical, theoretical, conceptual,

and contextual background of this research. The statement of the problem is presented,

describing the ideal situation among the study variables, the actual situation prevailing in this

research area, the evidence of intensity and magnitude of the existing problem, implications

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of the current situation, and what needs to be done. The overall aim of the study is presented in terms of what the study intends to achieve, followed by the study's disaggregated objectives. The justification and significance of the study are presented in terms of topicality and knowledge gaps that need to be filled. Proposed solutions to the identified research problems are also hypothesized, followed by the study assumptions, limitations, and delimitations of the study.

Background of the Study (The Problem)

Ensuring a safe workplace has been a reoccurring issue for employers. Precipitated by Heinrich's (1931) Domino Theory, which attributes 88% of industrial accidents to unsafe acts caused by workers, occupational safety research has traditionally concentrated on discerning the workers' individual characteristics which predispose them to unsafe acts that lead to accidents (Shaw & Sichel, 1971; Sunderland & Cooper, 1991). This orthodox view of human error and its contribution, according to Reason (2000), considers human error as a cause of accidents. Workers, sometimes labeled as "accident prone," are often blamed for their laziness, incompetency, carelessness, and lack of concentration whenever an accident happens (Guo, Yiu & González, 2016). Based on this philosophy, when an organization is confronted by an accident, it assumes that identifying and removing the "accident prone" person from the system or modifying their behavior makes the workplace safer (Dekker, 2002). This has historically led to the management of human performance by focusing on correcting error-prone and apathetic workers (Reason, 2016).

This Behavior-Based Safety (BBS) management approach has, however, come under various attacks. Spearheaded by organized labor, this approach can lead to a "blame" culture (Howe, 2000). Furthermore, DeJoy (2005) points out that the BBS management approach focuses on immediate causes at the detriment of remote causes of accidents; it places workplace safety responsibility on workers without factoring-in the potential effects of other

job factors; and it minimizes the importance of environmental controls in maintaining workplace safety. In short, there are limits to the advantages of BBS management approaches to improving workplace safety (Saari, 1992).

Based on these criticisms against the BBS management approach, together with the lessons learned from major industrial disasters (e.g., Piper Alpha, Three Mile Island, Chernobyl, Bhopal), there appears to be a shift in the accident causation paradigm. This paradigm shifts toward recognizing various management practices and organizational factors as root causes of industrial accidents. These are considered to be contributing factors to system failures that lead to accidents. As a result, more occupational safety research has been channeled towards understanding how organizational factors, such as safety climate and safety management practices, act as antecedents, determinants, mediators or moderators of workplace safety outcomes (e.g., Kletz 1985; Neal & Griffin, 1997; Vinodkumar & Bhasi, 2010). These investigations have centered on conducting managerial and workers' perception studies.

Generally, a great majority of these perception studies have identified safety climate, management commitment, safety incentives, safety communication, safety training, and motivation as potential factors that can ensure workplace safety. Safety culture and safety climate, the most frequently studied organizational factors, have particularly been associated with a number of safety outcomes (e.g., Griffin & Neal, 2000; Hofmann & Stetzer, 1996; Zohar, 1980). It is not surprising that various consensus management system standards are built on these research findings.

Like BBS management approaches, cultural change approaches to improving workplace safety, based on implementing safety management systems, have also been criticized. For instance, the methodology of culture change as suggested in various safety management systems is not prescriptive and is difficult to implement. Assessing

organizational culture to implement organizational safety culture change is mostly an inferential process; it is difficult to measure organizational safety values, beliefs and attitudes necessary to effect organizational positive safety culture (DeJoy, 2005).

According to DeJoy (2005), these two distinct methods to managing workplace safety – behavior-based and cultural change approaches – have competed for attention during the past decade in the United States. Organizations often adopt one system versus the other (Wachter & Yorio, 2013). However, instead of being lost in the considerable amount of debate surrounding the two approaches, DeJoy stressed that both approaches are largely complementary and could be merged into a unified or integrative safety management approach that harnesses their combined synergy.

This integrative approach to managing workplace safety leads to what Dekker (2002) called the "new view" on human error and human contribution to accidents. As opposed to "the old view," based on Heinrich's (1931) Domino Theory, "the new view" sees human error not as a cause of accidents, but as a symptom of failure (Dekker, 2006; Hoffman & Woods, 2000; Reason, 2000). "The new view" is what has been termed as the "human performance approach" to safety management (DOE, 2009a; Reason, 1990; Scott 1981; Wachter & Yorio, 2014). The human performance approach to organizational cultural change through safety management systems represents a significant movement across the fields of behavior-based or safety management system approaches to workplace safety; it also facilitates the adequate investigation of latent organizational weaknesses (e.g., weaknesses in organizational policies, missions, goals, and programs) which were traditionally hidden under the umbrella of human error interaction with human factors, to cause accidents (DOE, 2009a; Wachter & Yorio, 2014).

DeJoy (2005), who called for the human performance approach to safety management, also called for supportive evidence from intervention effectiveness studies in

order to validate the ultimate values of this integrative approach; however, there is a paucity of occupational safety research that has evaluated the effectiveness of this integrative approach in improving workplace safety, compared to BBS or safety management system research approaches. In one of the few cross-sectional studies investigating the human performance approach to workplace safety management, Wachter and Yorio (2013) found that the "engagement composite" (psychological factor) explained 40% and 32% of the variance in the dependent variables (recordable incidents and lost time incidents) respectively; and safety management systems composite (an aspect of safety culture, an organization factor), explained 20% and 18% of the variance in the dependent variables (recordable incidents and lost time incidents) respectively.

Although these values explain sizeable variance in the safety outcomes of concern, these results indicate that there is still more variability in safety outcomes that needs to be explained. As a result, more studies are needed to understand the antecedents of safety outcomes. Specifically in the field of human performance approach to workplace safety, it is necessary to explore other potential organizational and psychological factors that can explain more of the variance in the safety outcomes beyond the traditional factors that are rooted in safety culture and safety management systems. Although important breakthroughs have been made over the years to improve industrial safety, according to Huang, Lee, McFadden, Rinner, and Robertson (2017) and Klockner (2013), more integrated organizational and psychological approaches to managing workplace safety may yield increasing safety gains.

Respectively, workplace spirituality and mindfulness are organizational and psychological attributes whose organizational usefulness has been explored in several fields of study, but underexplored in safety literature. According to Kabat-Zinn (2000), mindfulness means paying attention in a particular way: on purpose, in the present moment, and non-judgmentally (p. 4). According to Giacalone and Jurkiewicz (2003), "workplace spirituality is

defined as a framework of organizational values evidenced in the culture that promote employees' experience of transcendence through the work process, facilitating their sense of being connected to others in a way that provides feelings of completeness and joy" (p. 397).

Workplace spirituality and mindfulness may factor significantly in the human performance approach to managing workplace safety, whose purpose is to integrate the behavior-based and the organizational safety "culture change" approaches to eliminate precursors of human error that lead to accidents. From an organizational culture perspective, workplace spirituality could be regarded as an aspect of organization culture (Daniel, 2010). As noted by Giacalone and Jurkiewicz (2003), individual spirituality influences decision-making; since workplace spirituality is an integration of individual spiritualities, it could be inferred that it influences organizational decision making. The decisions, usually made by top management, are expressed in the form of organizational missions, goals, policies, procedures, and programs, and enshrined in safety management system and other management systems. These processes have latent organizational weaknesses which could initiate flawed defenses and error precursors within organizations (Reason, 1997).

From a behavioral perspective, when workers join an organization, they bring their personal values and belief systems into the organization; this belief system may or may not match the existing organizational culture, including safety culture, as expressed in the organization's safety management system (DOE, 2009). These imported values might influence their moment-to-moment non-judgmental situational awareness of the aspect of organization culture that they pay attention to. With respect to safety, the workers' open-hearted moment-by-moment attention or mindfulness appears to determine the basic organization's values and assumption about safety practices workers might decide to engage or disengage from (Langer, 1989). In other words, workers would either engage or disengage from safety activities based on aspects of which they are more mindful.

Holistically, according to Maurino, Reason, Johnston, and Lee (1995), irrespective of the efficiency of equipment and the effectiveness of supervisors, workers, engineers, or managers, workers cannot perform better than their supporting organization. Additionally, human error is not only caused by error-prone workers: management incompatibility, leadership practices, organizational weaknesses and values are also contributing factors (DOE, 2009a). Nevertheless, workers are engaged in work activities within these prevailing organizational and psychological contexts that are perfect breeding grounds for human performance issues and resulting events. It is exactly these phenomena that feature workplace spirituality and mindfulness within the context of human performance; these two organizational and psychological latent constructs could influence organizational safety outcomes.

Literature is replete with remarkable and useful research on workplace spirituality and mindfulness in psychiatry, psychotherapy, organizational behavior, and psychology (Daniel, 2010; Davidson et al., 2003; Paul & Saha 2015). However, little is known about the combined implications of these two latent constructs for contexts in which there are occupational safety risks. As a result, there are some key issues that need to be investigated in this research. First, although mindfulness and workplace spirituality have been positively associated with organizational outcomes, such as job performance, organizational commitment, stress management, workplace safety, and low absenteeism (e.g., Bakker & Daniel, 2011; ; Elliot, 2011; Klockner, 2013), organizations need to understand how workplace spirituality and mindfulness relate to safety outcomes, such as accidents and injuries, safety performance, and safety compliance.

Second, deeper understanding of the mechanisms through which workplace spirituality and mindfulness relate to safety outcomes is imperative. Social exchange theory and Reason's (1995 & 2000) accident causation theory offer potentially useful conceptual

frameworks for understanding mechanisms through which workplace spirituality and mindfulness respectively relate to safety outcomes. This includes an engagement process in which workplace spirituality and mindfulness cognitively and emotionally engage workers to influence safety outcomes. Most prevalent models of workplace safety focus on safety workers' motivation, skill and training as mediators of the relationship between safety culture and safety outcomes (e.g. Neal & Griffin, 2004). These models appear incomplete as shown by the less than total variance in safety outcomes explained by the models.

Thus, the overarching goal of this research is to extend the knowledge of the human performance approach to safety management by using appropriate theoretical frameworks to establish how emergent organizational and behavioral factors (workplace spirituality and mindfulness) are related to safety outcomes. Based on research, key assumptions in this framework are that workers' engagement at least partially mediates the relationship between workplace spirituality and safety outcomes, and workers' engagement at least partially mediates the relationship between mindfulness and safety outcomes.

In the following sections, the relationships among workplace spirituality and mindfulness, workers' engagement, and safety outcomes will be discussed. Then, the relationships between workers' engagement and safety outcomes (safety compliance, safety participation, and injury frequency) will be explored. Finally, after exploring bivariate relationships, a framework (model) integrating workplace spirituality and mindfulness through workers' cognitive and emotional engagement to safety outcomes will be investigated.

Theoretical Framework

There are currently no clear, universally agreed-upon theories that provide a useful basis for conceptualizing the link between workplace spirituality and safety outcomes; however, Griffin and Neal (2000 & 2006) conceptualized the link between safety climate and

safety behavior based on theories of work performance (e.g. Campbell, McCloy, Oppler, & Sager, 1993). Because workplace spirituality and safety climate are aspects of organizational culture, the theories of work performance can be extrapolated and used to conceptualize the links between workplace spirituality and safety outcomes. This implies perceived workplace spirituality could be regarded as an antecedent of safety outcomes, and this relationship is posited to be mediated by workers' engagement. To summarize, the perception of positive workplace spirituality and mindfulness might engage workers in activities like adopting safe working practices that lead to positive safety outcomes
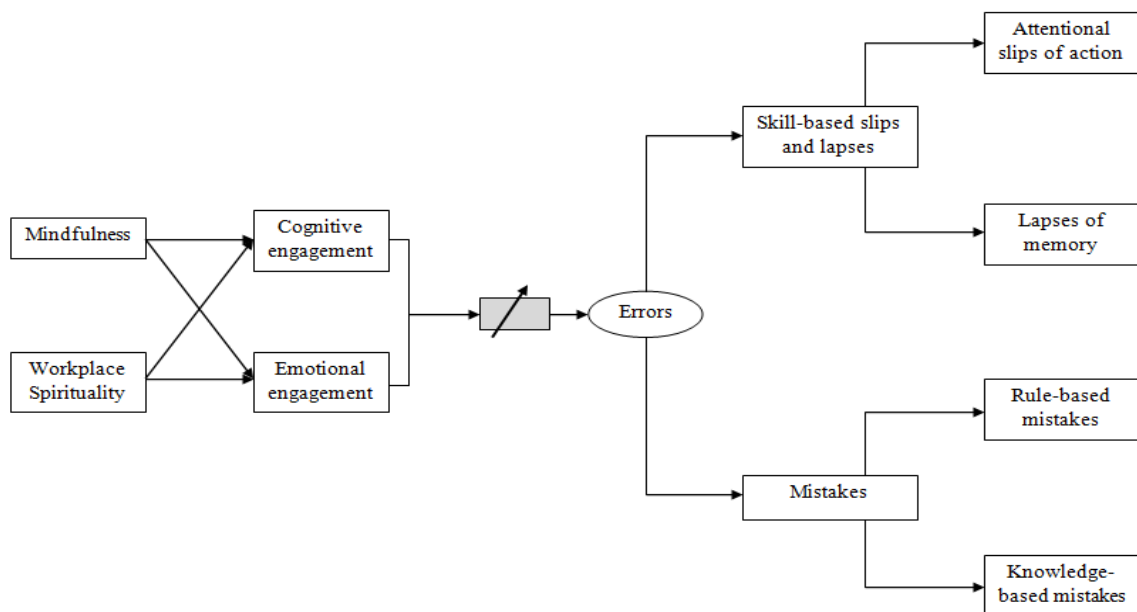
Figure 1. The proposed framework incorporating workplace spirituality, mindfulness, and workers' engagement latent constructs in the summary of the principal error types. Partially adapted with permission from "*Managing the Risks of Organizational Accidents,*" by J. Reason, 2016, p. 72. Copyright 1997 by the Taylor and Francis Group.

There are also some theoretical mechanisms that may explain the positive relationships between workplace spirituality and workers' engagement. These include theories of organizational support, social exchange, expectancy-valence theory and citizenship behavior (Blau, 1964; Vroom, 1964). Organizational support theory, based on perceived organizational support (POS), theorizes that in order to meet employees' needs,

given the organization's propensity to rewarding employees' increased input, employees form general beliefs about how the organization recognizes their input and cares about their general wellbeing (Blau, 1964). This implies employees who are cared for spiritually, emotionally, and socially, and are valued by their organization, will attach to their organization in an effective way and will respond by making the workplace safer for themselves and their organizations.

Similarly, expectancy-valence theory suggests that workers will engage in safety behaviors they believe will lead to positive safety outcomes. The social exchange theory contends employees evaluate the net worth of their relationship with employers by subtracting the costs of such relationship from the rewards the relationship provides (Blau, 1964). Employees expect financial, social and emotional (spiritual workplace) benefits; adherence to good safety practices is costly in terms of time spent working safely. This theory further states that the major driver in interpersonal relationships is the mutual satisfaction of both parties' self-interest; the self-interest should not necessarily be considered bad, but can be used to enhance relationships.

However, Reason's (2016) summary of the principal error types could provide the theory on which to build a human improvement performance framework that incorporates workplace spirituality, mindfulness, workers' engagement and safety outcomes towards improving workplace safety. This framework, as shown in Figure 1, suggests that workplace spirituality emotionally and cognitively engages workers to prevent or recognize unintended and intended actions or errors, mistakes and violations, such as skill-based, knowledge-based and rule-based mistakes, routine and exceptional violations, and acts of sabotage. This framework suggests that the levels of individual and organizational workplace spirituality and mindfulness regulate the levels of unsafe acts and other chains of events that lead to

accidents. This self-regulatory mechanism is symbolically represented with a variable resistor sandwiched between workers' engagement and unsafe acts.

This framework is partially consistent with the theory of perceived organizational support (POS) and citizenship behavior: when workers perceive an organization is interested in their emotional wellbeing, they would reciprocate by engaging in citizenship behaviors that would prevent unintended mistakes, violation and sabotage that often precede accidents. Conversely, when workers perceive the organization is not interested in their emotional needs (e.g., spiritual) wellbeing, the valence of their citizenship behaviors reduces (Blau, 1964; Vroom, 1964). This could manifest in high rates of unsafe acts, violations, mistakes and sabotage, and invariably, accidents.

The framework also suggests that mindfulness cognitively engages workers to prevent or be "mindful" of intended and unintended actions, such as attention slips and memory lapses that manifest as intrusions, omissions, reversals, mis-orderings, mistiming, and forgetfulness. This is to say, mindfulness cognitively and emotionally engages the worker to be attentive and situationally aware of task environment when engaged in intended actions (Lewicki, 2005). It also gives workers the ability to easily switch from one action to the other and frees the memory to concentrate on the present (Brown & Ryan, 2003). This could prevent forgetfulness, attention slips and memory lapses that lead to accidents.
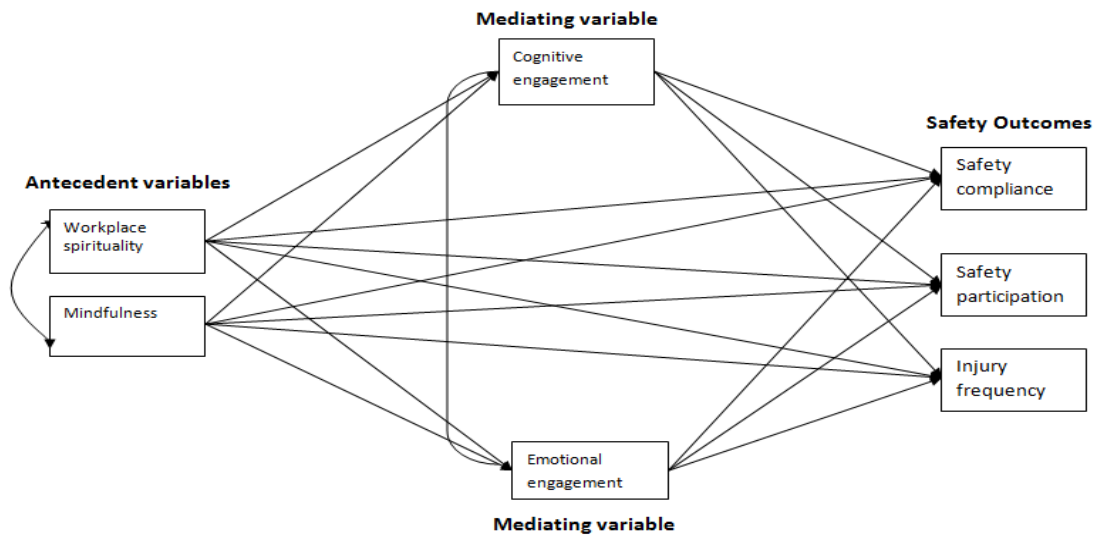
Figure 2. Conceptual framework linking mindfulness, workplace spirituality, workers'
engagement, and safety outcomes latent variables.

Aim of the Study

The overarching aim of this study is to develop a framework (model) (Figure 2) for

linking workplace spirituality, mindfulness, workers' safety engagement, and safety

outcomes. An important specific objective of this research is to determine the impact

workplace spirituality and mindfulness have on safety outcomes, and if the degree and type

of workers' engagement mediate the effects of workplace spirituality and mindfulness on

safety outcomes. This involves using various structural equation modeling (SEM) model-fit

indices to prove the proposed model by testing how well the sample data's variance-

covariance matrix fits the independent generated model-implied variance-covariance matrix.

Specific Study Objectives

The objective of this project is to build a framework model using simultaneous

equation modeling (SEM) that explains the observed variances among antecedents

(exogenous variables, such as mindfulness and workplace spirituality), mediators (such as

cognitive and emotional engagement), and safety outcomes (endogenous variables, such as

safety compliance, safety performance, and accident frequency) (see Figure 2).

In order to accomplish this overall objective, the following objectives must be accomplished:

1. Test the overall fit of the proposed model.

2. Investigate the relationship between workplace spirituality and safety outcomes.

3. Investigate the relationship between mindfulness and safety outcomes.

4. Examine if the relationships between workplace spirituality and safety outcomes are mediated by workers' emotional and cognitive job engagement.

5. Examine if the relationships between mindfulness and safety outcomes are mediated by workers' emotional and cognitive job engagement.

6. Investigate if workplace spirituality correlates with mindfulness.

7. Investigate if workers' cognitive engagement correlates with their emotional engagement.

Research Questions

Q_1:   Is there a statistically significant difference between the sample data's variance-covariance matrix and the generated model-implied variance-covariance matrix?

Q_2:   Is there a statistically significant correlation between mindfulness and workplace spirituality?

Q_3:   Is there a statistically significant correlation between workers' emotional job engagement and cognitive job engagement?

Q_4:   Are there statistically significant relationships between mindfulness and safety outcomes?

Q_5:   Are there statistically significant relationships between workplace spirituality and safety outcomes?

Q_6:   Are the relationships between mindfulness and safety outcomes mediated by workers' cognitive and emotional job engagement?

Q_7:   Are the relationships between workplace spirituality and safety outcomes mediated by workers' cognitive and emotional job engagement?

Hypotheses

The null and the alternative hypotheses are presented as:

HAo: There is no statistically significant difference between the sample data's variance-covariance matrix and the generated model-implied variance-covariance matrix.

HA_1: There is a statistically significant difference between the sample data's variance-covariance matrix and the generated model-implied variance-covariance matrix.

HB_o: There is no statistically significant correlation between mindfulness and workplace spirituality.

HB_1: There is a statistically significant correlation between mindfulness and workplace spirituality.

HC_o: There is no statistically significant correlation between workers' emotional job engagement and cognitive job engagement.

HC_1: There is a statistically significant correlation between workers' emotional job engagement and cognitive job engagement.

HD_o: There are no statistically significant relationships between mindfulness and safety outcomes (safety compliance, safety participation, and injury frequency).

HD_1: There are statistically significant relationships between mindfulness and safety outcomes (safety compliance, safety participation, and injury frequency).

HE_o: There are no statistically significant relationships between workplace spirituality and safety outcomes (safety compliance, safety participation, and injury frequency).

HE_1: There are statistically significant relationships between workplace spirituality and safety outcomes (safety compliance, safety participation, and injury frequency).

HFo: The relationship between mindfulness and safety compliance is not mediated by workers' cognitive job engagement.

HF$_1$:   The relationship between mindfulness and safety compliance is at least partially mediated by workers' cognitive job engagement.

HG$_o$:   The relationship between mindfulness and safety participation is not mediated by workers' cognitive job engagement.

HG$_1$:   The relationship between mindfulness and safety participation is at least partially mediated by workers' cognitive job engagement.

HH$_o$:   The relationship between mindfulness and injury frequency is not mediated by workers' cognitive job engagement.

HH$_1$:   The relationship between mindfulness and injury frequency is at least partially mediated by workers' cognitive job engagement.

HI$_o$:   The relationship between workplace spirituality and safety compliance is not mediated by workers' emotional job engagement.

HI$_1$:   The relationship between workplace spirituality and safety compliance is at least partially mediated by workers' emotional job engagement.

HJ$_o$:   The relationship between workplace spirituality and safety participation is not mediated by workers' emotional job engagement.

HJ$_1$:   The relationship between workplace spirituality and safety participation is at least partially mediated by workers' emotional job engagement.

HK$_o$:   The relationship between workplace spirituality and injury frequency is not mediated by workers' emotional job engagement.

HK$_1$:   The relationship between workplace spirituality and injury frequency is at least partially mediated by workers' emotional job engagement.

HL$_o$:   The relationship between mindfulness and safety compliance is not mediated by workers' emotional job engagement.

HL$_1$:   The relationship between mindfulness and safety compliance is at least partially mediated by workers' emotional job engagement.

HM$_0$:   The relationship between mindfulness and safety participation is not mediated by workers' emotional job engagement.

HM$_1$:   The relationship between mindfulness and safety participation is at least partially mediated by workers' emotional job engagement.

HN$_0$:   The relationship between mindfulness and injury frequency is not mediated by workers' emotional job engagement.

HN$_1$:   The relationship between mindfulness and injury frequency is at least partially mediated by workers' emotional job engagement.

HO$_0$:   The relationship between workplace spirituality and safety compliance is not mediated by workers' cognitive job engagement.

HO$_1$:   The relationship between workplace spirituality and safety compliance is at least partially mediated by workers' cognitive job engagement.

HP$_0$:   The relationship between workplace spirituality and safety participation is not mediated by workers' cognitive job engagement.

HP$_1$:   The relationship between workplace spirituality and safety participation is at least partially mediated by workers' cognitive job engagement.

HQ$_0$:   The relationship between workplace spirituality and injury frequency is not mediated by workers' cognitive job engagement.

HQ$_1$:   The relationship between workplace spirituality and injury frequency is at least partially mediated by workers' cognitive job engagement.

Significance of the Study

Findings of the research will add to the knowledge, understanding and application of workplace spirituality and mindfulness factors by occupational safety practitioners and

researchers to improving human performance in the workplace. This study should be significant in the sense that:

1. It is the first study to link workplace spirituality and mindfulness in tandem to safety outcomes through emotional and cognitive safety engagement of workers; thus, the results would form the basis for further research and re-affirm the importance of workers' emotional and cognitive engagement in affecting safety outcomes.

2. One of the limitations of traditional Behavioral Based Safety (BBS) program is that once the reinforcement is removed, the benefits of the program are lost. This study could provide support for using mindfulness meditation as a way of sustaining BBS in the absence of reinforcement.

3. It will allow the identification of the concept and framework of human performance improvement that takes into account workers' spirituality and mindfulness.

4. It will generate greater awareness among safety practitioners, researchers and academicians on the importance of workplace spirituality and mindfulness as vehicles to improving human performance towards ensuring workplace safety.

5. It will guide management in effective allocation of competing resources when faced with the choice among competing safety and human performance improvement programs: mindfulness-based human performance improvement programs versus organizational-based human performance improvement programs.

Justification of the Study

The exploration of the potential usefulness of mindfulness and workplace spirituality towards ensuring workplace safety is highly overdue and therefore, requires attention from occupational safety researchers and academicians. For more than three decades, these latent constructs have been usefully recognized in the fields of organizational management, psychology, and psychotherapy; however, there is little or no knowledge of the mechanisms

through which these constructs could be useful in improving human performance towards workplace safety. Occupational safety research has consistently and predominantly centered on safety culture, safety climate, safety management systems, human factors and their moderating or mediating motivational factors; sometimes with predictable and repeatable results. As a result, the response to the call for safety researchers and academicians to expand their research horizon, follow the steps of researchers in other fields of study, and explore the usefulness of workplace spirituality and mindfulness in achieving positive safety outcomes is overdue.

Assumptions of the Study

The researcher assumes the following:

1. The instrument used in this study accurately measured the latent constructs under study.

2. The respondents provided truthful answers to the survey items.

3. With a 10-point Likert scale, respondents were given many response options.

Delimitations of the Study

This study was delimited to:

1. Workers in Niger Delta region of Nigeria.

2. Shop-floor workers or workers at the "sharp edge."

3. Workers who had worked in the company for at least one year.

4. Workers who were at least 18 years old.

Limitations of the Study

The study was limited to:

1. The use of self-reported data on the number of injuries suffered for the past one year; it is possible that respondents might not remember all the injuries suffered.

2. The use of self-reported measures (e.g., perceptual measures) to assess all dimensions of the latent variables: estimates of the relationships among the variables may be susceptible to same-source, same-method bias. Therefore, objective measurement of the endogenous and exogenous variables is necessary to validate the hypothesized relationships.

3. Conducting the cross-sectional study within a limited time-frame. It was not possible to empirically validate the relationships proposed in this framework over an extended time period, such as performing a longitudinal study that would provide further validation of the proposed relationships.

4. Structural equation modeling being correlation and variance based; therefore, its use as a method of analyses cannot provide evidence of cause-and-effect relationships.

Definitions of Terms

Mindfulness: According to Kabat-Zinn (2000), mindfulness is "paying attention in a particular way; on purpose, in the present moment, and non- judgmentally" (p. 4).

Workplace spirituality: According to Giacalone and Jurkiewicz (2003), "a framework of organizational values evidenced in the culture that promote employees' experience of transcendence through the work process, facilitating their sense of being connected to others in a way that provides feelings of completeness and joy" (p. 397).

Cognitive engagement: This is the act of being vigilant, focused, and attentive to one's job (Kahn, 1990).

Emotional engagement: This is the act of being emotionally connected to one's work, to the organization, and to others in the service of their work (Kahn, 1990).

Workers' engagement: A worker is said to be engaged when the worker is physically involved in tasks, is cognitively vigilant, attentive and focused; and is emotionally connected with the organization and others in the conduct of their work (Kahn, 1990).

Safety outcomes: Safety outcomes could be defined as the long-term results of engaging in safe or unsafe behavior.

Summary

The historical, theoretical, conceptual, and contextual background of this research has been presented. The statement of the problem has also been described, detailing the ideal situation among the study variables, the actual situation prevailing in this research area, the evidence, intensity, and magnitude of the existing problem, implications of the current situation, and what needs to be done. The overall aim of the study has been presented in terms of what the study intends to achieve, followed by the study's disaggregated objectives. At the end, the proposed solutions to the identified research problems were also hypothesized, followed by the study assumptions, limitations, and delimitations of the study.

The next chapter presents a review of applicable literature, which establishes the background and the knowledge gaps this dissertation attempts to bridge.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

The purpose of this research is to improve workplace safety through improving human performance by developing and using a framework that links workplace spirituality, mindfulness, workers' engagement, and safety outcomes.

This chapter involves a systematic identification and critical evaluation of literature that is related to the research problem and needed to develop a thorough understanding and insight into related works. The literature review was conducted by examining the problems and current knowledge pertaining to each of the constructs: workplace spirituality, mindfulness, workers' engagement, and safety outcomes. Afterwards, different literature relating to the individual constructs was synthesized under sub-headings corresponding to the disaggregated study's objectives. The literature review was critically and analytically conducted by pointing out the knowledge gaps and grouping similar works together.

For the researcher to ensure the research is original and new to the profession, and to get information from direct sources, multiple databases were searched in the literature review process. These include ProQuest, EBSCOhost/Academic Search Complete, Google Scholar, and Indiana University library Web Access.

Human Performance Improvement Frameworks

In its simplest form, DOE (2009a) defines human performance as a series of behaviors (observable acts that can be heard or seen) carried out to accomplish specific objectives or results. Wachter and Yorio (2013) expanded this definition by stating that human performance encompasses the way workers, the organization, the work environment, and the management systems (e.g. programs and processes) work in synergy as a system to accomplish specific organizational objectives or results. This later definition is more

encompassing because it recognizes the fact that human performance and tools for its improvement should not only be worker-centric but should embody the worker and the organization, including management.

Since a series of behaviors carried out to accomplish specific objectives is the focal issue here, human performance improvement measures should be multifocal: they should modify the behaviors of management towards recognizing and managing latent organizational weaknesses as well as that of the front-line workers towards recognizing potential active errors. Human performance improvement philosophy centers on controlling the oral, written, and personal activities of workers, managers, engineers and other technical staff in order to reduce human error, potentially resulting in workplace incidents (DOE, 2009a).
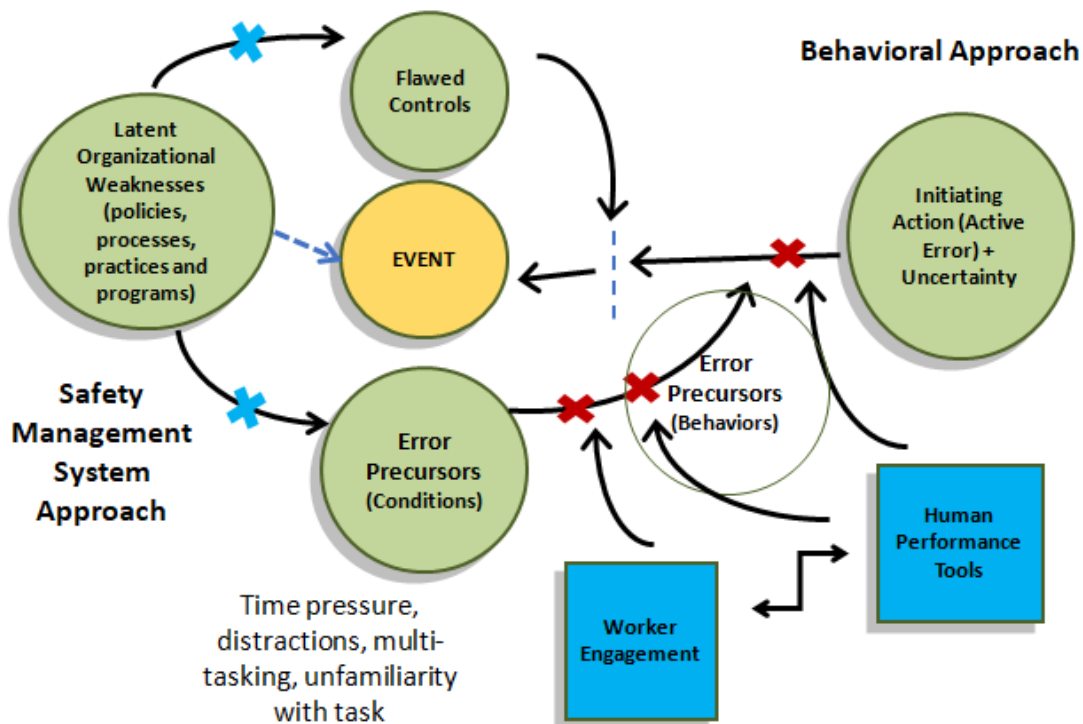
Figure 3. Framework for understanding and controlling an event from a human performance perspective. Copied with permission from "*Lecture Notes for Hazard Prevention Management II,*" by J. K. Wachter, 2017. Indiana University of Pennsylvania, Indiana, PA.

Figure 3 shows a typical framework for understanding and controlling an event from a human performance perspective (Wachter, 2017). It indicates that latent organizational weaknesses inherent in organization's missions, goals, policies, processes, procedures, and programs are always reflected in organization's safety management systems. These latent weaknesses can create error precursors which synergistically act with workers' personal visions, beliefs, and values (active errors) in the presence of flawed controls to initiate events. In other words, events are caused by the interactions of the workers, the workplace environment (where error precursors are evidenced), and the organization. This framework further shows that although the latent organizational weaknesses can weakly initiate an event, workers' engagement and human performance tools are needed to prevent error precursors' behaviors and active error that initiate events.

Reason (2009) generically defines human error as those occasions in which planned actions failed to achieve their desired ends, and when these events are not attributable to some unforeseeable event. Human error is caused by a mismatch between error-prone workers, unfavorable work environments, inappropriate management practices and organizational weaknesses (Wachter & Yorio, 2013b) which is fueled by the presence of error precursors. Wachter and Yorio describe error precursors as unfavorable conditions that interfere with successful performance and increase the probability for error when conducting specific actions. They further reiterate that error precursors are intelligible to workers; they can be observed and corrected; when they are corrected, chances of error are reduced.

Reason (2016) identifies latent organizational weaknesses as hidden deficiencies in management control processes (e.g., strategies, policies, work control, training, and resource allocation) or values (shared beliefs, attitudes, norms, and assumptions) that create workplace conditions that can provoke errors (precursors) and degrade the integrity of controls (flawed controls). Error precursors could include having workers performing at a fast pace or in a

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distracting environment. DOE (2009a) further asserts that system-level weaknesses are also latent organizational weaknesses potentially in the areas of procedure development and review, engineering design and approval, contracts, procurement and inspection receipt inspection, training and qualification system(s), and so on.

On the other hand, there is the fallible front-line worker with all the physical, social, biological, mental, spiritual, and emotional characteristics that define human attitude, aptitude, tendencies, abilities, and limitations (Reason, 1990). The front-line worker is always at the "sharp" edge where active errors occur as a result of latent organizational weaknesses in safety management system touching fallible workers (Reason, 1990).

Having recognized that events are caused by the totality of the workers and the organization, DOE (2009b) suggests some human performance tools for use by individuals, work teams, and management. The human performance tools for individuals are worker-centric and many of them are classified as "situational awareness" tools (Wachter & Yorio, 2013). These are tools that give workers accurate knowledge and understanding of the job requirements, work environment, and equipment needed before making decisions; they improve workers' ability to detect unsafe conditions that they would normally not foresee. These individual tools include task review, job site review, questioning attitude, stopping when unsure, self-checking, procedure use and adherence, validation of assumptions, signature, effective communication, place-keeping, and do not disturb signs. According to DOE (2009b), when these tools are used conscientiously, they give workers more time to think about the task at hand and promote the state of mindful uneasiness as workers approach their tasks.

While these tools are geared towards helping workers maintain positive control of a work situation, other tools designed for use by managers and supervisors help identify latent organizational weaknesses that create error precursors or degrade defenses integrity (flawed

defenses), which are suggested by DOE (2009b). These tools include benchmarking, observations, self-assessments, performance indicators, independent oversight, work product review, investigating events triggered by human error, operating experience, change management, reporting errors and near-misses, and employee survey. However, DOE points out that latent conditions are frequently difficult to identify, and they systematically accumulate in the system. These latent organizational weaknesses lie dormant until uncovered typically during incident investigations (Wachter & Yorio, 2013).

Since the development of the human performance system model for human error and its tools, very little is known on the relative application and prevalence of human performance improvement tools for reducing active errors and uncovering latent organizational weaknesses. However, Wachter and Yorio (2013) canvassed several high performing organizations in terms of the human performance tools they had used to reduce human error and improve safety performance successfully. They subjectively identified ten top human performance tools in high performing organizations. Most of the tools, like DOE's (2009b) human performance improvement tools for workers, were also worker-centric and were designed to make workers more situationally aware or mindful of their work environment, error traps inherent in the tasks being performed, and safety in general.

Wachter and Yorio's (2013) article posits that because workers cannot rely solely on management systems to manage error precursors, let alone the latent organizational weaknesses that potentially lead to these error precursors, workers should be on the defensive; that is, they should adopt their own personal defenses against active errors and 'shrapnel' of latent organizational weaknesses by using human performance tools that promote workers' engagement. Furthermore, another practical reason for placing the worker at the center of human performance improvement is that safety management systems are always flawed during their development and implementation. As a result, engaged and

mindful workers are in the best position to identify conditions and precursors that could lead to errors; therefore, they should be armed with situational awareness tools and should be mindful of their own vulnerabilities and limitations, as well as those of the organization.

Human performance improvement literature is beginning to recognize and conceptualize the workplace as an interconnected community where workers simultaneously engage their hands, heads, and minds simultaneously in meaningful work, with a sense of joy in improving safety outcomes and human performance. Over the years, workplace spirituality and mindfulness have been separately researched in different academic fields. In fact, there is increasing recognition that workers work not only with their "hands" and "head," but also with their "hearts" and "mind" (spirit), and a workplace should be a community where workers express their "whole person" (mind, head, heart and hands), not just the "head" and the "hands" (see Ashmos & Duchon 2000; Krahnke, Giacalone, & Jurkiewicz 2003; Neal 1997; Petchsawang & Duchon, 2009; Wachter & Yorio, 2013a).

In addition to the paucity of research that has investigated the separate relationships between workplace spirituality and safety outcomes, and mindfulness and safety outcomes, there has equally been no research investigating how workplace spirituality and mindfulness, in tandem, could synergistically influence safety outcomes and improve human performance. Investigating these constructs in tandem is a very important aspect of the research being conducted. In addition to revealing the plausibility of the proposed model, the research will also reveal the relative importance of these organizational and psychological constructs towards human performance improvement. This is managerially important, as the result could guide management in effective allocation of competing resources when faced with the choice of choosing among competing safety and human performance improvement programs.

Therefore, this research builds on the work of Wachter & Yorio (2013a) by investigating how workplace spirituality and mindfulness could be used to synergistically

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achieve positive safety outcomes and improve human performance through cognitive and emotional engagement of workers, thereby opening new frontiers for future research.

Workplace Spirituality

"People work with their hands, but also with their heart (spirit). It is when people work with their hearts or spirits that they find meaning and purpose, a kind of fulfillment that means the workplace can be a place where people can express their whole or entire selves and be fulfilled" (Petchsawanga & Duchon, 2009, p. 459).

Despite the controversies surrounding workplace spirituality as an organizational factor, research based on interchangeable concepts such as workplace spirituality, spirituality in the workplace, spirit goes to work, spirituality at work, or spirit at work, has increased tremendously in the past two decades. For instance, according to Oswick (2009), there are over 55 published books and over 192 journal articles on workplace spirituality. Many reasons for this astronomical increase in workplace spirituality-based research have been put forward: the desire by workers for experiencing increasingly spirituality at work and in daily life (Krishnakumar & Neck, 2002); the desire to merge individual and professional values (Block, 1993); and the desire for job security (Anderson, 2000).

Operational Definition of Workplace Spirituality

Despite the astronomical increase in workplace spirituality-based research, a perusal of workplace spirituality literature shows a lack of general consensus on the definition of this latent construct. For instance, Karakas (2009) identifies 70 distinct definitions of workplace spirituality. Although critics say that this lack of consensus tends to indicate that workplace spirituality is a field that has yet to attain a minimum level required for scholastic inter-subjective certification, this might not be totally true. For instance, even in the well-developed field of risk management, some terms such as risk assessment, risk analysis, and risk evaluation are sometimes used interchangeably, with conflicting definitions. Despite

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these conflicting definitions of key risk management terms, research in risk management has not been deterred; the same should equally apply to research involving workplace spirituality.

Based on the different definitions of workplace spirituality, two broad schools of thought tend to emerge: one believes that workplace spirituality transcends religion (e.g., Brandt, 1996; Harlos, 2000; King, 2007; Laabs, 1995), and another believes that believes that spirituality and religion are inseparable (e.g., Hicks, 2002; McDonald, 2000). However, a majority of researchers that posit that spirituality transcends religion appear to come from the Western world, while researchers that believe spirituality and religion are inseparable are mainly from the Eastern world. One plausible explanation for this cultural difference is that the U.S. emphasizes the separation of personal spirituality from work, which could be due to American's political insistence on the separation of church and state (Kent-Rhodes, 2006). Kent-Rhodes further states that this separation of personal spirituality from work stands in complete contrast to cultures in which individuals' daily lives are inseparable from religious traditions.

Notwithstanding the diverse definitions of workplace spirituality, two definitions appear to be gaining dominance. The first is Giacalone and Jurkiewicz's (2003, p.397) definition of workplace spirituality as a framework of organizational values, evidenced in the culture that promotes employees' experience of transcendence through the work process, facilitating their sense of being connected to others in a way that provides feelings of completeness and joy. The second definition of workplace spirituality by Ashmos and Duchon (2000) defines workplace spirituality as the recognition that workers have an inner life that within the context of a community is nourished by meaningful work that takes place there. Van Der Walt and De Klerk (2001), however, combined the two definitions above and defined workplace spirituality as the spiritual nature of an organization depicted by spiritual organizational values that facilitate employees' experience, sense of connectedness and

feeling of completeness and fulfillment, cognizant of an inner life that nourishes and is

nourished by meaningful work.

Dimensions of Workplace Spirituality

The different definitions of workplace spirituality have much wider implications when

it comes to operationalizing workplace spirituality as a latent construct. For instance, scholars

who insist that religion is separate from workplace spirituality usually factor-out religiosity or

sacredness as a component of workplace spirituality (e.g., Brandt, 1996; Harlos, 2000; King,

2007; Laabs, 1995). Researchers who posit that workplace spirituality and religion are

inseparable regard religious behavior and practice as a dimension of workplace spirituality

(e.g., Greenwald & Harder, 2003; Hicks, 2002; McDonald, 2000). For instance, proponents

of the inseparability of religion and workplace spirituality, Greenwald and Harder (2003)

empirically identified religiosity as one of the factors of workplace spirituality. This divide

definitely affects the content validity of any instrument developed for workplace spirituality

because the instrument's content validity depends on where experts who validated the

instrument stand on the debate of religion as a component of workplace spirituality or not.

Following the controversies surrounding the definitions of workplace spirituality,

various instruments (scales) have been developed to operationalize workplace spirituality; the

scales are as plentiful as the definitions of the construct itself. For instance, in a literature

review, Miller and Ewest (2011) identify up to 16 scales available to measure spirituality.

These scales include among others: Spiritual Well-Being Scale (SWBS) (Ellison, 1983),

Human Spirituality Scale (HSS) (Wheat, 1991), Organizational Spirituality Value Scale

(OSVS) (Kolodinsky, Giacalone, Jurkiewwicz, 2008), Spirit at Work Scale (SWS) (Kinjerski

& Skrypnek, 2006), and Spirituality at Work (SAW) (Ashmos & Duchon, 2000). Using these

scales, researchers have identified numerous factors of workplace spirituality: the inner life,

transcendence, holiness, meaningful life, sense of joy, meaningful work, sense of community,

religiosity, spiritual connection, interconnectedness, wellbeing, purposeful work, connection, compassion, benevolence, integrity, humanism, trust, respect, and virtue, among others.

Although these workplace spirituality dimensions seem to be endless, some dimensions measure and describe the same attributes; they only differ by the names researchers decided to give them after they had been extracted as factors using exploratory factor analysis (EFA). For instance, sense of community describes the same attribute as interconnectedness. This noticeable characteristic of workplace spirituality and its dimensions is best described by Petchsawange and Duchon (2009), who conclude that workplace spirituality is a multi-dimensional construct which has each dimension or factor connected to other dimensions, and cannot be seen in isolation.

Following the obvious disagreement by researchers on an acceptable definition of workplace spirituality and its dimensions, critics have different assumptions about workplace spirituality: a new age mantra, a fresh wave in the faith blanket, a novel buzzword to rally corporate troops, essentially denominational polemics, dogmatic, proselytizing, last corporate taboo, or ethereal machinations (Krahnke, Giacalone, & Jurkiewicz, 2003, McDonald, 1999). These controversies surrounding the operationalization of workplace spirituality are not necessarily peculiar outliers in organizational and behavioral research: other related organizational factors have had their definitional and operationalization issues at their various stages of conception as latent constructs. Safety culture, for instance, still has no generally acceptable definition and dimensions. It has been transformed to a general term for anything related to organizational, social, and psychological factors (Cox & Cox, 1996) with potential risk of becoming meaningless and useless in practice due to its broad application (Cox & Flin, 1998). This notwithstanding, the study of safety climate has been used to understand and solve many organizational occupational safety problems.

The same should also be applicable to the developing discipline of workplace spirituality. Despite the several assumptions about this discipline, a litany of best-selling books in this area of inquiry (e.g., Bolman & Deal, 1995; Greenleaf, 1997) is an evidence of general interest in workplace spirituality. Based on the popularity of the subject, Krahnke et al. (2003) suggest that workplace spirituality as a new area of research should be moved towards a more reasoned level where the Western objective/analytical paradigm and the Eastern subjective/interpretive paradigm can be integrated for a comprehensive worldview.

This notwithstanding, Moore (2008) asserts that self-work immersion, interconnectedness, and meaning from work have gained some level of acceptance as the three main dimensions of workplace spirituality. On the other hand, Petchsawanga and Duchon (2009), in a review of literature found that connection, compassion, mindfulness, meaningful work and transcendence are five themes that frequently surface as components of workplace spirituality. However, after they carried out a confirmatory factor analysis (CFA) on the five dimensions in a different culture, based on the Spirituality at Work (SAW) scale developed by Ashmos and Duchon (2000), "connection" as a dimension was eliminated as a component of workplace spirituality because of weak factor loading or overall poor fit. Although Ashmos and Duchon identify mindfulness as a component of workplace spirituality, Krahnke and Giacalone (2003) assert that mindfulness is not synonymous to workplace spirituality. This proposed study where workplace spirituality and mindfulness are covaried as separate constructs could throw more light on this debate.

The workplace spirituality dimensions for this study shall be adapted from the dimensions developed by Ashmos and Duchon (2000). The preference for the use of these dimensions is that the scales operationalize workplace spirituality to reflect individual, work group, and organization-wide expression of workplace spirituality. These three factors seem to encompass the three areas in which workers can express workplace spirituality: as an

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individual, within the worker's work unit or department, and within the organization as a whole (Ashmos & Duchon, 2000).

Mindfulness

The term "mindfulness" was coined from the Pali word "sati," meaning to have awareness, to be attentive, and to remember (Bodhi, 2000). Historically, mindfulness has been linked to the teachings of ancient Buddhist traditional systems developed in an attempt to ease pain and cessation of suffering of the masses (Bishop et al., 2004; Nnamoli & Bodhi, 1995; Silanada, 1990;). It is the "heart" of Buddhist meditation (Thera, 1962). According to these teachings, achieving mindfulness through meditation by focusing one's attention non-judgmentally helps to alleviate pain and develop a sense of community through empathy (Hanh, 1976; Ludwig & Kabat-Zinn, 2008).

The above definitions and descriptions of mindfulness place mindfulness within the context of traditional Buddhist meditation. However, treatments of mindfulness recognize that it is a concept that can be operationalized outside the orthodox Buddhist tradition of meditation (Elliot, 2011; Langer & Moldoveanu, 2000). Spearheaded by the work of Langer et al (1979), mindfulness was developed within the Western context of attention and situational awareness.

Following the development of western context of mindfulness, different definitions of mindfulness have been proffered. According to Martin (1997), mindfulness as a state of psychological freedom is attainable when attention remains unaligned to any particular point of view. Germer, Siegel, and Fulton (2005) simply define mindfulness as moment-by-moment awareness, and Bishop et al. (2004) define mindfulness as responding skillfully to mental processes that contribute to emotional distress. However, the most popular definition of mindfulness defines it "as the moment-by-moment awareness of one's experience without judgment" (Kabat-Zinn, 1994, p. 4).

In the last 30 years, mindfulness has garnered considerable attention for wider communities of psychologists and clinicians; however, the field of mindfulness as a construct has proceeded without an operational definition (Bishop, 2002). In this regard, a series of meetings were held to answer the fundamental questions concerning the specificity and operational definitions of mindfulness. At an international meeting of psychologists in 2003, a two-component model of mindfulness was developed: the first component involves self-regulation of attention, and the second aspect involves adopting a particular orientation towards one's experiences in the present moment (Bishop et al., 2004). The maintenance of self-regulation of attention on immediate experience allows for increased recognition of mental events in the present moment; acceptance, curiosity, and openness characterize the orientation adopted towards one's experiences in the present moment (Bishop, et al., 2004).

Thus, the outcomes of the international meeting of psychologists, in 2003, for the first time, appear to internationally position mindfulness as a concept that sits outside the common Buddhist understanding of mindfulness as meditation. This development ushered in the era of recognizing mindfulness as a human state of environmental situational awareness of the immediate happenings in the present, and the recognition of mindful workers as those that are attentive to the present changes in their environment (Lewicki, 2005; Shapiro, Carlson, Astin & Freedman, 2006).

The Process of Mindfulness

Based on the operational definition of mindfulness, Bishop et al. (2004) contend that the process of mindfulness begins by using regulation of the focus of attention to bring awareness to current experience; the bringing of awareness is accomplished by constantly observing and attending to the changing field of thoughts, feelings, and sensations from moment to moment. According to Schneider and Shiffrin (1977), attention needed to bring awareness to current experience has limited capacity; however, when attention is released

from elaborate thinking due to stimulus selection, more cognitive resources are freed to concentrate on processing information related to the current situational experience (Bishop et al, 2004). When this state of mindfulness is attained, it leads to being fully alert and situationally aware of what is happening in the moment.

Mindfulness is cultivated when there is sustained attention. However, sustained attention, as an ability to maintain a state of alertness and focus for a very long time, is learned and not acquired (Parasuraman, 1998). Sustained attention works together with switching, which is the ability to momentarily, alertly and attentionally shift focus from one object to the other (Posner, 1980). Switching, as an aspect of mindfulness, is also a skill. In essence, the abilities to sustain attention and alertly shift focus when needed are the essential ingredients of mindfulness. Because mindfulness involves self-regulation of attention, through the processes of selective attention, sustained attention, switching of attention, inhibition of elaborative thinking, and freeing of attention, it can be considered a meta-cognitive skill (Bishop et al, 2004). Metacognition is cognition about one's cognition, and it consists of two parts that work in a loop: monitoring and control (Flavel, 1979; Schraw & Moshman, 1995).

The other aspect of mindfulness is a practical orientation to experience that is cultivated during mindfulness meditation. This orientation to experience begins when one makes a commitment to maintain a non-judgmental curious attitude wherever the mind wanders, as well as maintaining the same non-judgmental curious attitude to different moment-by moment objects that come into one's experience (Bishop et al, 2004). By taking a non-judgmental stance towards all sensations, thoughts, and feelings that momentarily arise in one's stream of consciousness, all thoughts are initially seen as relevant and acceptable.

By assuming this stance of relating openly with one's moment-by-moment experience, one consciously and decisively abandons one's self-will and has a different

experience by welcoming streams of thoughts, feelings and consciousness that momentarily

arise (Hayes, Strosahl & Wilson, 1999). Bishop et al. (2004) call this acceptance stance an

active process where one chooses to take what is momentarily offered with an attitude of

submission, openness, and receptivity.

Adopting a stance of curiosity and acceptance appears to be the ultimate goal of

mindfulness trainings. The practice of mindfulness by adopting a stance of curiosity and

acceptance has been associated with increased dispositional openness, freeing of attention by

the reductions in the use of cognitive and emotional behavioral strategies to avoid aspects of

experiences, and changes in psychological contexts in which unpleasant experiences,

thoughts, and feelings are perceived (Coster & McCrae, 1987; Hayes, Strosahl & Wilson,

1999). This implies unpleasant experiences would be less threatening since openness to

thoughts, feelings, and sensations of the unpleasant experiences would change their

subjective meanings.

Applications of Mindfulness

Mindfulness as a latent construct has been variously explored in the fields of business,

education and health care. Although there is a paucity of studies that link mindfulness to

safety outcomes, business literature attributes the successes of high-reliability organizations

to mindfulness (Weick & Sutcliffe, 2007). High reliability organizations are high-risk

organizations that have internalized human performance improvement tools towards

improving their safety records through the reduction of human errors that lead to events.

According to Vogus & Sutcliffe (2007), mindfulness as an individual attribute is

organizationally leadership-driven. Klockner (2013) also examined the role of mindfulness in

workplace safety or safety behavior (safety compliance). The findings show a positive

relationship between mindfulness and safety compliance.

The field of healthcare, specifically neuro-psychiatry, is one field where mindfulness-based interventions have been greatly explored. Although mindfulness is an ancient Buddhist traditional teaching, in the western cultures, Kabat-Zinn et al. (1992) explored the use of a mindfulness-based stress reduction program as a clinical intervention measure for patients with anxiety disorder. They found that mindfulness-based stress reduction yielded a clinical, significant improvement in panic attacks, anxiety and depression in patients with these symptoms. Mindfulness also improves immunity function (Davidson et al., 2003) and reduces depression and suicidal risks (Sipe & Eisendrath, 2012).

Relationship of Workplace Spirituality and Mindfulness

Little is known about the relationship between workplace spirituality and mindfulness; however, lack of workplace spirituality could lead to mindlessness and disengagement. If workplace spirituality has been positively associated with employees' commitment, psychological adjustment, ethical decisions, job satisfaction and coping with stress, among others (e.g. Bodia & Ali, 2011; Usman, 2010), it implies that lack of workplace spirituality could be associated with psychological maladjustment, unethical decision making, low morale, and inability to cope with stress.

Under these prevailing stressful and psychological maladjustment conditions, workers' attention to their work could diminish, and concentration becomes unsustainable. Second, the use of cognitive and emotional behavioral strategies to avoid aspects of experiences and changes in psychological contexts in which unpleasant experiences, thoughts, and feelings are perceived may become difficult. Moreover, with many thoughts battling for attention, switching of thoughts needed to make safe decisions from various competing alternative actions becomes difficult. This mindless state could lead to the situations where unpleasant experiences are experienced as more threatening, since lack of

openness to thoughts, feelings, and sensations of the unpleasant experiences would change the subjective meanings of these experiences.

Empirically, the connection between workplace spirituality and mindfulness could be established by examining the relationship between cognitive engagement and emotional engagement. For instance Wachter and Yorio (2014) found that the presence of workers' emotional and cognitive engagement constructs can be used to predict safety outcomes; these constructs mediate the relationship between some safety management practices and safety outcomes. In addition, they determined that there was a strong correlation between workers' perceptions of emotional engagement and workers' perception of cognitive engagement.

However, cognitive job engagement reflects active focus, attention and concentration on successful execution of job, while emotional job engagement reflects eagerness and interest in one's job and organization (Wachter & Yorio, 2014). These attributes of cognitive engagement and emotional engagement reflect the dimensions of mindfulness and workplace spirituality respectively. This positive relationship between mindfulness and workplace spirituality is further buttressed by Ashmos & Duchon's (2000) findings that mindfulness is a component of workplace spirituality. In other words, there appears to be a direct relationship between workplace spirituality and mindfulness. Based on these premises, it is hypothesized that:

HB_1:   *There is a statistically significant correlation between mindfulness and workplace spirituality*.

Safety Outcomes

Safety outcomes can be defined as the long-term results of engaging in safe or unsafe behavior. In safety research, safety outcomes, safety behaviors and safety performance are often used interchangeably.

Following the traditional accident causation theory that workers are the cause of industrial accidents, lagging indicators such as lost time incident rate (LTIR), number of fatalities or injuries, lost labor time, and number of occupational illnesses, are traditionally used to measure safety outcomes, safety behaviors or safety performance. However, such traditional measures of safety outcomes have been variously criticized: the reliability of these incident rates as safety outcomes has been questioned (e.g., Hopkins, 1995). Guo and Yiu (2015) have pointed out that the reactive nature of such measures means they cannot provide proactive signals of future accidents; the collection of lagging safety data is time and cost consuming which makes them difficult and unattractive as measures of safety outcomes (Zohar, 2000); they are mostly personal measures that provide very little or no picture of overall organizational safety performance (Tamin, Laboureur, Mentzer, Hasan & Mannan, 2017); and reportable accidents and sickness have relatively low chances of occurring (Seo, Lee, Kim & Jee, 2014), resulting in a heterogeneous and skewed distribution with respect to time. These characteristics might make using accident data difficult due to the potential violation of several statistical tests necessary to use them for parametric analysis.

Following these limitations of lagging indicators as representatives of safety outcomes was the emergence of safety leading indicators (safety behavior or safety performance) as measures of safety outcomes. The use of safety behavior or safety performance as a measure of safety outcomes was popularized by Neal and Griffin's (2000) research, where they coined the terms "safety compliance" and "safety participation" as the two components of safety behavior or safety performance, based on work performance theories proposed by Borman and Motowidlo (1993). Griffin and Neal (2000) describe safety compliance as the core safety activities individuals need to carry out in order to maintain workplace safety. An example of safety compliance behavior includes performing flammable gas testing in a potentially explosive environment before carrying out any hot work activity. Safety participation is used

to describe participating voluntarily in safety activities that do not directly contribute to workplace safety but fosters an enabling environment that supports safety (Griffin & Neal, 2000). An example of safety participation behavior is attending safety committee meetings.

Following this paradigm shift in operationalizing the safety outcome criterion variable by Neal and Griffin's (2000), safety literature has widely reported the use of safety compliance and safety participation as safety outcome criteria (e.g., Neal & Griffin, 2006; Parker, Axtell & Turner, 2001; Vinodkumar & Bhasi, 2010). Likewise, Huang, Lee, McFadden, Rineer and Robertson (2017) focus on safety behavior as a safety outcome of safety climate. On the other hand, Li, Jiang, Yao and Li (2013) postulate that safety compliance mediates the relationship between job demands and safety outcomes (self-reported injuries and near-misses); they equally regard safety compliance as a category of workers' engagement. In other words, in this particular case, safety compliance is regarded as a predictor of safety outcomes.

In what appears to be a twist, in Nahrgang, Morgeson, and Hofmann's (2010) meta-analysis, workers' engagement is operationalized as safety compliance and safety participation, while accidents and injuries, adverse events, and unsafe behavior are identified as safety outcomes. This implies in this particular case that workers' engagement, operationalized as safety performance and safety compliance, could also be regarded as a determinant of other safety outcomes. Conversely, the degrees to which workers are engaged in safety activities determine safety outcomes.

However, a meta-analysis by Christian, Bradley, Wallace and Burke (2009) found that safety behavior (safety performance) mediates the relationships of safety climate and other safety outcomes. This is to say that one safety outcome can lead to other safety outcomes. This tends to justify Nahrganag's et al.'s (2010) model of work safety, which purports that

safety performance (safety compliance and safety participation) predicts other safety outcomes, such as accidents and injuries, adverse events and unsafe behavior.

The choice of using safety performance, accidents, injuries, adverse events or unsafe behavior as the terminal safety outcome depends on which of them is a more proximal outcome of the immediate construct under observation (Huang et al., 2017). As a result, Christian et al.'s (2009) meta-analysis targeted safety behavior (safety compliance and safety participation) as the safety outcome because it is a more proximal safety outcome of safety climate than other safety outcomes (Huang et al., 2017). Furthermore, irrespective of the classification of leading and lagging metrics as safety outcomes, Tamin et al (2017) point out that the interface between the two is still fuzzy: a safety event can serve as both a leading and lagging performance indicator. Since this research is descriptive in nature, it will use both proximal and distal outcomes of workplace spirituality and mindfulness; that is, safety compliance, safety participation and injury frequency are safety outcomes.

Relationship of Workplace Spirituality to Safety Outcomes

In occupational safety research, little is known on the link between workplace spirituality and safety outcomes. However, there are a number of theoretical frameworks that can be used to establish the links between workplace spirituality and safety outcomes. In organizational sciences, the social exchange theoretical mechanism has been used to investigate relationships among organizational group members, individuals and their leaders, and individuals and their organizations (e.g., Eiseberger, Fasolo, & Davis-LaMastro, 1990; Liden, Wayne, & Stilwell, 1997; Tsui, Pearce, Porter, & Tripoli, 1997). These studies establish that in organizations where employees perceive that their organizations are interested in their well-being, employees voluntarily reciprocate by increasing citizenship behaviors, increasing productivity and lowering employee turn-over, etc.

Potential frameworks include various organizational behavior theories such as social exchange theory (Blau, 1964), expectancy-valence social exchange theory (Vroom, 1964), and organizational citizenship behavior. Blau's social exchange theory postulates that when employees perceive their organizations have their common interest at heart, they would eventually reciprocate that gesture by voluntarily engaging in activities that would benefit their organization. Depending on the levels of social exchange between employer and employees, employees could reciprocate by exhibiting organizational citizenship behaviors such as accepting additional responsibility, adherence to organizational rules and procedures, and developing a positive attitude towards work dissatisfaction (Ahmadi, Nami, & Barvarz, 2014).

Thus, when workers perceive a sense of community, interconnectedness, and emotional care from the organization, which are components of workplace spirituality, they voluntarily exhibit organizational citizenship behaviors. These additional responsibilities could include participation in safety programs, compliance with safety rules, and adherence to safety behaviors that could prevent accidents.

Previous research supports this reciprocating relationship between workplace spirituality and various positive non-safety organization outcomes (e.g. Bodia & Ali, 2011; Hong, 2012; Rego & Cunha, 2007; Usman, 2010; Young, Cashwell & Shcherbakova, 2000). These organizational positive outcomes include organizational and employees' commitment, psychological adjustment, ethical decision-making, job satisfaction and coping with stress, among others. According to Rego and Cunha (2007), it is likely that these organizational benefits are possible because workers reciprocate positively towards the organizations that satisfy their spiritual needs, give them a sense of psychological safety, treat them as human beings that come to work with their hands, souls, and spirit; and allow them to have a sense of purpose, belonging, and joy at work.

Furthermore, the link between workplace spirituality and safety outcomes could also be established using Reason's (2009) summary of psychological varieties of unsafe acts model. As shown in Figure 4, Reason identifies major violations: routine, exceptional, and act of sabotage. Reason (2016) posits that the decision not to abide by safety procedures and indulgence in violation of safety rules are influenced by both individual and organizational factors and a typical example of routine violation is corner-cutting at the skill level of work performance. One possible organizational factor-based explanation for corner-cutting, sabotage, routine, and exceptional violations is lack of workplace spirituality, which manifests as lack of sense of community, interconnectedness, meaningful work, and sense of joy, which are accident precursors. When workers lack workplace spirituality, they likely disengage from exhibiting organizational citizenship behaviors, such as safety compliance and participation, which could lead to industrial accidents. Therefore, this study further postulates that:

HE₁: *There are statistically significant relationships between workplace spirituality and safety outcomes (safety compliance, safety participation, and injury frequency).*

Relationship of Mindfulness to Safety Outcomes

The usefulness of mindfulness as a latent construct has been explored in the fields of business, education and healthcare (e.g., Corcoran, Farb, Anderson & Segal, 2010; Davis & Hates, 2011; Shapiro & Izett, 2008). However, there appears to be a paucity of studies that link mindfulness to safety outcomes, although business literature attributes the successes of High-Reliability Organizations (HROs) to what HROs regard as collective mindfulness (Weick, Sutcliffe & Obstfeil, 1999). High reliability organizations are high-risk organizations that have internalized human performance improvement tools for improving their safety records through the reduction of human errors that lead to events.

This notwithstanding, Reason's (1995) Accident Causation Model or more specifically, Reason's (2009 & 2016) summaries of the psychological varieties of unsafe acts and principal error types models can be used as a theoretical frameworks to establish the link between mindfulness and safety outcomes. Reason posits that unsafe acts are broadly categorized into two areas: errors and violations. He suggests that errors arise due to informational problems and are of three types: skill-based slips and lapses, rule-based mistakes, and knowledge-based mistakes. Violations, on the other hand, arise from motivational factors and can be categorized into four areas: routine (corner-cutting) violations, thrill-seeking (optimizing) violations, necessary violations, and exceptional violations (Reason, 2016).

Reason (2016) describes slips and lapses as unintended actions; while absent-minded slips arise from attention or cognitive failures, lapses are internal events that arise from memory failures. Mistakes are actions that are executed as planned, but the plan itself is insufficient to achieve its designed outcomes or goals (Reason, 2016). Mistakes are further categorized into two areas: rule-based mistakes and knowledge-based mistakes. Rule-based mistakes involve misapplication of good rules or application of bad rules when dealing with a familiar problem (Reason, 2016). Knowledge-based mistakes, which exist in variable forms, could come into force when we have to think on our feet in novel circumstances after running out of ready-made solutions (Reasons, 2016).

As shown in Figure 4, the link between mindfulness and safety outcomes becomes obvious when one examines preconditions that promote human error. According to Reason (2016), slips and lapses most likely occur when performing routine actions in a familiar environment. Most often, when one performs these routine tasks in a familiar environment, one is distracted, inattentive, preoccupied, stressed, tired, or forgetful of the task at hand

(Reason 1995). Reason (2016) further points out that two particular conditions provoke memory slips: psychological and situational.
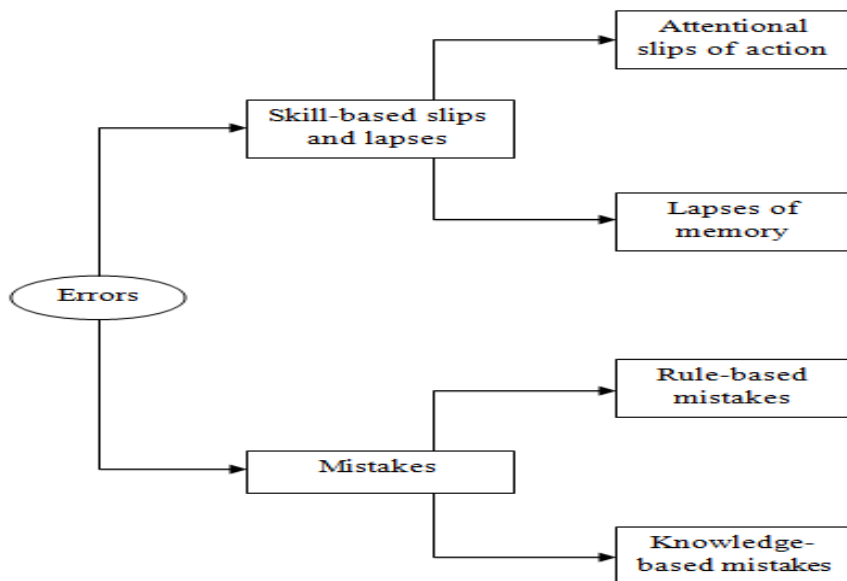
Figure 4. Summary of the principal error types. Copied with permission from "Managing the Risks of Organizational Accidents," by J. Reason, 2016, p. 72. Copyright 1997 by the Taylor and Francis Group.

According to Reason (2016), the psychological condition that provokes memory slips is "attentional capture": it comes into play when a worker's mind is so preoccupied with something else other than the task at hand that there is little or no attentional capacity left to concentrate. The situational condition that provokes error is change (Reason, 2016): change in the nature of the task or the circumstances surrounding the effective performance of the task. When these conditions exist, the probability of accidents increases as well as failure to engage and comply with safety (Carriere, Cheyne, & Smilek, 2008; Larson & Merrit 1991; Wallance & Vodanovich, 2003).

However, while these psychological and situational preconditions that provoke errors use attentional or cognitive capacity and prevent attention switching, mindfulness frees up attentional or cognitive capacity by reducing the use of cognitive and emotional behavioral strategies to avoid aspects of experiences, and changes in psychological contexts in which

unpleasant experiences, thoughts, and feelings are perceived (Coster & McCrae, 1987; Hayes, Strosahl & Wilson, 1999).

Mindfulness also ensures effective switching of attention from one object to the other (Posner, 1980). This is necessary to prevent error-enforcing changes, where changes require actions that are quite different from the norms. This is particularly evident when one examines Reason's (2016) three levels of human performance as distinguished by both psychological and situational variables. These three levels of human performance as originally introduced by Rasmussen (1982) are: the skill-based, the rule-based, and the knowledge-based performance modes. When operating in knowledge-based "activity space," workers must be focused and rely on their understanding and knowledge, perceptions of present circumstances, similarities to previous circumstances, and the scientific principles and fundamental theories related to the present situation in order to prevent active error that leads to event (Wachter & Yorio, 2013). This situational awareness relates mindfulness to safety outcomes. Based on the above premises, it is hypothesized that:

HD_1: *There are statistically significant relationships between mindfulness and safety*

outcomes (safety compliance, safety participation, and injury frequency).

Workers' Cognitive and Emotional Engagement

Employee, worker, or personal job engagement, as interchangeably used in literature, is popularized by Kahn (1990) in his work: "Psychological Conditions of Personal Engagement and Disengagement at Work." Kahn uses the terms "personal engagement" and "personal disengagement" to refer to behaviors by which people bring in or leave out their personal selves during work role performances. He provides two similar definitions for personal engagement. First, he defines personal engagement as the situation where members of an organization physically, cognitively, and emotionally harness themselves to their work performance roles. In a second definition, he defines personal engagement as the

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simultaneous employment and expression of a person's "preferred self," which are embodied by physical, cognitive, and emotional task behaviors that promote connections to work and to others, personal presence, and active, full role performances.

The physical aspect of Kahn's (1990) workers' engagement pertains to the physical energy exerted by workers to accomplish particular tasks; the cognitive aspect of workers' engagement concerns the degree to which workers are attentive to their work; the emotional aspect of workers' engagement concerns how workers feel, positively or negatively, about their job, leaders and organization. According to Kahn (1990), employees who simultaneously engage their physical, emotional, and cognitive energies in their work are said to be fully engaged; engaged workers do their work with their bodies, hearts, and minds totally and simultaneously involved.

Additionally, Schaufeli, Salanova, Gonzalez-Roma, and Bakker (2002) define workers' engagement as "a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption." (p. 24). Vigor is characterized by high level of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties; dedication is characterized by being strongly involved in one's work, and experiencing a sense of significance, enthusiasm, inspiration, pride and challenge; and absorption is characterized by being fully concentrated and happily engrossed in one's work, whereby time passes quickly and one has difficulties with detaching oneself from work.

While Kahn's (1990) definition of workers' engagement is tripartite in nature, relatively more contemporary definitions of workers' engagement represent it as a one-dimensional construct. For instance Frank, Finnegan and Taylor (2004) regard workers' engagement as a function of the amount of discretionary effort workers put into their job,

while Truss et al (2006) define workers' engagement as the amount of passion workers have for their work.

Notwithstanding these various definitions of workers' engagement, the concept remains contested in management sciences parlance because it is difficult to separate engagement from previously established constructs such as motivation and employee's job satisfaction. For instance Harter, Schmidt & Hayes (2002) define engagement as employee's involvement, commitment and satisfaction with work. Wollard and Shuck's (2011) review of employee engagement literature in fact found four main distinctive schools of thought with the concept: satisfaction-engagement approach, needs satisfying approach, multidimensional approach, and burnout-antithesis approach.

These four schools of thought with regard to the definition of workers' engagement could be integrated into two larger schools of thought: one assumes that workers' burnout and workers' engagement occupy the opposite poles of a continuum (e.g., Maslach, Jackson & Leiter, 1997); and another that regards workers' engagement as the beneficial antithesis of worker burnout (e.g. Bakker & Demerouti, 2007; Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002;). One common characteristic of these definitions is that they ascribe the responsibility of creating workers' engagement to either the individual worker or the employer or both of them; they differ only in the weight of engagement creation ascribed to each entity.

In occupational safety literature, however, there is a different dimension to the definition of workers' engagement. Workers' engagement in safety literature is traditionally regarded to be synonymous with the degree of worker's compliance, participation, visibility, commitment, communication, conformance, adherence, and submission to the organizations' safety rules, policies, procedures and activities (e.g., Nahrgang, Morgeson, Hofmann, 2010; Neal & Griffin, 2006; Wachter & Yorio, 2014). This is to say that workers' engagement in

safety implies workers' engagement in safety programs or compliance with safety rules. For instance, Hofmann and Morgeson (2000) state that workers' engagement in safety communication (safety participation) implies strong commitment to safety. In other words, workers' engagement is involvement in the organization's safety activities, and a totally engaged worker is one who totally complies, participates, conforms, commits and submits to the organization's occupational safety businesses.

Although it appears workers' engagement is defined differently in psychology, management, and occupational safety literature, Cole, Walter, Bedeian and Boyle (2013) liken participation in safety activities to "dedication" as expressed in Schaufeli, Salanova, Gonzalez-Roma, & Bakker's (2002) definition of workers' engagement. This means a worker who complies with safety rules and regulations, and participates in safety activities is said to be engaged and also dedicated to his work. This is to say workers' safety engagement is synonymous with workers' job engagement. Similarly, a successfully accomplished job can be said to have been done safely.

Nahrgang, Morgeson, and Hofmann (2010) in an occupational safety article go a step further by operationalizing employee satisfaction as a component of workers' engagement, based on the theory that engagement can be reflected as a positive state of employee satisfaction and commitment to the organization. However, workers' engagement has been found to be different from job satisfaction, organizational commitment, and job involvement (Macey & Schneider, 2008). Workers' engagement is also time-dependent because it takes variable time for different workers to be fully engaged in their job (Bakker & Xanthopoulou, 2009).

While workers' safety engagement has been traditionally operationalized as workers' compliance to safety, worker participation in safety activities or both, Rich, Lepine, and Crawford (2010), based on Kahn's work, operationalized workers' engagement in terms of its

components: physical engagement, emotional engagement, and cognitive engagement. They found out that this three-factor model in which each item was loaded onto its corresponding engagement dimension provided a better fit than one-factor model. Workers who are physically engaged channel their actions and behavior vigorously towards their job; those who are emotionally engaged direct their emotions and feelings fully to their job; and workers who are cognitively engaged devote their full attention to their job.

Operationalizing workers' engagement in terms of its various components is important in this context because the degrees of separate physical, emotional, and cognitive engagement workers are prepared to bring to their workplace vary (Kahn, 1990; Saks, 2006); these may depend on the economic and emotional resources the organization is willing to release (Kular, Gatenby, Rees, Soane & Truss, 2008). Thus, disaggregating workers' engagement into its three components enables an in-depth comparative examination of how each component mediates the relationship between its antecedents and consequences. This is highly desirable in this research as it provides an opportunity to increase understanding of the mechanisms through which workplace spirituality and mindfulness could affect different components of workers' job engagement to affect safety outcomes. Furthermore, Rich et al. (2010) assert that engagement entails the simultaneous active and complete investment of physical, emotional, and cognitive energies in full performance of a role. It is not just doing specific job tasks for the sake of doing them, or feeling and expressing job-related positive emotions, or being cognitively attentive to the task.

In another of the few safety articles that has operationalized workers' engagement based on Kahn's (1992) model, Wachter and Yorio (2014), being concerned with the behavioral aspect of workers' engagement in safety program, developed a two-factor workers' safety engagement model that features workers' cognitive and emotional engagement in safety programs. They define cognitive safety engagement as being actively

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focusing, concentrating, and paying attention to the safe execution of work tasks. Emotional engagement reflects workers' enthusiasm and interest in the established safety program. The results of their study show that workers' decision to cognitively and emotionally engage in safe execution of work tasks and their enthusiasm in the established safety program significantly mediates the relationship of safety management practices and the selected safety outcomes.

In this research, workers' engagement shall be operationalized from the perspective of Kahn's (1992) job engagement model. This entails operationalizing workers' engagement to reflect the simultaneous engagement of workers' emotional and cognitive energy in 'full work performance' rather than narrowly being restricted to engagement in safe execution of work tasks and interest in safety program. This is in line with Ashforth and Humphrey's (1995) assertion that workers' engagement entails investing the hands, head and heart in full work, and not restrictive to safety activities. Besides, being engaged in safe execution of work tasks and being enthusiastic in the established safety program are aspects of full cognitive and emotional workers' job engagement.

There is a paucity of research that examines the relationship between cognitive engagement and emotional engagement. Workers' engagement involves simultaneous engagement of individual's physical, cognitive, and emotional energy in full work performance (Rich, Lepine & Crawford, 2010). Although Kahn (1990) and Kahn (1992) assert that these energies are put into full work performance simultaneously in various degrees, not much is known on the relationship between cognitive and emotional workers' job engagement. In this research, it is argued that emotional workers' engagement to job performance positively and significantly correlates with cognitive workers' engagement in job performance. That is, a worker who is fully cognitively engaged to job is also more likely to be emotionally fully engaged to job. Based on this assertion, it is hypothesized that:

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HC$_1$:   *There is a statistically significant correlation between workers' emotional job*

           engagement and workers' cognitive job engagement.

Relationship of Workers' Cognitive and Emotional Engagement to Safety Outcomes

According to Kahn (1990), investment of cognitive and emotional energies into work roles promotes more attentive, focused and vigilant behavior that contributes to the achievement of organizational goals. Although Kahn did not specifically point out these achievable organizational goals, Rich, Lepine, and Crawford (2010) have found that simultaneous investment of cognitive, emotional, and physical energy into work role translates into superior work performance.

Although several studies have found that cognitive and emotional workers' engagement in safety activities is negatively related to accident rates as safety outcomes (e.g., Nahrgang, Morgeson & Hofmann, 2010; Wachter & Yorio, 2014), there is little information on the relationship between workers' job engagement and safety outcomes in the context of organizational and psychological constructs of workplace spirituality and mindfulness. However, there are plausible theoretical reasons to believe that links exist between workers' job engagement and safety outcomes within this organizational environmental context. Generally, employees who are fully engaged in their jobs simultaneously focus their physical, emotional, and cognitive energy to achieve better performance (Ashforth & Humphrey, 2008).

Specifically, emotional job engagement involves feeling positive, activated, pleasant, excited, enthusiastic, and interested towards one's job role and organization (Frijda, 1993; Russell & Barret, 1999). Cognitively engaged workers would be focused, attentive, concentrative, absolved, and engrossed in the job (Rothbard, 2001). Thus, cognitively and emotionally engaged workers would more likely participate in safety activities and comply with safety procedures necessary for their jobs. Being focused and attentive in the job implies

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that an engaged worker is less likely to make mistakes that could lead to injuries, accidents, and adverse effects. Although not postulated in this study, it is suggested that there would be a strong and significantly correlated links between workers' engagement and the various safety outcomes. However, this would need to be a necessary prerequisite in order to support the hypothesis that cognitive and emotional engagement acts as mediators between mindfulness, workplace spirituality and safety outcomes.

Mediating Role of Workers' Engagement on the Relationship of Workplace Spirituality and Safety Outcomes

The direct path relationship between workplace spirituality and safety outcomes has been established using some social exchange and accident causation theories. That is, when workers perceive high organizational support, they exhibit organizational citizenship behaviors which could be manifested in terms of participation in safety activities and compliance with safety rules. This is in line with the research that has shown that the quality of managerial support is linked to lower industrial injuries and accidents (e.g., Hofmann, Morgeson, & Gerras, 2003; Zohar, 2003).

According to Schneider (1987), interests and personality attract people to careers in differing ways. In other words, workers become emotionally and cognitively engaged in their jobs or careers based on their personality and interests. However, Konz and Ryan (1999) posit that organizational culture is sharpened by the values of the top management teams and is reflected in the organization's missions, visions, policies, and procedures. Since workplace spirituality could be regarded as an aspect of organizational culture or organizational culture emanates from workplace spirituality, it also implies that workplace spirituality is a reflection of the summative spirituality of the leaders of the organization. According to Moore (2008), aspects of workplace spirituality in an organization is accomplished through the founders' assertion of mission, vision, policies, and procedures. Employees in the organization have to

emotionally and cognitively align themselves to the same philosophy, values and beliefs as expressed in the operational artifacts of the organization, in order to be accepted in the organization. This alignment could be expressed through workers' safety participation, safety compliance, and organizational citizenship behaviors that improve safety outcomes.

On the other hand, employees in the organization, due to the dynamics of workplace spirituality, caused by periodic reviews of organizational policies, mission, vision, procedures, or outright change of top management teams' structure, may find that their individual spirituality is at variance with the prevailing organizational workplace spirituality. This could lead to their disengagement from safety participation, safety compliance, organizational citizenship behaviors that improve safety outcomes, and finally disengagement from the organization. This implies that the possible relationship between workplace spirituality and safety outcomes could be more effective when workers are emotionally and cognitively engaged in their jobs considering the prevailing organizational workplace spirituality. Based on these premises, it is posited that:

HI_1: *The relationship between workplace spirituality and safety compliance is at least partially mediated by workers' emotional job engagement.*

HJ_1: *The relationship between workplace spirituality and safety participation is at least partially mediated by workers' emotional job engagement.*

HK_1: *The relationship between workplace spirituality and injury frequency is at least partially mediated by workers' emotional job engagement.*

HO_1: *The relationship between workplace spirituality and safety compliance is at least partially mediated by workers' cognitive job engagement.*

HP_1: *The relationship between workplace spirituality and safety participation is at least partially mediated by workers' cognitive job engagement.*

HQ$_1$:   The relationship between workplace spirituality and injury frequency is at least

partially mediated by workers' cognitive job engagement.

Mediating Role of Workers' Engagement on the Relationship of Mindfulness and Safety

Outcomes

It has been proposed in this study, following Reason's (2009) summary of the

psychological varieties of unsafe acts, that mindfulness could be related to workers' cognitive

(primarily) and emotional engagement. It has been shown that cognitive engagement is

related to emotional engagement (Watcher & Yorio, 2014). In a nutshell, mindfulness

increases cognitive complexity, which is reflected by workers' ability to generate

differentiated and integrated representation of cognitive and emotional experiences (Bishop et

al 2004). This implies that mindfulness could be positively associated with measures of

emotional engagement. It is hypothesized in this study that workers who are cognitively and

emotionally engaged are more likely to harness their hearts and minds towards working

safely and hence be less likely to get injured. Thus, the remaining questions concern how

mindfulness translates into safety outcomes such as injuries, worker participation in safety

activities and worker compliance with safety.

Previous research supports the direct relationship between mindfulness and safety

outcomes (Klockner, 2013; Reason, 2009). The hypothesis advanced earlier suggests that

cognitive and emotional engagement mediate the relationship between workplace spirituality

and mindfulness with safety outcomes. First, although the direct path between mindfulness

and safety outcomes has been established, a fully mindful worker may actually decide not to

participate, comply with safety rules or other rules instituted by the organization to prevent

accidents. Secondly, workers need an enabling work environment to mindfully engage them

in improving workplace safety outcomes and human performance (Klockner, 2013; Langer,

et al., 1979). This is to say that mindful and spiritual workers must still fully engage their

cognitive and emotional capacities to avoid injuries, participate in safety activities, and comply with safety regulations.

Secondly, mindfulness makes workers situationally aware of their work environment (Klockner, 2013). Workers who are mindful of their jobs are more cognitively engaged and are less likely to be distracted, make mistakes, and commit errors that could lead to injury. Thus, it is proposed that relationships of mindfulness and safety outcomes would be stronger when workers are cognitively and emotionally engaged in their jobs. That is:

HF_1:   *The relationship between mindfulness and safety compliance is at least partially mediated by workers' cognitive job engagement.*

HG_1:   *The relationship between mindfulness and safety participation is at least partially mediated by workers' cognitive job engagement.*

HH_1:   *The relationship between mindfulness and injury frequency is at least partially mediated by workers' cognitive job engagement.*

HL_1:   *The relationship between mindfulness and safety compliance is at least partially mediated by workers' emotional job engagement.*

HM_1:   *The relationship between mindfulness and safety participation is at least partially mediated by workers' emotional job engagement.*

HN_1:   *The relationship between mindfulness and injury frequency is at least partially mediated by workers' emotional job engagement.*

Summary

The latent constructs of workplace spirituality and mindfulness have been usefully explored in several fields. However, the safety science field of human performance improvement is yet to fully recognize and conceptualize the workplace as an interconnected community where workers engage their hands, heads, hearts and minds simultaneously in meaningful work with sense of joy and mindfulness towards improving safety outcomes and

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human performance. This chapter has explored various theoretical frameworks used to establish the plausibility of developing a human performance framework that links workplace spirituality, mindfulness, and workers' engagement towards achieving positive safety outcomes.

The next chapter explicitly and philosophically maps out the methodology needed to verify that the sample data collected fit the proposed model; in other words, to prove that the proposed overall theoretical model is plausible. It also explores the methods available to test the generated hypotheses and their interpretations.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

The purpose of this research was to improve workplace safety through improving human performance by establishing a framework that links workplace spirituality, mindfulness, workers' engagement and safety outcomes. This chapter describes and critically justifies the optimum methods the researcher used to solve the identified problems in such a way that the research is replicable.

This chapter presents the study's overriding research method philosophical stance upon which other sections of this chapter are based. The geographical area where the study was conducted is presented, including the study's population, sampling method, and the power of test. The description of instrument used for data collection, its reliability, and validity are also presented. Lastly, the methods used to analyze and interpret the data, and to solve the identified research problems, are presented.

Research Methodology and Strategy

Research Literature broadly identifies three classifications of research methods: quantitative, qualitative, or mixed methods (Trochim & Donnelly, 2007). These research methods are usually based on cross-sectional, longitudinal or mixed method study approaches. According to Williams (1987), quantitative methods manipulate variables to generate figures for statistical analysis while qualitative studies involve manipulations of words. A cross-sectional research approach is an approach in which the researcher investigates a phenomenon in a given population at a certain point in time, and a longitudinal study extends over a long period of time (Bethlehem, 1999). Mixed research method combines qualitative and quantitative approaches.

A descriptive quantitative cross-sectional research approach was used in this study. According to Ezeani (1998), descriptive surveys are used to collect accurate information that describes existing phenomenon. The research method was descriptive in order to gather information from participants without manipulating any internal or external variables. The choice of cross-sectional approach was informed by the fact that this approach, apart from being less time consuming, simple, and less costly, also considers numerous variables at once (Trochim & Donnelly, 2007). This is in contrast to a longitudinal study approach, which although useful for establishing cause and effect relationships, is relatively complex, time-consuming and expensive (Collins, Onwuegbuzie, & Sutton, 2006).

Research Measures

The type of measure suitable for any research depends on the type, cost, and time available for the study. A group-administered questionnaire was used to collect information from respondents in this study. The group-administered questionnaire involved administering a questionnaire in group settings; it has a high response rate, and it is relatively easy to organize (Trochim & Donnelly, 2007). Specifically, group questionnaire surveys accommodate long response categories, thrive where there are limited research facilities and staff, and provide the needed avenue to explain the research to respondents in person (Dillman, 1999). However, a group-administered questionnaire survey does not accommodate long survey questions, does not give access to dispersed samples, and is not adaptable on the spot (Trochim & Donnelly, 2007). As a result, the survey questions were made as short as possible without compromising its contents. Specifically, the use of self-reported perceptual measures to assess the estimates of the relationships among the variables may be susceptible to same-source, same-method bias.

The survey assessed three dimensions of workplace spirituality, two dimensions of mindfulness, two dimensions of workers' engagement, and three safety outcome dimensions.

<p style="text-align: center;">**Measurement Scales**</p>

The sample data collected were treated as parametric. According to M. Zreiqat (personal communication, December, 18, 2017), for data to be treated as parametric, a minimum of ten-point scale is required. This stance was substantiated by J. Wachter (personal communication, December, 20, 2017) on a premise that ten-point scale would lend to a more normal distribution of responses. Therefore, a ten-point scale was used for data collection. However, a typical five-point or seven-point Likert scale ranges from "*strongly disagree*" to "*strongly agree*". Therefore, to accommodate a ten-point scale, a Semantic Differential scale using Bipolar Adjectives in the form of [*Strongly disagree* 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, *Strongly agree*] was used in this study. This ten-point scale was used consistently in all the surveys.

Safety Outcomes Scale

Safety outcomes in the employee survey were assessed using the number of self-reported injuries, and using safety participation and safety compliance survey measures. The numbers of self-reported injuries were determined by asking employees to recall the total number of times any major parts of their bodies was injured during the past year. That is, these were injuries that required first aid, medical treatment or restricted work days cases. The major parts of the body included the head, upper and lower limbs, eyes, neck, shoulders, and upper and lower back (Jiang et al., 2010; Li et al., 2013).

Although Veazie et al. (1994) and Zacharatos et al. (2005) assert that six months is the maximum period over which workers can accurately recall injuries suffered, a one-year time period was used in this study. The choice of one-year period as the maximum period over which workers should be asked to recall the number of injuries they have sustained is supported by previous research (e.g., Goldenhar et al., 2003; Jiang et al., 2010; Li et al., 2013). Secondly, the choice of the maximum period of one year over a six month period was

important in minimizing the frequency of "zero" and "one" injury, which might skew the injury frequency data and affect the normality test for self-reported injuries.

The two other components of safety outcomes: safety compliance and safety participation were assessed by three items and four items respectively, adapted from Neal and Griffin (2006). Other researchers also adapted this instrument in their various studies. (Griffin & Neal, 2000; Li et al., 2013; Vinodkumar & Bhasi, 2010).

Workers' Job Engagement Scale

Workers' engagement is a latent construct that was designed to capture both emotional and cognitive engagement in the job. The cognitive and emotional engagement questions were adapted from Rich et al. (2010), and Lepine and Crowford (2010). It consisted of 12 survey items: six survey items measured workers' cognitive job engagement, and six survey items measures workers' emotional job engagement. Other researchers have also used this scale in one modified form or the other (e.g. Wachter & Yorio).

Workplace Spirituality Scale

The instrument for measuring workplace spirituality was adapted from workplace spirituality measurement scales developed by Chawla and Guda (2010) and Ashmos and Duchon (2000). It consists of three dimensions: inner life, meaningful work, and sense of community, with 15 measurement items. These scales were preferred for its conceptualization of workplace spirituality in terms of individual spiritual identity (inner life), meaningful work and sense of community. These three factors seem to encompass the three areas workers can express workplace spirituality: as an individual, within the workers' work units or departments, and within the organization as a whole (Ashmos & Duchon, 2002; Chawla and Guda 2010).

Mindfulness Scale

Five Facet Mindfulness Questionnaire (FFMQ) was used to assess mindfulness as a latent construct in this study. This is because FFMQ provides the most comprehensive coverage of aspects of mindfulness for the assessment of mindfulness in the general population (Bergoni et al., 2013).

The Five Facet Mindfulness Questionnaire (FFMQ) is a 39-item multi-faceted scale covering five aspects of mindfulness: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (Bergoni et al., 2013). However, within the context of this research, "observing" and "acting with awareness" appear to be the two dimensions of mindfulness that are closely related to workplace safety. Thus, "observing" and "acting with awareness" were the two dimensions of FFMQ used in this study, resulting in 16 questions being used in this survey. "Observing" is synonymous to noticing. "Acting with awareness" describes the ability of workers to concentrate and not being distracted from the task at hand (Bergoni et al, 2013). At the same time, "Acting with awareness" entails workers' ability to be situationally aware and ability to "switch" to an automatic or an autopilot work mode as situation demands.

Instrument Reliability and Validity

Although the instruments adapted for this study had been validated by their originators and other researchers, since the instruments were to be used in a new culture, it was deemed to be important to recheck their reliability, validity and unidimensionality based on the collected sample data. As a result, the reliability, validity and unidimensionality of the instruments developed for assessing workplace spirituality, mindfulness, cognitive job engagement, emotional job engagement, safety performance and safety compliance were reexamined prior to testing the measurement model and substantive structural relationships.

Composite Reliability

Reliability is the degree of consistency of an instrument (Kerlinger & Lee, 2000). The reliability of the instrument or its factors was established using composite reliability (CR), or rho. As opposed to Cronbach's alpha as a measure of reliability, Raykov (2004) believes that a composite reliability estimate is a more reliability estimate than Cronbach's alpha because unlike Cronbach's alpha, a composite reliability estimate does not assume the equality of the error or loading terms of instrument items. Like Cronbach's alpha estimate, the acceptable standard minimum threshold for composite reliability is 0.7 (Guo, Yiu & González, 2016).

Convergent Validity

Convergent validity indicates the extent to which a latent construct is well explained by its observed variables or items; a scale is said to have a high convergent validity if items of the construct commonly share a high proportion of variance (Hair, 2006). Convergent validity in this study was assessed by examining the loading factors and Average Variance Extracted (AVE). According to Hair (2006), standardized loading estimates of 0.7 or higher and an AVE of 0.5 or higher indicates proper convergence.

Discriminate Validity

Discriminate validity indicates the extent to which a construct is actually different from other constructs in a model (Henseler, Ringle & Sarstedt, 2014). The six latent variables or factors in this study were tested for discriminate validity based on Hair, Black, Babin, & Anderson's (2010) requirements. According to Hair et al., 2010, the square root of Average Variance Explained for a factor should be greater than correlations; AVE should be greater than Average Shared Variance (ASV); and AVE should be greater than Maximum Shared Variance (MSV).

Unidimensionality

According to Hair et al. (1998), unidimensionality refers to a situation where a single construct underlies a set of measures. According to Byrne (1994), a model Comparative Fit Index of 0.9 or higher indicates a strong evidence of unidimensionality.

Participants and Demographic Information

Data were collected through convenient sampling of workers from accessible companies in the Niger Delta region of Nigeria. No particular industry was specifically targeted, but the choice of industry or organization for the study was based on accessibility and permissions of the corporate gatekeepers. However, the inclusion criteria for the sample population were workers at the "sharp" edge (i.e., workers whose work activities brought them very close to physical and chemical hazards); workers who were above eighteen years of age; and workers who had spent a minimum of one year in the organization. The ranks of supervisors and above and those that had spent less than a year in the organization were excluded from the study.

After the approval of this dissertation proposal by the university's board of the School of Graduate Studies and Research (see Appendix A), site approval request letters were sent to 15 companies to participate in this study; at the end, five organizations agreed to participate. The organizations' sectors include general construction, food and beverages manufacturing, and metal fabrication. Socio-demographic information gathered from the respondents included gender, age, work experience, and education level.

Population Sampling

A convenience sampling method was adopted in this study. Convenience sampling method is a non-probability sampling method that involves drawing representative data by selecting people because of their organization's volunteering for survey participation or due to ease of access (Business Dictionary, n.d.). Convenience sampling has the advantage of

ensuring that data can be easily gathered; however, as a non-probability sampling method, samples cannot depend on the rationality of probability theory such as random or stratified sampling. The sampling method is convenience in the sense that respondents were from a mix of organizations that were willing to participate in the study.

Effect Size and Power of Test

The power of hypothesis testing is the probability of retaining the null hypothesis when the alternative hypothesis is false (Schumacker and Lomax, 2016). According to Schumacker and Lomax, the determination of power and effect size in SEM is complicated because theoretical models have several variables or parameter estimates. This appears to be the reason why power and effect size are hardly reported in SEM-based research. However, post-hoc power of tests and effect sizes for hypothesis testing (testing model fit to data) and comparing alternative models - the proposed model and the final model – were calculated in this study using G*power 3 (Faul, Erdfelder, Lang & Buchner, 2007).

Survey Distribution and Collection

Hard copy survey instruments (see Appendix C) were physically distributed and collected from the participants at their workplaces on the days appointed by management between 7th January, 2018 and 15th February, 2018. Although electronic mail would have been a more preferable option for the distribution and collection of questionnaires, in general, this option was not readily available in Nigerian workplace for the targeted respondents that met the study's inclusion criteria.

On the day appointed by each organization, before distributing the questionnaires to the respondents, the researcher explained the aim of the study and its confidentiality and anonymity requirements to the respondents. Questions about the study and its procedures were solicited from the respondents; thereafter, the questionnaires and pencils were distributed accordingly.

Although proficiency in English language was needed for respondents to complete the questionnaire, for respondents with limited proficiency in English language, the researcher used Pidgin English, an unofficial language that unifies Nigeria where over 200 languages are spoken, to clarify issues to the affected respondents. The researcher was always with the respondents throughout this period to clarify issues and to collect and package the questionnaires at the end. After data analysis, the questionnaires were locked in a secured box. The questionnaires will be destroyed after two years.

Ethical Issues

Formal approval letters to conduct this study were received from the top management of the various organizations where data were collected. Companies' official letterhead letters were obtained from the various organizations that voluntarily agreed to participate; these approval letters were forwarded to IUP's institutional review board (IRB) as part of the requirements for the approval of this study. The questionnaire had a cover sheet that assured the respondents of confidentiality and anonymity of their responses, the voluntary nature of this study, and that a decision to withdraw from the study would not affect their relationship with the organizations they work for (see Appendix B)

To ensure anonymity, there was no requirement for respondents to indicate their names or identification numbers on the survey. The researcher ensured confidentiality by making sure that the questionnaires were collected immediately after they were completed. For those respondents who could not complete their questionnaires immediately, sealed collection boxes were provided for them to drop their completed questionnaires.

Data Analysis Method

Structural Equation Modeling (SEM)

SEM was used for the data analyses, since the framework or model that this research tested had several latent constructs, variables, and parameters to be estimated. This is in

contrast to basic inferential statistical methods, such as bivariate correlation, independent and dependent t-test, linear regression and analysis of variance (ANOVA) that utilize only a limited number of independent and dependent variables (Hoyle, 2012). Thus, these were not the primary statistical methods to choose when testing interdependencies among several variables. Furthermore, although ANOVA and multiple regression analyses can accommodate multiple dependent variables, they are limited in how the relations between those variables are specified (Hoyle, 2012).

A further advantage of SEM over the traditional multivariate analysis procedures is that in traditional multivariate analysis procedures, variables can be independent or dependent, but not both; this limits the number of predictions possible with these variables. On the other hand, strictly speaking, SEM has no dependent or independent variables: endogenous variables may be used as exogenous variables capable of predicting the other endogenous variables (Hoyle, 2012).

Traditional multivariate data analysis procedures, such as multiple regression analysis, general linear model, and discriminate analysis do not take measurement error into consideration. Applying these traditional multivariate analysis methods where there are potential sizeable measurements errors may ultimately lead to serious inaccuracies (Byrne, 2003). Byrne further stresses that such inaccuracies are eliminated when SEM analyses are used because SEM analyses incorporate measurement errors when statistically analyzing data.

Again, data analysis based on the traditional multivariate procedures are based on observed measurements only, but SEM data analysis procedures can incorporate both observed measurements and latent or unobserved variables (Byrne, 2003). According to Hoyle (2012), the integration of the two constitutes the main strength of SEM. Finally, Byrne emphasizes that there are no popular and easily applied alternative methods for modeling

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multivariate relationships or for estimating direct or indirect effects other than using SEM data analysis procedures. Based on these reasons, SEM was used for inferential data analysis in this study.

Testing SEM Assumptions

SEM is a general case of multiple regression analysis, a parametric test, and therefore carries similar assumptions (Malone & Lubansky, 2015). Therefore, the data collected were tested to ensure they met the following multiple regression assumptions before parametric-SEM-based data analyses were conducted:

1. A continuous dependent (exogenous) variable.

2. Two or more continuous or categorical independent (endogenous) variables.

3. Independence of observations (that is, independence of residuals).

4. A linear relationship between the exogenous and each of the endogenous variables, and the exogenous and the collective endogenous variables.

5. Homoscedasticity of residuals, equal error variance.

6. No multicollinearity.

7. No significant outliers, high leverage points or highly influential points.

8. Data which is approximately normally distributed.

Assumptions 1 and 2 were met by using a Likert scale of 10 points. Assumptions 3 to 8 were tested by running multiple regressions using mindfulness and workplace spirituality separately as a dependent variable; safety outcomes were used as independent variables. The moderating variables, workers' cognitive engagement and workers' emotional engagement, were not included in the regression equation because they were neither dependent nor independent variables. Prior to running the regression analysis, respondents' scores on each of the latent variables were transformed into composite mean scores. The composite mean scores were used to run the regression analysis.

Assumption 3, independence of observations, was confirmed using Durbin-Watson statistic produced as part of the multiple regression analysis. The Durbin-Watson statistic ranges from 0 to 4; a value of approximately 2 indicates that there is no correlation between residuals. This implies independence of error or residuals (Laerd, 2017).

Linear relationship between the exogenous variable and the endogenous variables was examined using partial regression plots between each exogenous and endogenous variable. However, the examination of the various plots for normality assumption is highly subjective and tasking.

The assumption of homoscedasticity is that the residuals are equal for all values of the predicted endogenous variable. Homoscedasticity is desirable because it is not expected that the variance of the dependent variable should be concentrated within a limited range of the independent values (Hair et al, 2016). The plot of the studentized residuals (SRE_1) against the unstandardized predicted values (PRE_1) was to check for heteroscedasticity. If there is heteroscedasticity, the spread of the residuals would increase or decrease as it moves along the predicted value axis to form a "funnel" or "fan" shape. If there is homoscedasticity, the spread of the residuals will not increase or decrease as you move along the predicted values (Laerd, 2017).

Multicollinearity occurs when there is a linear dependence among the endogenous variables: this implies that one has some endogenous variables that are highly correlated with each other (Hair et al, 2016; Malone & Lubansky, 2015). The situation makes it impossible to understand which variable contributes to the variance explained in the model (Laerd, 2017). Multicollinearity was checked by examining the correlation matrix for correlations of 0.9 and above and inspected the tolerance value/variance inflation factor (VIF) produced as part of multiple regression analysis. Correlation coefficients of 0.9 or above imply the presence of multicollinearity; a tolerance value of less than 0.1 or a VIF of greater than 10 implies a

collinear issue (Laerd, 2017; Field, 2005). A multicollinearity problem may result from analyst error and carelessness in data preparation. Where this is found to be the cause of the problem, one of the simplest solutions to the problem of multicollinearity would be to drop one of the collinear variables. However, in mediation studies, multicollinearity is expected and cannot be avoided (Kenny, 2016). According to Frost (2013), a VIF of 5.0 or greater implies a serious multicollinearity issue, and one way of overcoming this problem is centering the variables by subtracting the mean from the variables.

Outliers or influential data points are data values that are extreme or atypical on either endogenous or exogenous variables or both (Ho & Naughter, 2000). In multivariate analysis, two types of outliers exist: univariate outliers and multivariate outliers (Fields, 2005). Univariate outliers have atypical data points on a single variable, and multivariate outliers have extreme scores on multiple variables. Univariate outliers was checked by inspecting the box plots, scatter-plots and histograms. Multivariate outliers are checked for using AMOS software to examine the values of Mahalanobis distance (d^2). Multivariate outliers are said to exist for all observations or records with P1 values less than 0.05 (Gaskin, 2016). This implies that the correlations between variables for these responses are significantly different or abnormal when compared to the rest of the data set (Gaskin, 2016).

Leverage values were checked by examining the variable LEV_1 that was created during multiple regression analyses. Cases with leverage values less than 0.2 are safe; cases with leverage values 0.2 to less than 0.5 are risky cases; cases with leverage values of 0.5 and above are dangerous (Laerd, 2017). Similarly, influential points were checked by examining variable COO_1 in the data file that is produced by selecting the Cook's option during regression analyses. Cook's Distance values above 1.0 need to be investigated, where Cook's distance is a measure of influence (Laerd, 2017).

On finding outliers, leverage values, or influential points that are of major concern, one could consider explaining them, removing the cases with these problems or accommodating them by using robust statistics for data analysis. Gaskin (2016) asserts that it is very difficult to justify removing multivariate outliers because they do not simply match one's model: this is tantamount to forcing the data to fit the proposed model instead of freely allowing the model to fit the data. He further states that multivariate outliers nearly always exist. Even if one removes them, more outliers will show up.

Univariate and multivariate data normality assumptions also need to be tested in SEM. Examination of the partial plots of the variables would indicate whether the assumption of univariate data normality has been violated, and inspection of the normal Q-Q Plot of Studentized Residual and the normal P-P Plot of Regression Standardized Residual would indicate whether the residuals were normally distributed.

The above normality tests were augmented by using AMOS software to check for kurtosis values of seven or above, which indicates univariate sample data departure from normality (West, Finch, and Curran, 1995). Using AMOS software, multivariate normality was double-checked by examining Mardia's (1970, 1974) normalized estimate of multivariate kurtosis. Normalized estimates greater than 5.00 indicate that data are not normally distributed (Bentler, 2005).

Nevertheless, the violation of normal distribution assumptions does not affect exogenous or antecedent variables, as the default maximum likelihood estimation (MLE) method does not affect incorporated distributional assumptions for exogenous variables (Eliason, 1993). But endogenous (mediating and outcome) variables that are not normally distributed are problematic. According to Malone and Lubansky (2015), the solution to non-normality is the use of an alternative estimation method to maximum likelihood examination

(MLE), such as Asymptotic distribution-free (ADF) estimation (Browne, 1984), rather than data transformation.

However, ADF estimation requires extremely large sample sizes (1000 to 50000); otherwise, it performs poorly and yields severely distorted estimated values (Hu, Bentler, & Kano, 1992; West et al., 1995). Alternatively, Kline (2011) suggests that AMOS bootstrapping method can also be used for testing data based on non-normal data. This study used MLE and bootstrap method for testing of the structural models and hypothesized substantive relationships. This implies that potential violation of the assumption of normal distribution was not really an issue in this study, since it was taken care of by these methods of estimation.

Structural Equation Modeling Procedure

SEM, structurally and functionally, can be decomposed into two sub-models: a measurement model and a structural model. The measurement model focuses exclusively on the relations between the latent (unobserved) variables and their indicators (observed) variables. In other words, a measurement model links the measuring instruments' scores and the latent constructs the instruments measure (Schumacker & Lomax, 2014). Structural models, on the other hand, are theoretically specified to represent relationships existing among the latent variables (Schumacker & Lomax, 2014). These relationships specify direct and indirect effects of one variable on the other and moderating effects of a third variable where applicable.

The following major steps as specified by Schumacker & Lomax (2016) were applied in modeling this dissertation's structural equation:

1. Model specification

2. Model identification

3. Model estimation

4. Model testing

5. Model modification

Model Specification

      Model specification entails determining and mapping-out every relationship and parameter in the theoretical model that interests the researcher. As the name implies, model specification should be based on theoretical background from literature review. Model misspecification could yield biased parameter estimates and lack of goodness-of-fit. According to Hoyle (2015), the goal of model specification is not to provide full account of the data but to present a model that offers a parsimonious and useful account of data; bearing in mind that since all models are approximations of real word dynamics that produce the data, it means that all models are to an extent incorrect (MacCallum, 2003). However, based on the theoretical foundation established through literature review, the model for this dissertation was specified as shown in Figure 5.
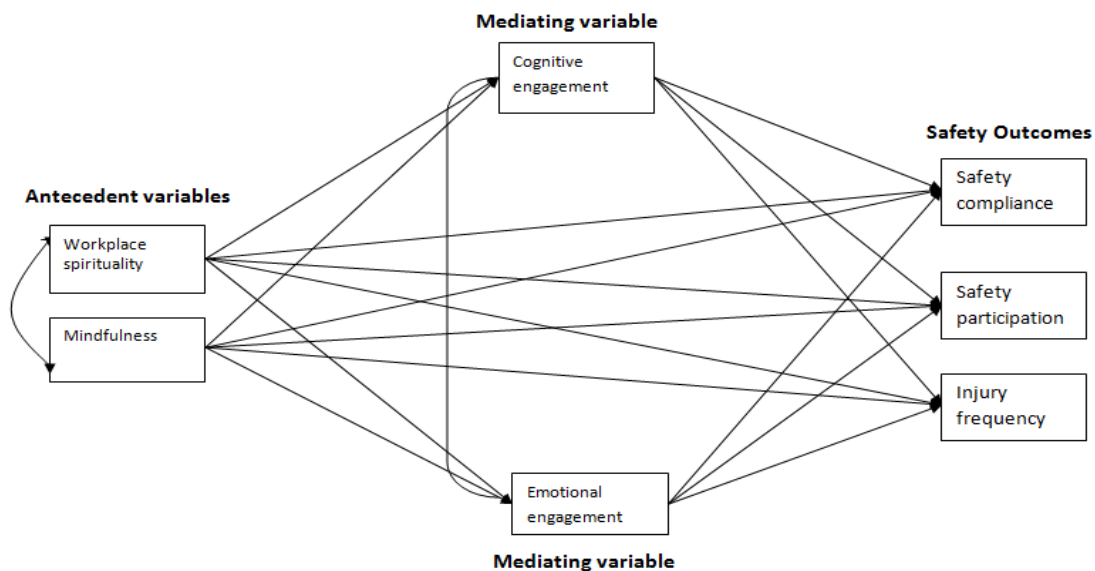
Figure 5. Model specification for the study.

Model Identification

Model identification is the process of ensuring that one can obtain estimates for the path coefficients in the specified model, given the sample data and theoretical path model (Kenny & Milan, 2015). SEM software cannot run any model that is not properly identified. Model identification is based on "order condition" (Schumacker & Lomax, 2016). Therefore, it is important to ensure the model was properly identified. The order condition specifies that the number of free parameters to be estimated must be equal or less than the number of distinct values in the sample variance-covariance matrix (Kenny & Milan, 2015; Schumacker & Lomax, 2016). For a model to be properly identified, its degrees of freedom must be equal to or greater than one.

Considering this study's model, there were:

- sixteen (16) path coefficients to be estimated;

- five (5) error variances [for the five endogenous (dependent) latent variables];

- two (2) correlations among the exogenous (independent) variables; and

- two (2) exogenous or independent variables.

This implies that there were 25 free parameters to be estimated in this theoretical model.

The number of distinct values in the data sample variance-covariance matrix are given by $[P(P + 1)]/2$ (Schumacker & Lomax, 2016), where P is the number of latent variables in the matrix = 7.

This implies that the number of distinct values in this data's sample variance-covariance matrix was $[7(7 + 1)]/2 = 56/2 = 28$.

Given that the number of distinct values (28) in the sample variance-covariance matrix was greater than the number of free parameters (25) in the path model, the model's order condition was satisfied and properly identified. The degree of freedom (*df*) for a path model is the difference between the number of distinct values and the numbers of free

parameters. The *df* for this model was = 28 − 25 = 3. The degree of freedom was also greater than one, which means that the model was properly identified.

Model Estimation

The AMOS SEM program has several methods for estimating parameters in the model: maximum likelihood estimation (MLE), generalized least squares (GLS), unweighted least squares (ULS), scale-free squares (SFS), and asymptotically distribution free (ADF). According to Loehlin (1987), MLE, GLS and ULS are commonly used to estimate goodness-of-fit model. MLE is AMOS' default parameters estimation method and is the most widely used SEM parameters estimation method (Hair et al, 2016). Although MLE is based on the multivariate normality assumption, it is also robust to violations of data's normality assumption (Olsson, Foss, Troye, & Howell, 2000; Savalei, 2008). Therefore, the default AMOS MLE method for estimating the model's parameters was used.

Model-fit Testing

Before testing for the relationships between parameters and moderating effects in SEM, it was confirmed that the sample's data fit the theoretical model; that is, the measurement model's construct validity was confirmed. This validity was ensured by assessing the similarity of the estimated theoretical covariance matrix to the observed matrix (Hair et al, 2016). Chi-square (χ^2) statistic is the basic SEM's goodness-of-fit (GOF) measure to estimate the similarities between the covariance matrices (Byrne, 1998). However, increase in sample size makes the χ^2 statistic produce erroneous results (Hair et al, 2016). Because of this, many GOF indices have been invented, and χ^2 statistic is no longer used as the only GOF measure.

These indices have been broadly classified into three major categories: absolute measures, incremental measures, and parsimony fit measures (Hair et al, 2016). Hair et al (2016) further recommend that using three to four fit indices provides evidence of model fit;

the researcher should report at least one incremental index and one absolute index, in addition to the χ^2 statistic value and degree of freedom.

Thus, in addition to reporting the χ^2 statistic value and degree of freedom, the normed chi-square (CMIN/DF or χ^2/df), which is the ratio of χ^2 to the degrees of freedom; the root mean square error of approximation (RMSEA); and the comparative fit index (CFI) were equally reported. RMSEA is one of the most widely used GOF to correct for the tendency of χ^2 to reject models with a large sample (Hu & Bentler, 1999). CFI is an incremental fit index that is relatively insensitive to model complexity (Hair et al., 2016). A non-significant χ^2 statistic value, CMIN/DF values below 3.0, RMSEA values below .08, and CFI values above .90 usually indicate a well fitted model (Hair et al, 2016).

Model Modification

It is very rare for a researcher to terminate research based on a rejected model, considering the costs of data collection: the researcher goes ahead to generate a model that better fits the sample data (Byrne, 2016). According to Hu and Bentler (1998), a model is considered unfit and subject to modification if it fits the data but has excessive parameters (over-parameterization), or the model does not fit the data (under-parameterization).

The proposed model showed a good fit to the data; however, after testing the hypothesized relationships, some relationships were found to be weak and not significant. Therefore, using the results of tests of hypotheses, the hypothesized model was constrained by deleting the relationships that were not significant to form a nested model with the hypothesized model. The new model was tested for model fit and compared with the hypothesized model.

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The Choice of SEM Software

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Organizational, psychological, safety, and social sciences literature shows different SEM software being used by researchers; however, AMOS software appears to be the most

frequently used (Gou et al 2016; Wachter & Yorio, 2014). Other researchers used SEM to develop their frameworks, yet few of them reported the specific SEM programs used (e.g. Griffin & Neal, 2000; Lepine & Crawford, 2010; Neal, Griffin, & Hart, 2000). This may underscore the importance of the SEM procedure over the specific SEM programs and points to the commonalities among the various SEM programs. This notwithstanding, SPSS AMOS Version 24 software was used for data analysis in this study. The choice of this program was based on preferences and the need to work in SPSS augmented environment.

Data Analysis Method

The data collected were analyzed descriptively and inferentially. IBM Statistical Package for Social Sciences (IBM SPSS) Software Version 24 (Arbuckle, 2016) was used for descriptive statistical data analysis, and structural equation modeling software, AMOS Version 24, was used for inferential statistics of testing the model and the hypotheses.

Data Entry and Coding

AMOS is an SEM software and an add-on purchase in the IBM SPSS statistical package. Data entry and coding was done using SPSS; the data were later imported into AMOS environment for measurement model, structural model, and hypothesis testing.

Descriptive and Inferential Statistical Data Analyses

Laerd (2017) defines descriptive statistics as the analysis of data that helps describe, show and present data in a meaningful way. Inferential statistics are techniques that allow one to use representative samples' data to make meaningful generalizations about the population from which the samples were drawn. Prior to making any data analysis, missing cases were identified because statistical analysis of data is affected by missing data. Roth (1994) and Schumacker and Lomax (2016) suggest the use of listwise deletion of cases or mean substitution when missing data is 5% or less. Alternatively, maximum likelihood estimation method that makes use of available data, as available in AMOS program, could be used for

parameter estimation (Little & Rubin, 1987). Listwise deletion of cases was used in this study because the proportion of cases with missing data was less than 5%. Maximum likelihood estimation method was then adopted after listwise case deletion.

Descriptive statistic measures of central tendency and measures of dispersion such as standard deviation, mean, and frequency, stratified according to demographic variables (gender, age, and work experience), were used to offer information and trends on the nature of the sample data. Also, a correlation table was produced that comprises the study variables and the socio-demographic variables.

Inferential statistical data analyses were performed using SPSS AMOS Version 24. The inferential statistical tests done included testing the measurement model, the structural model, and the substantive relationships.

Testing the Measurement Model

Because the survey instruments used in this research were adapted from other research, it was imperative to "confirm" that the key latent variables in this study were actually distinct from each other. It is conventionally important to assess the fit of the sample data to the proposed measurement model before testing other substantive relationships. Therefore, a confirmatory factor analysis (CFA) was performed using AMOS Version 25 (Arbuckle, 2016), with the covariance matrix and maximum likelihood estimation method. CFA is theory driven (McDonald, 1978); this informed its choice in testing the measurement model where theories behind the latent variables in this study had already been established through exploratory factor analysis in different cultures, but needed to be reconfirmed in a different (Nigerian) culture.

Prior to testing the entire measurement model, it was important to investigate the unidimensionality of the scales. Hair et al. (1998) refers to unidimensionality of a measure as the existence of a measure that defines one and only one single construct. Unidimensionality

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of the instrument used to assess the constructs of workplace spirituality, mindfulness, workers' engagement, safety compliance and safety participation in this study was assessed using Comparative Fit Index (CFI).

For the proposed measurement model, each individual questionnaire item was loaded onto its respective higher order factor (workplace spirituality, mindfulness, workers' engagement, safety compliance and safety participation). The higher order factors, the latent variables, were allowed to correlate or covary. Scaled factor loading of indicators to latent variables was set to 1.00 in order to scale the latent variables. Item wording similarities and measurement artifacts variance were accounted for by allowing similarly worded items to correlate, and ensuring that negatively worded items were properly recoded.

However, one of the constructs, injury frequency, was a single-item measure. According to Hair, Black, Babin, and Anderson (2016), one-item measures are associated with a higher likelihood of estimation problems encountered in later stages of the SEM process, and their reliability and validity are difficult to compute. Secondly, the main problem with single-item measures is that they are under-identified and as such, their loading and error terms cannot be estimated (Hair et al., 2016)   As a result, Hair et al. (2016) caution against the inclusion of one-item measures in SEM process.

In safety sciences, however, many times specific outcomes such as Total Recordable Case (TRC), injury frequency, Days Away Restricted or Transferred (DART) case rates are single measures. Under this scenario, Hair et al. (2016) recommend that the researcher must specify both the loading and error terms. The researcher could set the loading factor to 1.0 and the error term to zero where there is no error in the observed value, or the loading factor could be set to the square root of the estimated reliability, and the error term is set to 1.0 minus the reliability estimate (Hair et al., 2016). In this study, participants may not be able to accurately remember how many injuries they have suffered for the past one year. This may

introduce error in the observed values. As a result, the loading factor of injury frequency was set to the square root of the estimated reliability, and the error term was set to 1.0 minus the reliability estimate.

Having ensured unidimensionality of the individual measures, the entire measurement model was tested for model-fit to the sample's data. This involved covarying the highest order factors in each model and estimating the variables. The measurement model was assessed for fit using commonly used model goodness-of-fit and badness of fit criteria, such as chi-square (X^2), CMIN/DF, CFI, and RMSEA. Where there was poor data fit between the proposed measurement model and sample data, modification indices and residuals from AMOS output data were used as guides to improve the model. In which case, items with low factor loadings were dropped in the CFA to ensure that loadings relating indicators to latent factors were statistically significant (P < .05), or two items' errors with high modification indices that load on the same factor were covaried, or correlated items above .4 were removed.

To verify that the proposed ten-factor model was the most plausible measurement model based on the sample data, a series of alternative plausible measurement models were compared using the hypothesized measurement model as a baseline for comparison with alternative models. Seven alternative models were generated by combining factors of latent constructs:

Model 1: Null covariance / correlation model – all the factors were freely constrained not to covary.

Model 2: One-factor model – This model comprised of three workplace spirituality (WPS) factors, two mindfulness (MND) factors, two engagement factors, and the three safety outcome factors combined into one factor.

Model 3: Four-factor model – In this model, WPS and MND were combined into one factor, workers' cognitive engagement and workers' emotional engagement existed as separate factors, and the three safety outcome factors, safety compliance (SC), safety participation (SP), and injury frequency (IF), were combined into another single factor. The four factors were allowed to freely correlate.

Model 4: Six-factor model – In this model, WPS and MND were combined into one factor, workers' cognitive engagement and workers' emotional engagement existed as separate factors, and the three safety outcome factors, SC, SP, and IF existed as separate factors. The six factors freely correlated.

Model 5: Eight-factor model – This model consisted of the three WPS dimensions as factors, two MND factors, workers' cognitive engagement and workers' emotional engagement as separate factors, with SC, SP, and IF combined into a factor. Again, the eight factors were allowed to freely correlate.

Model 6: Nine-factor model – This model consisted of the three WPS dimensions as factors, the two MND factors, workers' cognitive engagement and workers' emotional engagement as a single factor; and SC, SP, and IF as individual factors. The nine factors freely correlated.

Model 7: Ten-factor model (The hypothesized model) – This hypothesized model consisted of the three WPS dimensions as factors, the two MND factors, workers' cognitive engagement, workers' emotional engagement, and SC, SP, and IF as individual factors. The ten factors freely correlated.

The one-factor model was proposed to test the possibility that all items in the study load on a general factor regarding human factor improvement. Overall, the models were assessed based on acceptable model fit criteria: CFI of 0.90 or greater, CMIN/DF of less than 3.0, RMSEA of 0.08 or less, and a non-significant Chi-square value (Hu and Bentler, 1999). For comparison of alternative models, Chi-square test of significant difference [$\Delta\chi^2(df)$] was

used to examine each model's fit in relation to nested competing alternative models and null model, where applicable. The model that showed statistically significant Chi-square difference test with respect to the baseline model was chosen as the preferred model.

Testing the Structural Model

In a summary of general frameworks for testing structural equation models, Jöreskog (1993) has identified three scenarios: strictly confirmatory, alternative models, and model generation. A perusal of safety, management, and psychology literature clearly indicates model generation is the most prevalent of the three scenarios and the strictly confirmatory case is rarely found in literature. According to Byrne (2016), the reason for the prevalence of model generation over the other scenarios is because it would be rare to find a researcher who would terminate a research simply on the basis of a rejected hypothesized model, considering the cost associated with collection of sample data. Therefore, when a hypothesized model is rejected due to lack of model fit, the researcher invokes the model generation scenario.

Based on the preceding discussions, this research was based on a model generation scenario. After testing the proposed model fit using X^2, CMIN/DF, CFI, RMSEA, and the hypotheses, a nested model was developed by removing the insignificant paths. This model was tested for fit and compared with the hypothesized model.

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Testing of Hypotheses

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Four distinct groups of hypotheses were tested in this study:

1. One model fit testing hypothesis (hypothesis HA).

2. Two correlation or association-related hypotheses (hypotheses HB and HC)

3. Two relationship or prediction-related hypotheses (hypotheses HD and HE).

4. Twelve mediation-related hypotheses (hypotheses HF to HQ).

The model-fit hypothesis was tested using simultaneous equation modeling, SEM, to check if there was a statistically significant difference between the sample data's variance-

covariance matrix and the generated model-implied variance-covariance matrix. Maximum likelihood estimation method using AMOS SEM software was adopted.

The two correlation or association-related hypotheses were tested using Pearson bivariate correlation on the affected data's composite mean scores, after ensuring that the data met parametric assumptions tests. Additionally, a correlation table for key study variables was produced.

The two relationship or prediction-related or direct effect hypotheses, hypotheses HD and HE, were tested by having the model-fit with the moderators (cognitive and emotional engagement) isolated. That is, the SEM model was run with only the antecedent and outcome variables, as shown in Figure 6. In this scenario, there was no influence of competing pathways, as every pathway was unidirectionally isolated. The AMOS *estimation output* data was examined to check whether the direct effect of the antecedent variables on the outcome variable was significant or not significant.

Testing for Mediation

The AMOS bootstrap approach of testing the significant of the indirect effects was adopted in this study. Bootstrap is a re-sampling procedure where pseudo samples of the original samples are drawn randomly with replacement to provide data for experimental investigation of the variability of parameter estimates and indices of fit (Byrne, 2010). Bootstrap is independent of normal distribution assumption and treats non-normal data as normal by randomly drawing predefined numbers of pseudo samples out of the original non-normal data. Bootstrap has become one of the more recommended approaches to test for mediation (Hayes, 2009; Preacher & Hayes, 2004).

The primary benefit of bootstrapping is that it is robust against normality assumption, which is necessary for parametric procedures inherent in Baron and Kenny's approach to mediation (Preacher & Hayes, 2004). As incorporated in the SEM program, the bootstrap

approach incorporates measurement error; therefore, it is free from measurement-error-based unreliability that plagues multiple regression-based approaches. And according to Cheung and Lau (2008), the bootstrap method enables researchers to examine the stability of parameters, and it has more power and accurate Type-1 error rates than normal distribution assumption-based single sample approaches like ANOVA and multiple regressions.

The AMOS bootstrap program was run following a two-step approach. First, the model was tested with only the antecedent and outcome variables in the model as shown in Figure 6. The essence of this stage was to establish the direct effects of the antecedent variables on the outcome variables so as to ensure that there was something (a statistically significant path "c") to be mediated in the first place. If this direct path is not significant at this stage, it means that nothing can be mediated. However, this step was performed when testing the direct effect hypotheses.

The second step involved running the AMOS bootstrap program with the introduction of the mediating variables one at a time into the model for the significant direct effect paths, as shown in Figure 7. In this model, there is a potential problem of competing pathways which from a holistic model perspective will affect particularly the estimates of the total effect because of the two mediating variables in the model. To isolate the competing pathways and estimate the isolated direct and indirect effects due to each mediator, Macho and Leadermann's (2011) Phantom model approach was adopted. This involved the introduction of each mediator into the model one at a time as shown in Figure 7.

For instance, when testing for the mediating effect of cognitive engagement on the relationships of workplace spirituality and safety outcomes, other links or paths that connected workplace spirituality to the second mediator (e.g. emotional engagement) were removed, as shown in Figure 7 with "Red" link. By so doing, only the effect of one mediator was considered in the relationship of exogenous variables and the safety outcomes.

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Otherwise, AMOS program would put all the mediating factors into the equation, thus

producing erroneous parameter estimates, confidence intervals and significant levels. These

steps were repeated until all the potential mediated paths were examined in turn.
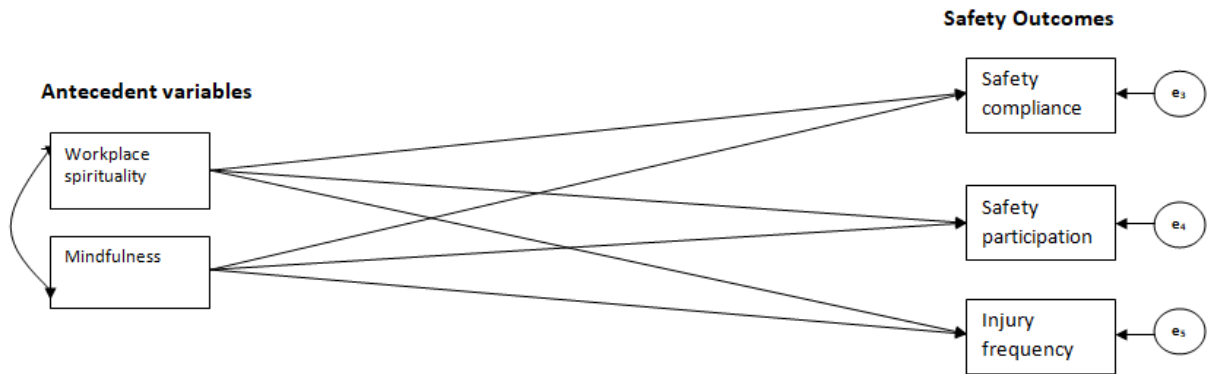
Figure 6. Stage one - test for mediation (testing of direct effects).
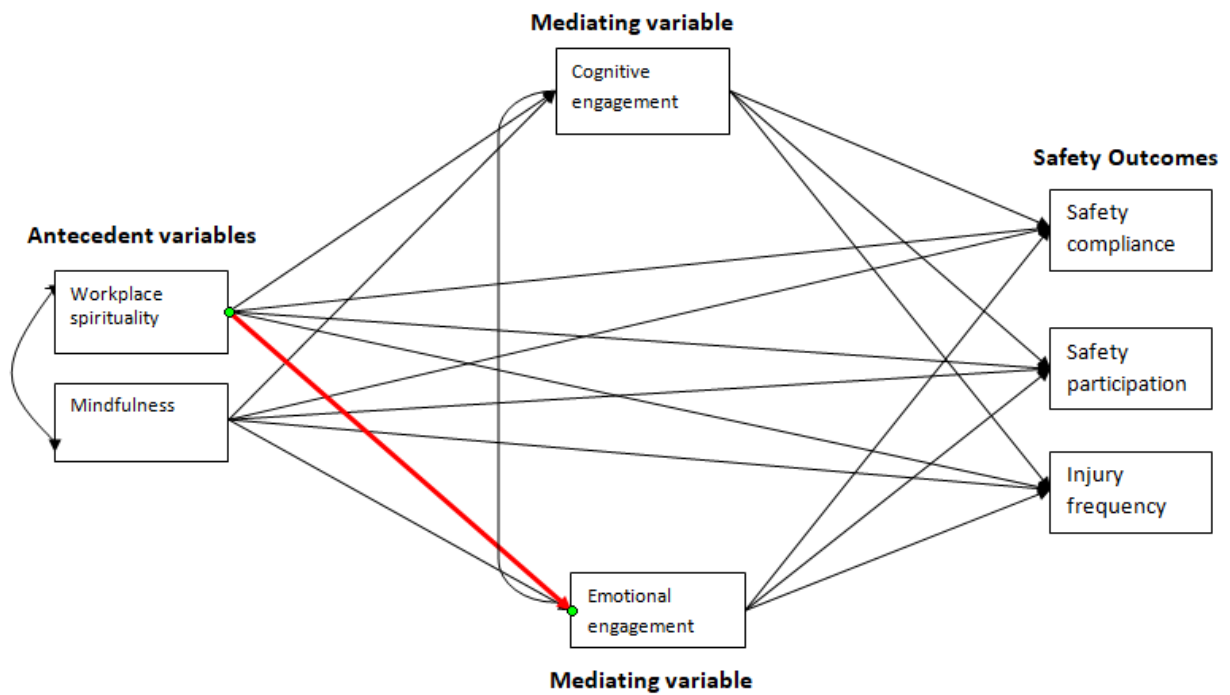
Figure 7. Stage two - test for mediation (testing of indirect effects).

Zainudin (2010) distinguishes three types of mediation: full (complete) mediation, partial mediation, and non-mediation. This study proposed at least partially mediated relationship in which workers' engagement mediates the relationships of mindfulness and workplace spirituality respectively with safety outcomes. Based on the *Estimate/Bootstrap Contents* output table produced, full mediation, partial mediation and non-mediation were assessed based on the following criteria:

Full Mediation

1. The direct effect path "c" before the introduction of mediators must be statistically significantly different from zero;

2. The combined indirect effect path "ab" after introducing the mediators must be statistically significantly different from zero; and

3. The total effect "c^1" after the introduction of the mediators must be statistically insignificantly different from zero.

Partial Mediation

1. The direct effect path "c" before the introduction of mediators must be statistically significantly different from zero;

2. The combined indirect effect path "ab" after introducing the mediators must be statistically significantly different from zero; and

3. The total effect "c^1" after the introduction of the mediators must also be statistically significantly different from zero; however, the coefficient of "c^1"must be lower that the coefficient of "c".

Non-Mediation

1. The direct effect path "c" before the introduction of mediators is statistically significantly different from zero;

2. The combined indirect effect path "ab" after introducing the mediators is not statistically significantly different from zero; and

3. The total effect "c^1" after the introduction of the mediators is statistically significantly different from zero.

Summary

For reasons already explicated, descriptive, cross-sectional, and convenience research methods were used in this dissertation. The adapted instruments were validated before they were used to collect data. SPSS version-24 was used for descriptive data analyses, and AMOS Version-25 was used for models' fit analyses and inferential statistics, including the testing of hypotheses. The next chapter presents the results of the data analyses, in line with the research method.

CHAPTER FOUR

RESULTS

Introduction

The overarching purpose of this study was to develop a framework (model) for linking workplace spirituality, mindfulness, workers' safety engagement, and safety outcomes. An important specific objective of this research was to determine the impact workplace spirituality and mindfulness collectively have on safety outcomes and to determine if the degree and type of workers' engagement mediated the effects of workplace spirituality and mindfulness on selected safety outcomes. This involved applying various SEM model-fit indices to prove the hypothesized model and by testing how well the sample's data variance-covariance matrix fitted the independent generated model-implied variance-covariance matrix.

In this chapter, in line with the methodology described in Chapter Three, the results of the data analyses are presented. The remaining part of this chapter is broadly divided into sections that covered the results of SEM assumption tests, descriptive statistics, assessment of the reliability, validity and unidimensionality of the adapted instruments used in this study, the measurement model, the structural model, testing of the substantive hypothesized relationships within the model, and the testing of the new (revised) model and the examination of the effect size, and power of the test.

Participants

The sample for this study consisted of 259 shop-floor employees in five privately owned and profit-oriented Nigerian construction, oil and gas, and manufacturing companies in the Niger-Delta region of Nigeria. Listwise deletion of uncompleted survey cases resulted in a final sample of 251 surveys for the analyses. The response rate was 80%, as shown in Table 1.

Table 1

Descriptions of the Study's Participating Organizations, Participants, and Response Rate

Industry	Type of industry	Questionnaire details:		
		No. issued	No. returned	Response rate
A	Oil and Gas	91	80	88
B	Construction	67	50	75
C	Food manufacturing	50	37	74
D	Food manufacturing	45	38	84
E	Food manufacturing	59	46	78
	Total	312	251	80%

Two hundred and fifty-one (251) participants took part in the study: 216 (86.1%) males and 35 (13.9%) females. The mean age of the participants was 34.43 ± 6.77 years, and the mean number of years the participants had worked in that particular organization was 6.0 ± 3.38 years (see Appendix E). In terms of the highest educational level reached, 9.2% of the participants had primary school level education; 30.3% of the participants had secondary school level education; 38.6% of the participants had two years diploma certificate level of education; and 21.9% had a minimum of a four years degree in primarily engineering and science disciplines.

Assumptions of the Statistical Analyses Results

The assumption of independence of residuals was tested: there was independence of residuals, as assessed by a Durbin Watson statistic of 1.941 (see Appendix F). Because this value is approximately 2.0, it means that there was no correlation between residuals (Field, 2005)

Examination of partial regression plots between each of safety outcomes and the antecedent variables indicated approximate linear relationships. Similarly, an examination of the studentized residuals (SRE_1) against the (unstandardized) predicted values (PRE_1)

showed a linear relationship (see Appendix J). This means that a linear relationship existed between the antecedent variables and safety outcomes collectively (Field, 2005).

For the assumption of homoscedasticity, homoscedasticity was assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values (see Appendix I). The plot showed a linear relationship, as opposed to increasing and decreasing funnel or fan shaped relationship (Field, 2005, Hair et al. 2016).

None of the correlations between the latent variables was larger than .9. All of the tolerance values were greater than .1 (see Appendix H); the lowest value was .386; and all the variance inflation factors (VIF) were far lower than 10; the highest value was 2.593. This implies that there was no problem with collinearity in the data set (Bowerman & O'Connell, 1990; Field, 2005; Menard, 1995; Myers, 1990).

An inspection of the box plots individually produced for each latent variable revealed no outliers (see Appendix G). However, an inspection of *Casewise Diagonistics* table revealed two cases (participants) where the cases' standardized residual was greater than ±3 standard deviation, (3.102 and 4.062) respectively (Appendix H). Ordinarily, these cases would be considered potential outliers; however, their leverage values (LEV_1) and Cook's Distance (COO_1) values were respectively well below .2 and 1.0, respectively. Their Mahalanobis distance values were well below the cut-off value of 15 for a sample size of 100 and three predictors. This implies that these potential outliers did not have any undue influence on the model (Barnett & Lewis, 1978; Cook & Weisberg, 1982; Laerd, 2018); therefore, these cases were retained.

Examination of the normal Q-Q Plot of Studentized Residual, the normal P-P Plot of Regression Standardized Residual, and the histogram (see Appendix K) indicated that the residuals were normally distributed (Field, 2005). Therefore, no transformation of data was done.

Descriptive Statistics

Table 2 shows the descriptive statistics: means and standard deviations together with correlations among the study's latent and socio-demographic variables. As depicted in the table, all the correlations among constructs are significant at p level of .01. The significant correlations among the variables indicate high degree of internal consistency reliability. As expected, the table also shows significant negative correlations between the antecedents and the moderating variables with the self-reported injury data. This suggests that higher levels of mindfulness, workplace spirituality, and workers' cognitive and emotional engagement practices may reduce workplace injuries.

As hypothesized, the measures of mindfulness and workplace spirituality were highly correlated (.81); similarly, there was a high correlation between the measures of workers' cognitive engagement and workers' emotional engagement (.70). These high correlations between each pair of measures indicate that these measures can be used to predict each other.

It is also evident that older, more experienced, and more academically qualified workers reported fewer injuries within a year, as shown by the negative correlations between these socio-demographic variables and the number of self-reported injuries. Likewise, these classes of workers perceived higher workplace spirituality, mindfulness, job engagement, and had higher perceived propensities to comply with safety rules and participate in safety activities.

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Table 2

Means, Standard Deviations and Correlations for all Scales [a]

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. Age	34.4	6.76	-									
2. Wep	6.16	3.38	.43									
3. Qlf	2.73	0.91	.31	.37								
4. WPS	5.91	1.28	.44	.58	.44							
5. MND	5.58	1.46	.44	.60	.49	.81						
6. WCE	3.43	1.41	.45	.62	.50	.69	.86					
7. WEE	5.27	1.37	.36	.41	.34	.60	.74	.70				
8. SCP	5.91	1.86	.39	.66	.51	.76	.82	.84	.61			
9. SPP	5.80	1.96	.37	.51	.39	.58	.81	.74	.69	.66		
10. IFQ	2.45	1.16	-.71	-.58	-.50	-.65	-.66	-.64	-.51	-.59	-.53	-

Note. Wep = number of years of experience; Qlf = highest educational qualification, coded from 1 to 4; WPS = workplace spirituality; MND = mindfulness; WCE = workers' cognitive engagement; WEE = workers' emotional engagement; SCP = safety compliance; SPP = safety participation; IFQ = number of injuries suffered in a year.

[a.] Correlations are all significant at $p \leq .01$ level (2-tailed).

Although these significant zero-order correlations supported two correlation-based hypotheses (hypotheses HB_1 and HC_1) and are suggestive of initial support for some of the direct effects hypotheses, the mediating effects hypotheses were also tested by specifying some structural models in which workers' emotional and cognitive engagement were sandwiched between the antecedent variables and the safety outcome variable.

Scales Reliability and Validity Results

The results of the measures' unidimensionality, reliability, convergent and discriminate validity are shown in Table 3.

Table 3

Scales Reliability, Validity and Unidimensionality

Variable (Scale)	CR	AVE	MSV	ASV	$(AVE)^{0.5}$	CFI
1. Workplace spirituality	.976	.730	.722	.538	.854	.98
2. Mindfulness	.990	.883	.757	.616	.940	.96
3. Cognitive engagement	.986	.923	.533	.584	.960	.99
4. Emotional engagement	.984	.914	.740	.630	.956	.98
5. Safety compliance	.848	.624	.617	.562	.790	.99
6. Safety participation	.888	.769	.728	.585	.877	.99
7. Injury frequency	.819	.819	.640	.382	.905	-[a]

Note.-[a:] Injury frequency is a single item variable; confirmatory factor analysis cannot be done on a single item variable.

Composite Reliability

Table 3 also shows that the Composite Reliability (CR) for all the latent variables were greater than .7. This suggests that the survey items are suitable measures of their respective indicative constructs (Hair et al., 1998).

Convergent Validity

All the standardized loading estimates were greater than .7. Similarly, the respective Average Variance Extracted (AVE), which is the sum of squares of an individual factor's loading divided by the number of factors, is greater than .5. This implies that the variables

correlate well with each other within their root factor; that is, the latent factors are well explained by their observed or measured variable.

Discriminate Validity

The Maximum Shared Variance (MSV) and the Average Shared Variance (ASV) for all latent factors are all less than the Average Variance Extracted (AVE). Also, the square roots of AVEs for the latent factors are all greater than their respective inter-construct correlations. This implies that the latent variables are better explained by their own observed variables, rather than by some other variables from a different factor (Hair et al., 1998).

Unidimensionality

Table shows that the Comparative Fit Index (CFI) values for all the measures are well above .90, which indicates that the individual items in the model comprising the latent variables closely represent the hypothesized model (Byrne, 1997; Hair et al., 1998).

<center>**Structures of the Measurement Scales**</center>

Since the mindfulness, workplace spirituality, and safety outcome scales used in this study were adapted from scales developed in a different culture, their measurement structures were validated to check their suitability for use in the new culture. The results of the assessments of the structures of all scales using confirmatory factor analysis, as shown in Table 4, indicate that the second-order models fit the data well, both in absolute sense and relatively to the null covariance structure and first-order models. The one-factor or first-order model provided the poorest fit, absolutely and relatively. This implies that the measures of mindfulness, workplace spirituality and engagement are better represented by higher order models rather than first order model. These results confirm the external validity and adaptability of these scales for use in a new culture.

Although it appears the higher-factor models, the models where the first-order factors were free to correlate, presented the same fit with their respective second order models, the

second-order factor loadings for the different dimensions were all high, positive, and statistically significant. The sameness in fit statistics between the models with correlated dimensions and their corresponding second-order models is because the number of estimated parameters and degrees of freedom are the same in both cases (Rich, Lepine & Crawford, 2010).

Based on the fact that the second-order models for all the scales displayed the best fits, subsequent confirmatory factor analysis of the measurement model and tests of substantial relationships were carried out based on the higher order model.

Measurement Models Assessment

Table 5 shows the results of a series of seven CFA models that represented plausible measurement models for the data. These analyses tested the proposed factor structure comprising workplace spirituality, mindfulness, cognitive engagement, emotional engagement, safety compliance, safety participation and injury frequency. First, a null model where there was no correlation among the latent factors was specified; this null model was used as a baseline for comparing subsequent models.

In Table 5, first, a null model was analyzed where no correlation among the latent factors was specified; this null model was used as a baseline for comparing subsequent models. This null covariance model showed a poor data fit, $\chi^2(1225, N = 251) = 7970.12$, CMIN/DF = 6.51, CFI = .64, and RMSEA = .15.

Second, a one-factor model tested the possibility that all the 53 survey items loaded on a general single factor pertaining to human performance improvement was specified. This model showed a significantly better fit that the null model, $\Delta\chi^2(5, N = 251) = 3075.62$, $p < .001$. This reinforces the results of the correlation studies which show that some items and factors were highly and significantly correlated.

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Table 4

The Structures of All Scales Using Confirmatory Factor Analysis (CFA)[a]

Structures	$\chi2$	*df*	CMIN/DF	CFI	RMSEA	$\Delta \chi^2(df)$[b]
Workplace spirituality						
Model 1: Null covariance model	172.55	90	1.83	.98	.06	-
Model 2: One-factor model	1985.25	90	22.06	.38	.29	-1812.70(0)
Model 3: Covariance model	158.87	87	1.83	.98	.06	13.69(1)
Model 4: Second order model	158.87	87	1.83	.98	.06	13.69(1)
Mindfulness						
Model 1: Null covariance model	535.38	104	5.15	.94	.13	-
Model 2: One-factor model	2357.64	104	22.67	.70	.30	-1822.26(0)
Model 3: Covariance model	446.20	103	4.33	.96	.12	89.18(1)
Model 4: Second order model	446.20	103	4.33	.96	.12	89.18(1)
Workers' engagement						
Model 1: Null covariance model	278.63	54	5.16	.96	.13	-
Model 2: One-factor model	2119.47	54	39.25	.64	.40	-1840.84(0)
Model 3: Covariance model	113.64	53	2.14	.99	.07	164.98(1)
Model 4: Second order model	113.64	53	2.14	.99	.07	164.98(1)
Safety Outcome						
Model 1: Null covariance model	177.87	14	12.71	.84	.22	-
Model 2: One-factor model	163.45	14	11.68	.86	.21	14.42(0)
Model 3: Covariance model	25.64	13	1.972	.99	.06	152.23(1)
Model 4: Second order model	25.64	13	1.972	.99	.06	152.23(1)

Note. $\chi2$ is Chi-Square, CMIN/DF =the ratio of Chi-Square to the degree of freedom; CFI = comparative fit index; RMSEA = the root mean square error of approximation.

All values of $\chi2$ and $\Delta \chi^2$ are *p* < .001.

[b] $\Delta \chi^2$ tests relative to Model 1.

[a] n = 251.

Third, a four-factor model tested the possibility that mindfulness and workplace spirituality could be describing one latent variable and that the three safety outcomes are undifferentiated. This model did provide a significantly better fit than the null model, $\Delta\chi^2$(12, N = 251) = 5108.15, p < .001. This relative significance reflects the significance correlations between the antecedent variables and also the significant correlations among the safety outcome variables.

Fourth, a six-factor model tested the possibility the safety outcomes indeed measured different variables rather than a single safety outcome variable, and the antecedent variables could be describing one latent variable. This model also showed an improvement of fit over the null model, $\Delta\chi^2$(20, N = 251) = 5330.00, p < .001.

Fifth, an eight-factor model was estimated where the three safety outcome factors were combined and other latent variables were left as conceptualized. The essence of this model was to isolate the effects of combining the antecedent variables (Model 3) from the combined effect of the safety outcomes. This model did provide a significant better fit than the null model, $\Delta\chi^2$(15, N = 251) = 5252.37, p < .001.

Sixth, a nine-factor model, where workers' emotional and cognitive engagements were combined into a single latent factor was estimated to test the possibility that workers' engagement is a one-factor latent variable. This model allowed for the possibility that the distinction between the two dimensions of workers' engagement was not meaningful. Absolutely, this model provided a poor fit: CFI = .8 and RMSEA = .1. However, relative to the null model, this nine-factor model provided a significant improvement in model fit, $\Delta\chi^2$(19, N = 251) = 3635.90, p < .001.

Table 5

Assessment of Plausible Measurement Models

Models	χ^2	*df*	CMIN/DF	CFI	RMSEA	$\Delta \chi^2(df)$[b]
Measurement Models						
Model 1: Null covariance model	7970.12	1225	6.51	.64	.15	-
Model 2: One-factor model:	4894.50	1220	4.01	.81	.11	3075.62(5)
Three WPS, two MND, WEE, WCE						
& three safety outcome dimensions						
combined						
Model 3: Four factor model:	2861.97	1213	2.36	.92	.07	5108.15(12)
WPS & MND combined						
Cognitive workers' engagement						
Emotional workers' engagement						
SP & SC & IF combined						
Model 4: Six factor model:	2640.12	1205	2.19	.93	.07	5330.00(20)
WPS & MND combined						
Cognitive workers' engagement						
Emotional workers' engagement						
Three safety outcome dimensions						
Model 5: Eight factor model:	2717.75	1210	2.25	.92	.07	5252.37(15)
Three WPS dimensions						
Two mindfulness dimensions						
Cognitive workers' engagement						
Emotional workers' engagement						
SP & SC & IF combined						

Table 5 (*Continued*)

Assessment of Plausible Measurement Models

Models	$\chi 2$	*df*	CMIN/DF	CFI	RMSEA	$\Delta \chi^2(df)^{\text{b}}$
Model 6: Nine factor model:	4334.22	1206	3.60	.81	.10	3635.90(19)
Three WPS dimensions						
Two mindfulness dimensions						
WCE & WEE combined						
Three safety outcome dimensions						
Hypothesized model: Ten factor model:						
Three WPS dimensions	2442.69	1199	2.04	.93	.06	5527.43(26)
Two mindfulness dimensions						
Cognitive workers' engagement						
Emotional workers' engagement						
Three safety outcome dimensions						
Hypothesized structural model	2475.25	1204	2.06	.94	.06	5494.87(21)
Alternative (nested) structural model	2108.59	932	2.27	.93	.07	5861.5(293)

Note. $\chi 2$ is Chi-Square, CMIN/DF =the ratio of Chi-Square to the degree of freedom; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; WPS = workplace spirituality; WEE = workers' emotional engagement; WCE = workers' cognitive engagement; SC = safety compliance; SP = safety participation; IF = injury frequency. All values of $\chi 2$ and $\Delta \chi^2$ are *p* < .001.

[b] $\Delta \chi^2$ tests relative to Model 1

[a] n = 251,

Finally, the conceptualized ten-factor model was estimated (see Appendix M). This hypothesized model of ten factors presented the best fit in an absolute sense $\chi^2[1220] = 2442.69$, CMIN/DF = 2.04, CFI = .93, RMSEA = .064; and relative to the null covariance model $\Delta \chi^2(26, N = 251) = 5527.43$, p < .001.

These results support the proposition that a human safety performance improvement framework can be presented in terms of antecedent, mediation and safety outcome relationships. The relatively better model fitness of the proposed model over those where mindfulness and workplace spirituality were combined, workers' emotional and cognitive job engagement were combined, and the three safety outcome components were combined, support a distinction between these constructs, although they were highly correlated.

Because the proposed model met the model-fit criteria, the option of using modification indices to improve the data's model fit was not considered before testing for the substantial relationships being hypothesized. Any attempt to modify the model's parameters to increase its fit is tantamount to trying to force the data to fit the model. This would defeat and bias the objectives of this study.

<div align="center">

Factors Loading

</div>

The first order factor loadings of the items, represented as standardized regression weights, were produced as an AMOS output. Appendix L shows that all the factor loadings were statistically significant with standardized loading estimates higher than the cut-off level of .70. In terms of the variances extracted of the items, that is factor loadings squared, it implies that more than half of the variations in items were explained by the corresponding latent factors: the error variances were small (Hair et al., 2016). The factor loadings compare more favorably to the factor loadings of the research items where these survey items were extracted.

Structural Model

In line with the theoretical model specified earlier, a mediation model in which the relationships between mindfulness and workplace spirituality, as antecedent variables, and safety outcomes, were being mediated by workers' emotional engagement and workers' cognitive engagement was considered. Based on established theories, the antecedent variables were allowed to correlate; and the mediators were also allowed to correlate. However, when drawing the path diagram, the SEM program could not permit the correlation of the mediators on the ground that they were acting as endogenous variables.

The fit indices showed that the hypothesized model fit the data, $\chi^2[1204] = 2475.29$, CMIN/DF = 2.06, CFI = .94, RMSEA = .064 (See Appendix N). However, to maintain the balance between model parsimony and model fit, the hypothesized substantive relationships were tested to obtain a nested model. The results of these tests formed the basis of the nested model.

Hypothesis HA Results

HAo: *There is no statistically significant difference between the sample data's variance-covariance matrix and the generated model-implied variance-covariance matrix.*

HA$_1$:   *There is a statistically significant difference between the sample data's variance-covariance matrix and the generated model-implied variance-covariance matrix.*

A structural path analysis was conducted using IBM SPSS AMOS Version 25 with the covariance matrix and Maximum Likelihood estimations to test the model fit. Incorporated in the model were the antecedent variables, the mediators, and the safety outcome variables. The fit indices showed that the hypothesized model fit the data, $\chi^2[1204] = 2475.29$, CMIN/DF = 2.06, CFI = .94, RMSEA = .064 (See Appendix N). However, the Chi-square statistic as an absolute fit index for testing the closeness of fit between the sample covariance matrix and the fitted covariance matrix, showed a significant value. This could be

because the sample size was fairly large because Chi-square is sensitive to sample size. When sample size is large, models tend to be evaluated as incorrect (e.g., overemphasizing differences in model fit) (Bentler and Bonnet, 1980). However, an alternative absolute fit index, CMIN(χ^2)/DF, which is less sensitive to sample size, indicated model fit at 2.0 (Wheatson, 1977; Ullman and Bentler, 2003). Other fit indices, such as CFI and RMSEA, are also acceptable.

Therefore, the null hypothesis that stated that there was no statistically significant difference between the sample data's variance-covariance matrix and the generated model-implied variance-covariance matrix was accepted. That is to say that the hypothesized model fits the sample data collected, without using the produced Modification Indices to improve the model fit.

Hypothesis HB Results

HB_o: *There is no statistically significant correlation between mindfulness and workplace spirituality.*

HB_1: *There is a statistically significant correlation between mindfulness and workplace spirituality.*

A Pearson's product-moment correlation analysis was run on the aggregated mean scores of workers' perceived workplace spirituality and mindfulness to test if there was a significant association between workplace spirituality and mindfulness. Results are presented in Table 6.

The results showed there was a strong positive correlation between workers' perceived workplace spirituality and mindfulness, $r(251) = .81$, $p < .01$, with mindfulness and workplace spirituality explaining $(.805)^2$ per cent or 65% variation in each other. Therefore, the null hypothesis was rejected and the alternative hypothesis failed not to be rejected.

Table 6

Correlation Between MND and WPS

		WPS	MND
WPS	Pearson Correlation	1	.805[**]
	Sig. (2-tailed)		.000
	N	251	251
MND	Pearson Correlation	.805[**]	1
	Sig. (2-tailed)	.000	
	N	251	251

Note. WPS = workplace spirituality; MND = mindfulness.
**. Correlation is significant at the .01 level (2-tailed).

Hypothesis HC Results

HC$_o$:   There is no statistically significant correlation between workers' emotional job

engagement and workers' cognitive job engagement.

HC$_1$:   There is a statistically significant correlation between workers' emotional job

engagement and workers' cognitive job engagement.

A Pearson's product-moment correlation analysis was run on the aggregated mean

scores of workers' perceived cognitive engagement and emotional engagement to test if there

was a significant association between them. The results are presented in Table 7.

Table 7

Correlation Between WCE and WEE

		WCE	WEE
WCE	Pearson Correlation	1	.702[**]
	Sig. (2-tailed)		.000
	N	251	251
WEE	Pearson Correlation	.702[**]	1
	Sig. (2-tailed)	.000	
	N	251	251

Note. WCE = workers' cognitive engagement; WEE = workers' emotional engagement.
**. Correlation is significant at the .01 level (2-tailed).

The results showed there was a strong positive correlation between workers'

perceived cognitive engagement and emotional engagement, $r(251) = .70, p < .01$, with

workers' cognitive engagement and workers' emotional engagement explaining 49%

variation in each other. Therefore, the null hypothesis is rejected and the alternative

hypothesis fails not to be rejected.

Hypotheses HD and HE Results

HD_0:   *There are no statistically significant relationships between mindfulness and safety*

   outcomes (safety compliance, safety participation, and injury frequency).

HD_1:   *There are statistically significant relationships between mindfulness and safety*

   outcomes (safety compliance, safety participation, and injury frequency).

HE_0:   *There are no statistically significant relationships between workplace spirituality and*

   safety outcomes (safety compliance, safety participation, and injury frequency).

HE_1:   *There are statistically significant relationships between workplace spirituality and*

   safety outcomes (safety compliance, safety participation, and injury frequency).

SEM was performed to test if there were significant relationships between

mindfulness and each of the safety outcomes (see Appendix Q). This was accomplished by

testing the direct effects between the antecedent variables and the safety outcome variables,

without putting the moderating variables into the model. Figure 8 shows the standardized

path estimates of the direct relationship effects between the antecedent variables and safety

outcome variables.

The standardized path estimates, shown in Figure 8, indicate support for Hypothesis

HD_1, because the direct paths linking mindfulness to safety compliance, safety participation,

and injury frequency were all strong and statistically significant (β = .42, .81, and -.24)

respectively at $p < .001$. This implies that workers' perceived levels of mindfulness can be

used to predict the three safety outcomes respectively - safety compliance, safety

participation, and injury frequency.
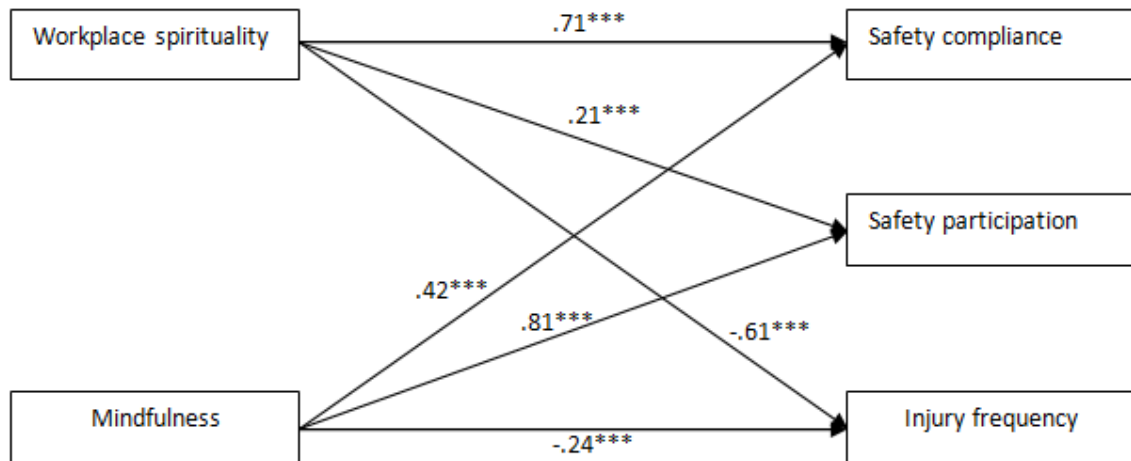
Figure 8. Path diagram of the direct relationship between the antecedent variables and safety outcome variables. Completely standardized maximum likelihood parameter estimates. *** $p < 0.001$ (two-tailed).

The direct effect estimates of mindfulness on safety compliance and safety participation are positive, and the direct effect estimate of mindfulness on injury frequency is negative - a result that is congruent with that of correlation results. This implies that workers who perceived high levels of mindfulness were more likely to participate in safety programs and comply with safety rules. Similarly, workers who perceived high levels of mindfulness had lower propensities to suffer or report workplace injuries. Hypothesis HD_1 is therefore supported; so, the null hypothesis is rejected and the alternative hypothesis fails not to be rejected.

The standardized path estimates, shown in Figure 8, also indicate support for Hypothesis HE_1 in that the direct paths linking workplace spirituality to safety compliance, safety participation, and injury frequency were all strong and statistically significant ($\beta = .71$, .21, and -.61) respectively at $p < .001$ in all cases. This implies that workers' perceived levels of workplace spirituality can be used to predict the three safety outcomes respectively - safety compliance, safety participation, and injury frequency.

The direct effect estimates of workplace spirituality on safety compliance and safety participation are positive, and the direct effect estimate of workplace spirituality on injury frequency is negative, a result that is also congruent with that of correlation results. This implies that workers who perceived a high level of workplace spirituality were more likely to participate in safety programs and comply with safety rules. Similarly, workers who perceived high levels of workplace spirituality had lower propensities to suffer or report workplace injuries. Hypothesis HE1 is therefore supported; so, the null hypothesis is rejected and the alternative hypothesis fails to be rejected.

The presence of significant direct effects between mindfulness, workplace spirituality and safety outcomes is a basic requirement for conducting mediation analyses that follows.

Hypotheses HF, HG, HH, HI, HJ, and HK Results

HFo: *The relationship between mindfulness and safety compliance is not mediated by workers' cognitive job engagement.*

HF$_1$: *The relationship between mindfulness and safety compliance is at least partially mediated by workers' cognitive job engagement.*

HGo: *The relationship between mindfulness and safety participation is not mediated by workers' cognitive job engagement.*

HG$_1$: *The relationship between mindfulness and safety participation is at least partially mediated by workers' cognitive job engagement.*

HHo: *The relationship between mindfulness and injury frequency is not mediated by workers' cognitive job engagement.*

HH$_1$: *The relationship between mindfulness and injury frequency is at least partially mediated by workers' cognitive job engagement.*

HIo: *The relationship between workplace spirituality and safety compliance is not mediated by workers' emotional job engagement.*

HI_1:   *The relationship between workplace spirituality and safety compliance is at least*

         partially mediated by workers' emotional job engagement.

HJo: *The relationship between workplace spirituality and safety participation is not*

         mediated by workers' emotional job engagement.

HJ_1:   *The relationship between workplace spirituality and safety participation is at least*

         partially mediated by workers' emotional job engagement.

HKo: *The relationship between workplace spirituality and injury frequency is not mediated*

         by workers' emotional job engagement.

HK_1:   *The relationship between workplace spirituality and injury frequency is at least*

         partially mediated by workers' emotional job engagement.

These mediation tests were carried out by introducing workers' cognitive and emotional engagement variables as mediators into the model. Feedbacks within the system were prevented by removing the covariance link between the antecedents. Other links that connected the mediators in parallel were also removed. The AMOS path diagram is shown in Appendix R.

The standardized path estimates in Figure 9 indicate that workplace spirituality and mindfulness positively, strongly and significantly predicted emotional engagement and cognitive engagement respectively ($\beta = .70$ & $.86$ at $p < .001$). This means that workers who perceived high workplace spirituality and mindfulness respectively also reported high emotional engagement and cognitive engagement.

Figure 9 further shows that although workplace spirituality significantly predicted emotional engagement, emotional engagement significantly predicted only safety participation, with a corresponding decrease in the magnitude of the direct relationship between workplace spirituality and safety participation from $\beta = .21$ (when emotional

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engagement as a mediator had not been introduced; see Figure 8) to β = .10 (after the

mediator was introduced).
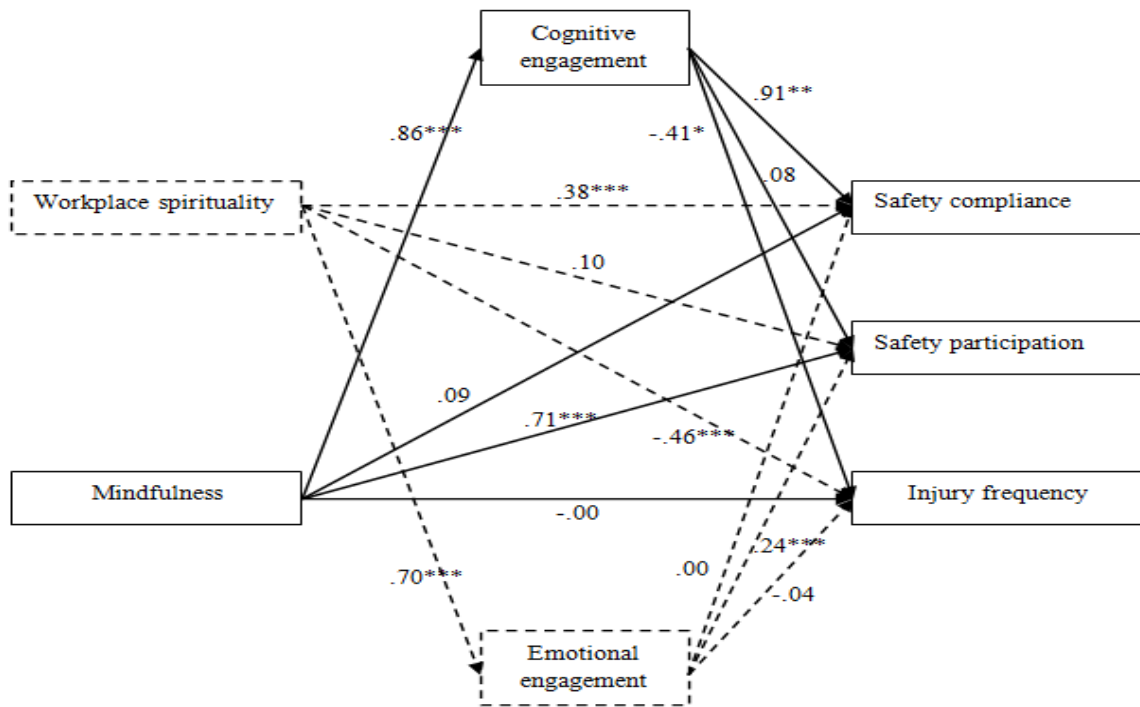
Figure 9. Path diagram of the mediating effects of cognitive engagement on the relationship
of mindfulness and safety outcomes and the mediating effects of emotional engagement on
the relationship of workplace spirituality and safety outcomes. Using completely standardized
maximum likelihood parameter estimates.
To prevent the problems of feedback and masking effects caused by multiple mediators, links
between the antecedents were eliminated.
* $p < .05$ (two-tailed), ** $p < .01$ (two-tailed), *** $p < .001$ (two-tailed).

This suggests that emotional engagement could be a mediator of the relationship

between workplace spirituality and safety participation. However, this claim could not be

fully substantiated at this stage pending results of the joint tests of indirect effects using the

bias-corrected bootstrapping method.

Conversely, despite the finding that workplace spirituality predicted workers'

emotional engagement, emotional engagement did not predict safety compliance or injury

frequency. In fact, the relationship between emotional engagement and safety compliance

was zero (β = .00), while a weak, negative, insignificant relationship existed between

emotional engagement and injury frequency (β = -.04). At the same time, the direct effects of

workplace spirituality on safety compliance and injury frequency after emotional engagement had been introduced into the model as a mediator still remained significant at $\beta = .38$ and $\beta = -.46$, respectively. This suggests workplace spirituality directly and significantly influenced safety compliance and injury frequency without being mediated by workers' emotional engagement. However, this claim could only be fully substantiated based on the results of the joint tests of indirect effects using bias-corrected bootstrapping method.

Regarding the relationship between workers' cognitive engagement and safety outcomes, workers' cognitive engagement strongly predicted safety compliance ($\beta = .91$). At the same time, the formerly positive, strong and significant direct relationship ($\beta = .42$, see Figure 8) between mindfulness and safety compliance decreased to an insignificant value of ($\beta = .09$). There was also a strong, negative, and significant relationship between emotional engagement and injury frequency ($\beta = -.41$); similarly, the initially strong, significant, direct relationship between mindfulness and injury frequency completely vanished ($\beta = - .00$).

These scenarios suggest that emotional engagement mediated the relationship between mindfulness and safety compliance; emotional engagement also mediated the relationship between mindfulness and injury frequency. Similarly, this claim could only be substantiated based on the results of the joint tests of indirect effects using bias-corrected bootstrapping method.

At the same time, while mindfulness positively and strongly predicted workers' cognitive engagement, workers' cognitive engagement did not predict safety participation ($\beta = .08$). The direct effect of mindfulness on workers' participation still remained strongly significant at ($\beta = .71$) after the introduction of workers' cognitive engagement as a mediator. Therefore, this suggests that the positive relationship between mindfulness and safety participation was more direct than being mediated by workers' cognitive engagement.

However, the presence of mediation or lack of it could not be established at this stage, pending the results of bias-corrected bootstrapping test of joint indirect effects.

Tests of Mediating Effects of WCE on the Relationship of MND and Safety Outcomes

Mediating effects of WCE on the relationship of mindfulness and safety outcomes were conducted using AMOS Version 25 software to test the indirect effects. Maximum Likelihood estimates were carried out using 2000 bootstrap samples at a 95% bias-corrected confidence interval. The AMOS output results for the direct and indirect effects after the introduction of the mediators is shown in Appendix S. The results of the indirect effects and the direct effects before and after the introduction of WCE into the model are presented in Tables 8, 9 and 10.

Table 8

Mediating Effect of WCE on the Relationship of MND and Safety Compliance

Effects	Relationships	p-value	Significance
Direct effects before introducing WCE into the model.	SC <--- MND	***	Sig.
Indirect effect through WCE.	SC <--- WCE <--- MND	.001	Sig.
Direct effects after introducing WCE into the model.	SC <--- MND	.611	Not sig.
	Inference		Full mediation

Note. WCE = Workers' cognitive engagement; MND = mindfulness; SC = Safety Compliance.
*** $p < .001$

Table 8 shows that the indirect effect of workers' cognitive engagement on the relationship between mindfulness and safety compliance was significant ($p = .001$), and the formerly significant direct relationship ($p = .001$) between mindfulness and safety compliance, before the mediator was introduced into the model, became insignificant ($p = .611$) after the mediator was introduced into the model. This implies that workers' cognitive job engagement mediated the relationship of mindfulness and safety compliance. Therefore the null hypothesis HF_0 is rejected and the alternative hypothesis, HF_1, fails to be rejected.

Table 9

Mediating Effect of WCE on the Relationship of MND and Safety Participation

Effects	Relationships	*p*-value	Significance
Direct effects before introducing WCE into the model.	SP <--- MND	***	Sig.
Indirect effect through WCE.	SP <---WCE<--- MND	.637	Not sig.
Direct effects after introducing WCE into the model.	SP <--- MND	.001	Sig.
	Inference		No mediation

WCE = Workers' cognitive engagement; MND = mindfulness; SP = Safety Participation.
*** *p* < .001.

Table 9 shows that the indirect effect of workers' cognitive engagement on the relationship between mindfulness and safety participation was not significant (*p* = .637), and the formerly significant direct relationship (*p* = .001) between mindfulness and safety compliance, before the mediator was introduced into the model, still remained significant (*p* = .001) after the mediator was introduced into the model. This implies that workers' cognitive job engagement did not mediate the relationship between mindfulness and safety participation. Therefore the null hypothesis HG_0 is accepted and the alternative hypothesis, HG_1 fails to be accepted.

Table 10

Mediating Effect of WCE on the Relationship of MND and Injury Frequency

Effects	Relationships	*p*-value	Significance
Direct effects before introducing WCE into the model.	IF <--- MND	***	Sig.
Indirect effect through WCE.	IF <--- WCE <--- MND	.001	Sig.
Direct effects after introducing WCE into the model.	IF <--- MND	.957	Not sig.
	Inference		Full mediation

Note. WCE = Workers' cognitive engagement; MND = mindfulness; IF = Injury Frequency.
*** *p* < .001.

Table 10 shows that the indirect effect of workers' cognitive engagement on the relationship between mindfulness and injury frequency was significant (*p* = .001), and the formerly significant direct relationship (*p* = .001) between mindfulness and injury frequency,

before the mediator was introduced into the model, became insignificant (p = .957) after the

mediator was introduced into the model. This implies that workers' cognitive job engagement

mediated the relationship of mindfulness and injuries. Therefore the null hypothesis HH_0 is

rejected and the alternative hypothesis, HH_1, fails to be rejected

Tests of Mediating Effects of WEE on the Relationship of WPS and Safety Outcomes

Mediating effects of WEE on the relationship of workplace spirituality and safety

outcomes were conducted using AMOS Version-25 software to test the indirect effects.

Maximum Likelihood estimates were carried out using 2000 bootstrap samples at a 95% bias-

corrected confidence interval. The AMOS output results for the direct and indirect effects

after the introduction of the mediators is shown in Appendix S. The results of the indirect

effects and the direct effects before and after the introduction of WEE as a mediator into the

model are presented in Tables 11, 12 and 13.

Table 11

Mediating Effect of WEE on the Relationship of WPS and Safety Compliance

Effects	Relationship	*p*-value	Significance
Direct effects before introducing WEE into the model.	SC <--- WPS	***	Sig.
Indirect effect through WEE.	SC <--- WEE <--- WPS	.649	Not Sig
Direct effects after introducing WEE into the model.	SC <--- WPS	.006	Sig
	Inference		No mediation

Note. WEE = Workers' emotional engagement; WPS = workplace spirituality; SC = Safety Compliance.
*** $p < .001$.

Table 12

Mediating Effect of WEE on the Relationship of WPS and Safety Participation

Effects	Relationship	*p*-value	Significance
Direct effects before introducing WEE into the model.	SP <--- WPS	***	Sig.
Indirect effect through WEE.	SP <---WEE <--- WPS	.058	Not Sig
Direct effects after introducing WEE into the model.	SP <--- WPS	.482	Not sig.
	Inference		No mediation

Note. WEE = Workers' emotional engagement; WPS = workplace spirituality; SP = Safety Participation.
*** *p* < .001.

Table 13

Mediating Effect of WEE on the Relationship of WPS and Injury Frequency

Effects	Relationship	*p*-value	Significance
Direct effects before introducing WCE into the model.	IF <--- WPS	***	Sig.
Indirect effect through WEE.	IF <--- WEE <--- WPS	.677	Not sig
Direct effects after introducing WEE into the model.	IF <--- WPS	.002	Sig
	Inference		No mediation

Note. WEE = Workers' emotional engagement; WPS = workplace spirituality; IF = Injury Frequency.
*** *p* < .001

Tables 11, 12 and 13 indicate that workers' emotional engagement did not mediate the established direct relationship between workplace spirituality and any of the safety outcomes - safety compliance, safety participation and injury frequency. In all cases, the indirect effect between workplace spirituality and the safety outcomes, through workers' emotional engagement, was not significant. Therefore, the null hypotheses HIo, HJo, and HKo that WEE does not mediate the relationship between workplace spirituality and the safety outcomes are accepted.

Hypotheses HL, HM, HN, HO, HP, and HQ Results

HLo: *The relationship between mindfulness and safety compliance is not mediated by workers' emotional job engagement.*

HL₁: *The relationship between mindfulness and safety compliance is at least partially mediated by workers' emotional job engagement.*

HMo: *The relationship between mindfulness and safety participation is not mediated by workers' emotional job engagement.*

HM₁: *The relationship between mindfulness and safety participation is at least partially mediated by workers' emotional job engagement.*

HNo: *The relationship between mindfulness and injury frequency is not mediated by workers' emotional job engagement.*

HN₁: *The relationship between mindfulness and injury frequency is at least partially mediated by workers' emotional job engagement.*

HOo: *The relationship between workplace spirituality and safety compliance is not mediated by workers' cognitive job engagement.*

HO₁: *The relationship between workplace spirituality and safety compliance is at least partially mediated by workers' cognitive job engagement.*

HPo: *The relationship between workplace spirituality and safety participation is not mediated by workers' cognitive job engagement.*

HP₁: *The relationship between workplace spirituality and safety participation is at least partially mediated by workers' cognitive job engagement.*

HQo: *The relationship between workplace spirituality and injury frequency is not mediated by workers' cognitive job engagement.*

HQ₁: *The relationship between workplace spirituality and injury frequency is at least partially mediated by workers' cognitive job engagement.*

These mediation tests were carried out by introducing workers' cognitive and emotional engagement variables as mediators into the model. Feedbacks within the system were prevented by removing the covariance link between the antecedents. Other links that

connected the mediators in parallel were also removed. The AMOS path diagram is shown in Appendix T.

The standardized path estimates in Figure 10 showed that workplace spirituality and mindfulness positively, strongly and significantly predicted workers' cognitive engagement and workers' emotional engagement respectively (β = .85 & .71). This means that workers who perceived high workplace spirituality and mindfulness also reported high cognitive engagement and emotional engagement respectively.
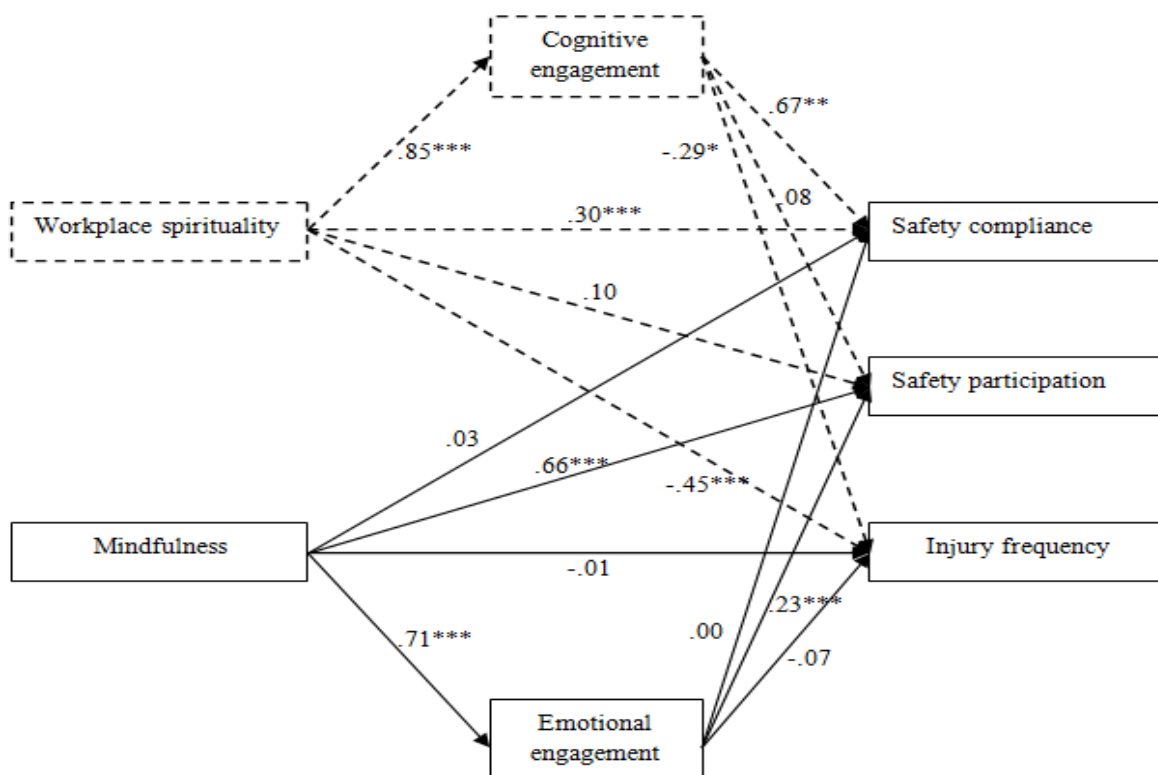
Figure 10. Path diagram of the mediating effects of cognitive engagement on the relationship of workplace spirituality and safety outcomes and the mediating effects of emotional engagement on the relationship of mindfulness and safety outcomes. Using completely standardized maximum likelihood parameter estimates.
To prevent the problems of feedback and masking effects caused by multiple mediators, links between the antecedents were eliminated.
* *p* <.05 (two-tailed), ** *p* <.01 (two-tailed), *** *p* <.001 (two-tailed).

Figure 10 shows that although mindfulness significantly predicted workers' emotional engagement, emotional engagement strongly and significantly predicted only safety

participation (β = .23), with a corresponding decrease in the magnitude of the direct

relationship between mindfulness and safety participation from β = .81 (when emotional

engagement as a mediator had not been introduced, see Figure 8) to β = .66 (after the

mediator was introduced). However, the direct effect estimate after the introduction of

workers' emotional engagement, as mediator, still remained significant. This suggests that

emotional engagement could be a partial mediator of the relationship between workplace

spirituality and safety participation. However, this claim could not be fully substantiated at

this stage pending results of the joint tests of indirect effects using bias-corrected

bootstrapping method.

Conversely, despite the finding that mindfulness predicted workers' emotional

engagement, workers' emotional engagement did not predict safety compliance or injury

frequency. In fact, the relationship between emotional engagement and safety compliance

was zero (β = .00), while a very weak negative and insignificant relationship exist between

emotional engagement and injury frequency (β = -.07). At the same time, the direct effects of

mindfulness on safety compliance and injury frequency, after emotional engagement had

been introduced into the model as a mediator, was not significant at β = .03 and β = -.01,

respectively. This suggests that mindfulness directly and significantly influenced safety

compliance and injury frequency without being mediated by workers' emotional engagement.

Again, this claim could only be fully substantiated based on the results of the joint tests of

indirect effects using bias-corrected bootstrapping method.

Regarding the relationship between workers' cognitive engagement and safety

outcomes, workers' cognitive engagement strongly predicted safety compliance (β = .67). At

the same time, the formerly positive, strong, significant, direct relationship (β = .71, see

Figure 8) between workplace spirituality and safety compliance decreased to a significant

value of (β = .30). There was also a strong, negative, significant relationship between

workers' cognitive engagement and injury frequency (β = -.29); however, the initially strong, significant direct relationship (β = -.61, see Figure 8) between workplace spirituality and injury frequency decreased, but still remained significant (β = - .45). These scenarios suggest that workers' cognitive engagement partially mediated the relationship between workplace spirituality and safety compliance, and the relationship between workplace spirituality and injury frequency. This notwithstanding, the presence of mediation or lack of it could not be fully established at this stage pending the results of bias-corrected bootstrapping test of joint indirect effects.

At the same time, while workplace spirituality positively and strongly predicted workers' cognitive engagement, cognitive engagement did not predict safety participation (β = .08). This suggests that the previously established positive relationship between mindfulness and safety participation is not mediated by workers' cognitive engagement. However, this could only be fully confirmed by the results of the bias-corrected bootstrapping test of joint indirect effects that followed.

Tests of Mediating Effects of WCE on the Relationship of WPS and Safety Outcomes

Mediating effects of WCE on the relationship of workplace spirituality and safety outcomes were conducted using AMOS Version-25 software to test the indirect effects. Maximum Likelihood estimates were carried out using 2000 bootstrap samples at a 95% bias-corrected confidence interval. The AMOS output results for the direct and indirect effects after the introduction of the mediators is shown in Appendix U. The results of the indirect effects and the direct effects before and after the introduction of WEE as a mediator into the model are presented in Tables 14, 15 and 16.

Table 14

Mediating Effect of WCE on the Relationship of WPS and Safety Compliance

Effects	Relationship	*p*-value	Significance
Direct effects before introducing WCE into the model.	SC <--- WPS	***	Sig.
Indirect effect through WCE.	SC <--- WCE <--- WPS	.001	Sig.
Direct effects after introducing WCE into the model.	SC <--- WPS	.014	Sig.
	Inference		Partial mediation

Note. WCE = Workers' cognitive engagement; WPS = Workplace spirituality; SC = Safety Compliance.
*** $p < .001$.

Table 14 shows the indirect effect of workers' cognitive engagement on the

relationship between workplace spirituality and safety compliance was significant ($p = .001$),

and the formerly significant direct relationship ($p = .001$) between workplace spirituality and

safety compliance, before the mediator was introduced into the model, still remained

significant ($p = .014$) (but less significant), after the mediator was introduced into the model.

This implies that workers' cognitive job engagement partially mediated the relationship of

workplace spirituality and safety compliance. Therefore the null hypothesis HO_0 is rejected

and the alternative hypothesis, HO_1, fails to be rejected.

Table 15

Mediating Effect of WCE on the Relationship of WPS and Safety Participation

Effects	Relationship	*p*-value	Significance
Direct effect before introducing WCE into the model.	SP <--- WPS	***	Sig.
Indirect effect through WCE.	SP <---WCE <--- WPS	.699	Not sig.
Direct effect after introducing WCE into the model.	SP <--- WPS	.471	Not sig.
	Inference		No mediation

Note. WCE = workers' cognitive engagement; WPS = workplace spirituality; Safety Participation.
*** $p < .001$.

Table 15 shows the indirect effect of workers' cognitive engagement on the relationship

between workplace spirituality and safety participation was not significant ($p = .699$). This

implies that workers' cognitive job engagement did not mediate the relationship between

workplace spirituality and safety participation. Therefore the null hypothesis HP_0 is accepted

and the alternative hypothesis, HP_1, fails to be accepted.

Table 16

Mediating Effect of WCE on the Relationship of WPS and Injury Frequency

Effects	Relationship	*p*-value	Significance
Direct effect before introducing WCE into the model.	IF <--- WPS	***	Sig.
Indirect effect through WCE.	IF <--- WCE <--- WPS	.021	Sig.
Direct effect after introducing WCE into the model.	IF <--- WPS	.002	Sig
	Inference		Partial mediation

Note. WCE = workers' cognitive engagement; WPS = workplace spirituality; IF = Injury Frequency.
*** $p < .001$.

Table 16 shows the indirect effect of workers' cognitive engagement on the relationship

between workplace spirituality and injury frequency was significant ($p = .021$), and the

formerly significant direct relationship ($p = .001$) between workplace spirituality and injury

frequency, before the mediator was introduced into the model, still remained significant ($p =$

.002), after the mediator was introduced into the model. This implies that workers' cognitive

job engagement partially mediated the relationship of workplace spirituality and injuries.

Therefore the null hypothesis, HQ_0, is rejected and the alternative hypothesis, HQ_1, fails to be

rejected

Tests of Mediating Effects of WEE on the Relationship of MND and Safety Outcomes

Mediating effects of WEE on the relationship of mindfulness and safety outcomes

were conducted using AMOS version-25 software to test the indirect effects. Maximum

Likelihood estimates were carried out using 2000 bootstrap samples at a 95 percent bias-

corrected confidence interval. The AMOS output results for the direct and indirect effects

after the introduction of the mediators is shown in Appendix U. The results of the indirect

effects and the direct effects before and after the introduction of WEE as a mediator into the

model are presented in Tables 17, 18 and 19.

Table 17

Mediating Effect of WEE on the Relationship of MND and Safety Compliance

Effects	Relationship	*p*-value	Significance
Direct effects before introducing WEE into the model.	SC <--- MND	***	Sig.
Indirect effect through WEE.	SC <--- WEE <--- MND	.390	Not sig.
Direct effects after introducing WEE into the model.	SC <--- MND	.919	Not sig.
	Inference		No mediation

Note. WEE = workers' emotional engagement; MND = mindfulness; SC = Safety Compliance.
*** *p* < .001.

Table 18

Mediating Effect of WEE on the Relationship of MND and Safety Participation

Effects	Relationship	*p*-value	Significance
Direct effect before introducing WEE into the model.	SP <--- MND	***	Sig.
Indirect effect through WEE.	SP <---WEE <--- MND	.054	Not sig.
Direct effect after introducing WEE into the model.	SP <--- MND	.001	Sig.
	Inference		No mediation

Note. WEE = workers' emotional engagement; MND = mindfulness; SP = Safety Participation.
*** *p* < .001.

Table 19

Mediating Effect of WEE on the Relationship of MND and Injury Frequency

Effects	Relationship	*p*-value	Significance
Direct effect before introducing WEE into the model.	IF <--- MND	***	Sig.
Indirect effect through WEE.	IF <--- WEE <--- MND	.906	Not sig
Direct effect after introducing WEE into the model.	IF <--- MND	.830	Not sig.
	Inference		No mediation

Note. WEE = workers' emotional engagement; MND = mindfulness; IF = Injury Frequency.
*** *p* < .001.

Tables 17, 18 and 19 indicate that workers' emotional engagement did not mediate the established direct relationship between mindfulness and any of the safety outcomes - safety compliance, safety participation and injury frequency. In all cases, the indirect effects

between mindfulness and the safety outcomes, through workers' emotional engagement, were not significant. Therefore, the null hypotheses (HLo, HMo, HNo) that WEE does not mediate the relationship between mindfulness and the safety outcomes are accepted

An Alternative Structural Nested Model

Based on the tests of hypothesized full mediation model, in order to produce a nested model, the links between the antecedent variables and the three safety outcomes through workers' emotional engagement were removed because workers' emotional engagement did not mediate the relationship between the antecedents and the safety outcomes. Similarly, the direct paths for fully mediated relationships were removed. Since the relationship between mindfulness and safety participation was not fully mediated, this originally significant direct path was retained.
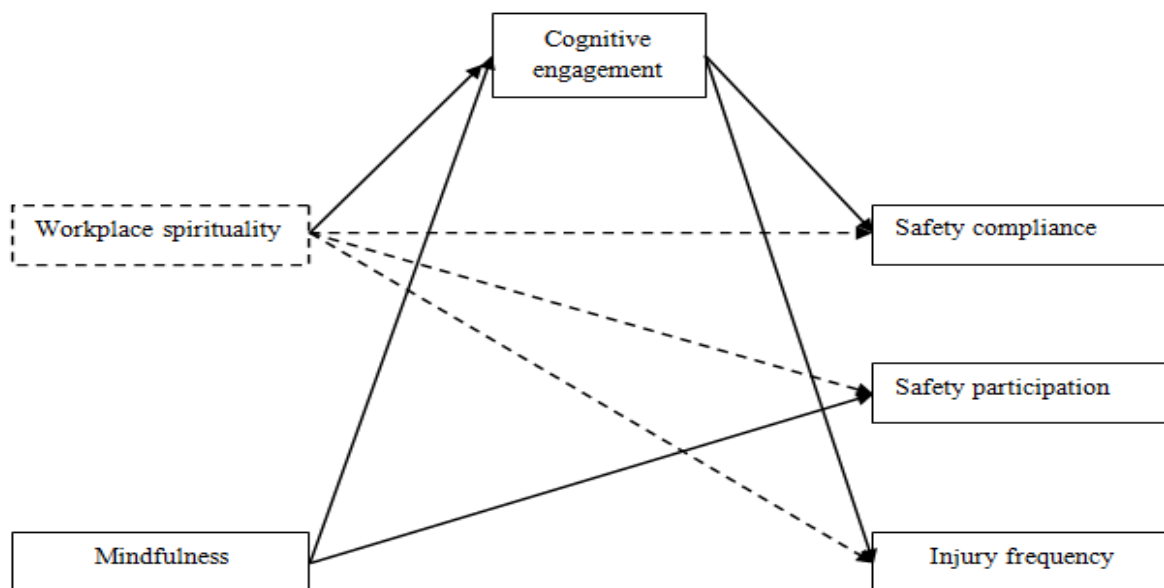
Figure 11. An alternative structural model.

Based on the tests of hypothesized full mediation model, in order to produce a nested model, the links between the antecedent variables and the three safety outcomes through workers' emotional engagement were removed because workers' emotional engagement did not mediate the relationship between the antecedents and the safety outcomes. Similarly, the direct paths for fully mediated relationships were removed. Since the relationship between

mindfulness and safety participation was not fully mediated, this originally significant direct path was retained.

This alternative (constrained) model was tested using SEM. The results showed that the alternative model exhibited an absolute good goodness of fit $\chi^2[932] = 2108$, CMIN/DF = 2.27, CFI = .93, RMSEA = .07; relative to the hypothesized model, this nested model exhibited a significant increase in goodness-of-fit $\Delta\chi^2(268, N = 251) = 332.0$, p < .001.

Effect Size and Power of Test of the Nested Models

The power to detect differences between the nested models was calculated using MacCallum, Browne, and Cai's (2006) approach. In this case, the effect size was first calculated as the difference between the products of the degrees-of-freedom and the RMSEA values of the two competing models. That is, effect size = [(degree-of-freedom of the alternative model X its $RMSEA^2$) – (degree-of-freedom of the hypothesized model X its $RMSEA^2$)] (MacCallum et al., 2006).

Extracting these values from Table 5,

Effect size = $[937 \times (.07)^2 - 1204 \times (.06)^2]$ = .25.

The effect size of .25 means that although there was a significant model-fit difference between the hypothesized model and the alternative constrained model, this difference had a small-to-medium effect (Cohen, 1988 & 1992).

Non Centrality Parameter (NCP) = [sample size – 1] x effect size (MacCallum et al., 2006).

NCP = (251 – 1) x 0.25 = 63.0

Using G*Power 3.1, (Appendix P) and entering NCP = 63, $df = 268$ (the difference between Chi-square values of the competing models, 2475 – 2108) at .05 alpha level, the Power of Test score was calculated to be .80. This implies there was an 80% chance of detecting a difference of fit between the nested models in terms of RMSEA.

Summary

Tests of direct substantive relationships showed that there were direct appropriate relationships between the two antecedent variables (spirituality and mindfulness) and the safety outcomes investigated. Two of the safety outcomes (safety participation and safety compliance) had appropriate positive relationships with the antecedents; the other safety outcome (injury frequency) had an appropriate negative relationship with the antecedents.

However, the results of mediation tests revealed only WCE exerted mediation effects in this model, while WEE did not exert any mediation effects. Among the variables mediated, WCE partially mediated the relationships between workplace spirituality and safety compliance and injury frequency and more fully mediated the relationships between mindfulness and safety compliance and injury frequency. However, relationships between the antecedent variables and safety participation were not mediated. Possible reasons for the pattern of results observed on this chapter are discussed in Chapter five, general discussion and conclusion.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

Introduction

The purpose of this study was to develop a framework (model) for linking the

organizational and psychological constructs of workplace spirituality and mindfulness, as

antecedents, to selected safety outcomes; and to investigate how these relationships are

mediated by workers' emotional and cognitive job engagement. This involved testing the

direct relationship between the antecedent variables – workplace spirituality and mindfulness

- and safety outcomes, as well as testing the mediating roles of workers' cognitive and

emotional job engagements on the relationships between the antecedent variables and safety

outcomes.

This chapter presents a general discussion on the study's findings. It is broadly divided

into sections that cover theoretical contributions, managerial and professional implications,

the study's limitations, future research recommendations, and conclusion.

General Discussion

There is a paucity of research addressing the process through which workplace

spirituality and mindfulness, respectively, can be used to improve human safety performance

for organizations. Research in this area appears to be hampered by lack of a coherent

framework linking these emergent organizational and physiological constructs to specific

safety outcomes. In recognition of the potential usefulness of mindfulness and the need for

investigating other organizational safety constructs, apart from safety climate and safety

management systems, various researchers (e.g., DeJoy, 2005; Huang et al., 2017; Klockner,

2013) have called for investigations into the plausibility of more integrated organizational

and psychological approaches to managing workplace safety.

This present study responds to this call by developing a framework for linking organizational and psychological constructs of workplace spirituality and mindfulness respectively, through the mediating roles of workers' emotional engagement and workers' cognitive engagement, to safety outcomes.

This framework is based on the theories of organizational behavior and work performance. Some major attributes of this framework are worth noting: the incorporation of emergent organizational safety construct of workplace spirituality and the psychological construct of mindfulness in tandem into the model; the inclusion of meditational role for workers' emotional job engagement and workers' cognitive job engagement based on Kahn's (1990) engagement perspective; and the inclusion of both perceptive objective (injury frequency) and subjective safety performance information into the framework (safety compliance and safety performance).

This framework for assessing human performance improvement is valuable because it allows for a pragmatic and systematic assessment of some unique organizational and psychological constructs, towards the goal of improving human safety performance. These performance improvements can then be linked to different types of safety outcomes.

The results of this study show workplace spirituality strongly and significantly predicts safety outcomes - safety compliance, safety participation, and injury frequency. These results are consistent with other research investigating the relationship between workplace spirituality and non-safety performance outcomes (e.g., Ajala, 2013; Chawla & Guda, 2010; Mumtaz, 2017; Wainaina, Iravo & Waititu, 2014).

The results of this study also show mindfulness strongly and significantly predicts safety outcomes - safety compliance, safety participation, and injury frequency. These results are also consistent with other research investigating the relationship between mindfulness,

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safety performance outcomes, and non-safety performance outcomes (e.g., Klockner, 2013 Reason, 2000; Weick & Sutcliffe, 2007).

In terms of the relationship between the antecedent variables and the mediators, these research findings show workplace spirituality strongly and significantly predicts the perceived levels of cognitive and emotional workers' engagement. Similarly, mindfulness strongly and significantly predicts cognitive and emotional workers' engagement. These findings are also congruent with those of similar research that found a predictive relationship between organizational and personal factors and levels of workers' engagement (e.g., Rich et al., 2010; Wachter & Yorio, 2014).

In terms of the relationship between the mediators and the safety outcomes, as expected, workers' cognitive engagement significantly predicts safety compliance and injury frequency at $p = .01$ and $p = .05$, respectively. In line with the proposed theoretical model, it means workers who are cognitively engaged are more likely to comply with safety rules and experience fewer accidents than those who are not cognitively engaged. These finding are consistent with similar research results (Griffin and Neal, 2000; Neal et al. 2009; Vinodkumar & Bhasi, 2010; Wachter & Yorio, 2014), where motivational and engagement factors have been found to predict safety compliance and quantitative measures of safety outcomes.

While cognitive engagement predicts safety compliance and injury frequency, it is important to note in this study, emotional engagement only predicts safety participation. This tends to underscore the relationship between emotional engagement and organizational citizenship behavior. These findings are also consistent with similar research where workers' safety motivation, safety training and skill have predicted safety participation (Griffin & Neal, 2000; Neal et al. 2009; Vinodkumar & Bhasi, 2010). Considering the voluntary nature of workers' participation in safety activities, unlike workers' safety compliance which is

compulsory, these studies suggest workers exhibit organizational citizenship behavior of participating in safety activities when they perceive their organization is interested in their emotional and general well-being.

The relationship between workplace spirituality and two of the safety outcomes, safety compliance and injuries, is partially mediated by workers' cognitive job engagement. This is partially consistent with perhaps the only study that has specifically investigated the mediating roles of cognitive engagement and emotional engagement on safety performance outcomes (e.g., Wachter & Yorio, 2014). It also remotely supports other research that has established the mediating role of engagement on organizational outcomes (e.g., Rich et al., 2010).

The relationship between mindfulness and safety compliance and injuries are also mediated by workers' cognitive engagement. This finding is also consistent with other research results linking lack of workers' cognitive engagement to industrial and vehicular accidents (e.g., Larson & Merritt, 1991; Reason, 1979; Wallace & Vodanovich, 2003) and patient safety (Gawande, Studdert, Orav, Brennan & Zinner, 2003).

However, while cognitive engagement fully mediates the relationship between mindfulness and two of the safety outcomes (safety compliance and injury frequency), cognitive engagement only partially mediates the relationship between workplace spirituality and the two safety outcomes. This establishes that cognitive engagement is a stronger mediating mechanism by which psychological factors, (e.g., mindfulness), influence safety outcomes; rather than a mediating mechanism through which organizational factors, such as, workplace spirituality, exert influence on safety outcomes. This supports Wachter and Yorio's (2014) finding that cognitive engagement has a stronger mediating effect than emotional engagement on the relationship between safety management practices and safety outcomes.

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It is noteworthy that the mediating effect of workers' emotional engagement on the relationship of workplace spirituality and safety participation is stronger than the mediating effect of workers' emotional engagement on the relationship of workplace spirituality and the other two safety outcomes – safety compliance and injury frequency. The mediating effect of WEE on the relationship of WPS on safety participation is almost significant at $p = .058$ (see Table 12). This implies that emotional engagement would more likely increase workers' participation in safety activities than increase workers' compliance to safety rules or in reducing injury frequency. This finding is logical because participation in safety activities is voluntary, while compliance to safety rules is mandatory (Neal et al., 2000). It means emotional engagement is needed for workers to voluntarily exhibit the organizational citizenship behavior to participate in safety activities.

However, contrary to expectations and to a previous study (Wachter & Yorio, 2014), emotional engagement did not mediate the relationship between the antecedent variables and the safety outcomes, despite having identified mindfulness and workplace spirituality as strong and significant predictors of workers' emotional engagement. A plausible explanation for this observation may not be far-fetched as these results are examined through the lenses of national job culture and reward systems. The strong positive relationship between mindfulness and workplace spirituality with workers' emotional engagement could be attributed to collectivist, high power distance, and masculine nature of Nigerian society, where worker and employer relationship in this type of society is perceived in moral terms (Hofstede, 1991). This implies workers are morally obliged (i.e., it is their duty) to exhibit emotional engagement in their job and the organization, irrespective of the prevailing working conditions, motivations, or potential results of this emotional engagement. This unflinching collectivistic loyalty is reflected in the comparatively higher mean score of workers' emotional engagement (5.27) over the workers' cognitive engagement score (3.43).

In addition, various motivation theories (e.g., Hertzberg, 1966, Taylor, Mausner, Snyderman, 1959) have suggested that when employees are motivated and engaged through more pay, recognition, and praise, their performance increases. However, empirical evidence suggests that Nigerian workers, especially those at the "sharp-edge," have poor social, technical, and financial working conditions (Okolie & Okoye, 2012). These prevailing working conditions in Nigeria and their resultant disengagement and impact on mindfulness could have been reflected the weak relationship between workers' emotional engagement with both safety compliance and injury rate. This lack of significant relationship between emotional engagement and safety outcome variables prevents emotional engagement to act as a mediator, but allows workplace spirituality and mindfulness to more directly influence safety participation and other safety outcomes.

It is also important to note that while cognitive engagement mediates the relationship between the antecedent variables and safety outcomes, the relationship between the antecedent variables and safety participation was not mediated. Rather, contrary to expectations, there were significant direct paths between the antecedent variables and safety participation. A possible explanation for these phenomena is that the engagement scales did not capture the important dimensions of workers' engagement (Neal et al., 2000). The adapted emotional and cognitive scales appear to be generic in terms of the energy that workers invest in participating in safety activities. If workers had been specifically asked how often they participated in safety compliance and safety participation activities, it could have eliminated the problem of lack of "engagement" with the questions being asked regarding engagement.

Nevertheless, although the relationship between the antecedent variables and worker participation was not mediated by workers' emotional and cognitive engagement, the mediating effect of workers' emotional engagement on the relationship between mindfulness

and safety participation, and the relationship between workplace spirituality and safety participation were nearly significant at $p = .054$ and $p = .058$, respectively. Nigeria recorded a nine-point gain in employee engagement in 2017 (AON, 2017), meaning that in a little while, the mediating effect of emotional engagement on the relationship between workplace spirituality and workers' participation could be significant.

Khan (1990) asserted engaged workers invest their physical, emotional and cognitive energies simultaneously and in different proportions into their job indicating that investment in engagement approaches/types can vary. In line with Khan's assertion, in the Western context, Wachter and Yorio's (2014) found that cognitive engagement and emotional engagement mediate the relationship of safety management practices and safety performance outcomes, with the mediating role of cognitive engagement being stronger than the mediating role of emotional engagement. Similarly, in the sub-Saharan African context, the results of this study show that the mediating role of cognitive engagement is far stronger than the mediating role of emotional engagement, with emotional engagement not mediating any relationships at all.

Finally, on comparing the nested models (e.g., the hypothesized versus the constrained models), results show that the alternative model provides a parsimonious better fit to the sample data than the hypothesized model in terms of the most fundamental absolute fit index, the Chi-square statistic. However, the hypothesized model exhibits a better goodness-of-fit in terms of CMIN/DF, CFI, and RMSEA parameters.

It is worth noting that the hypothesized model has more indicators and observed variables than the constrained alternative model. Given that just adding indicators to a model will cause the Chi-square statistic values to increase and make it difficult to achieve model fit (Hair et al., 2015), it is not surprising, based on Chi-square statistic, that the hypothesized model provides a poorer fit. However, given that the hypothesized model exhibits a better

model-fit in terms of fit indices that correct for model complexity and observed variables (i.e., the CFI and the RMSEA), the hypothesized model represents a better model that fits the population, not just the sample used for estimation in this research.

This scenario tends to perpetuate the long-established debate between model parsimony and model-fit. While it is logically acceptable in parameters estimation that the estimation of parsimonious models are less problematic than the estimation of complex model, it is equally important to note that complex models tend to fit the data better (Mulaik, et al., 1989). However, as the debates rage, Steiger (1990) contends that since it is impossible to define one optimal way of resolving the issue between model parsimony and model-fit, the trade-off between model parsimony and model-fit is left to the choice of the researcher.

Theoretical Contributions

First, this framework is the pioneer study to incorporate in tandem the emergent organizational concepts of workplace spirituality and the psychological concept of mindfulness into any human safety performance improvement framework. Thus, this represents a paradigm shift from popular frameworks that use safety climate and management systems as antecedents of system safety to a framework that recognizes workplace spirituality and mindfulness as distal causes of variability in human safety performance. Furthermore, the results of this research reinforce the notion that some antecedents influence safety outcomes through mediators.

This research also provides an improved understanding of the etiology of workers' job engagement as initiated by Kahn (1990), extended by Rich et al. (2010), and related to accident prevention by Wachter and Yorio (2014). According to Kahn, perceptions of self and work context are the antecedents of psychological conditions of meaningfulness, safety, and availability on which workers' job engagement is founded. Rich et al. (2010) identified value congruence, perceived organizational support, and self-evaluation as antecedents of

engagement and job performance. Wachter and Yorio (2014), on the other hand, established the mediating effects of workers' engagement in safety on the relationships between safety management system practices, total recordable case (TRC) rate and days away, restricted duty, or job transfer (DART) case rate. This research is the first to link the organizational and psychological constructs of workplace spirituality and mindfulness in tandem to safety compliance and safety participation as safety outcomes through Kahn's engagement constructs.

This proposed framework shifts the human safety performance paradigm from reliance on flawed safety management systems (including safety policy and procedures) and safety culture, to recognition that workers need to be mindful and guard against these flaws in these management systems and safety culture. In addition workers prefer working in organizations that encourage human interconnectedness, community life, and expression of inner life. This framework does not necessarily abrogate the previous frameworks or research that have focused on safety climate and management systems as antecedents of safety outcomes (e.g., Griffin & Neal, 2000; Wachter & Yorio, 2014); however, it augments these frameworks by laying a foundation for onward exploration of the concepts of workplace spirituality and mindfulness as they relate to safety systems.

Second, previous research that have investigated the mediated relationships between some organizational constructs and safety outcomes consider safety outcomes as either subjective safety participation and safety compliance (Griffin & Neal, 2000; Vinodkumar & Bhasi, 2010;) or objective safety performance statistics (Wachter & Yorio, 2014). However, this present study's framework considers safety outcomes as consisting of subjective measures (safety compliance and safety performance) and an objective safety statistics measure (injury frequency). Thus, this framework provides a more holistic and encompassing measures of safety outcomes.

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Again, the division of the framework into antecedents, mediators and outcome variables (Griffin & Neal, 2000) provides the basis for distinguishing performances that are related to human safety improvement. Specifically, workplace spirituality and mindfulness were distinguished from safety outcomes and from the workers' emotional job engagement and cognitive job engagement determinants of safety outcomes. Differentiating workplace spirituality and mindfulness from other organizational constructs contained in this model allows the substantive relationships pertaining to the mechanisms through which mindfulness and workplace spirituality influence safety outcomes to be formulated and tested.

Furthermore, the mediation of workplace spirituality and mindfulness through workers' emotional and cognitive job engagement as proposed within the framework provides the collective individual mechanism that links workplace spirituality and mindfulness to specific safety outcomes. As hypothesized, the results support the proposal that workers' cognitive job engagement mediates the respective direct effects of mindfulness and workplace spirituality on specific safety outcomes. This distinction of engagement into specific higher-order factors of workers' emotional and cognitive job engagement, respectively, according to Kahn's (1990) perspective of engagement, is important because it identifies the process through which workplace spirituality and mindfulness are likely to influence safety outcomes. It also reflects the cognizance that engagement involves simultaneous investment of personal energy into physical, cognitive, and emotional labors (Wachter & Yorio, 2014) and investing the "hands, head and heart" (Ashforth & Humphrey, 1995).

The finding that workplace spirituality and mindfulness are antecedents of safety compliance and injury frequency is worth noting. This finding is valuable, because most human performance improvement models have traditionally focused on safety culture and management system components as antecedents of some safety outcomes (e.g., Griffin & Neal, 2000; Neal et al., 2000; Vinodkumar & Bhasi, 2010; Wachter & Yorio, 2014).

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However, this study provides a complementary way of improving human safety performance, suggesting that workplace spirituality and mindfulness are positively related to workers' cognitive job engagement, and workers' cognitive job engagement is positively and negatively related to safety compliance and number of injuries, respectively. Thus, organizations have the option of creatively integrating elements of mindfulness and workplace spirituality into its safety management system to influence safety outcomes.

The results of this research suggest extending the idea of a "safety system" beyond strict management systems to the recognition that workers' cognitive engagement mediates the relationship between an organizational or psychological safety system and safety outcomes, an inference that is consistent with Wachter and Yorio's (2014) research. This is to say that because "sharp edge" workers interface between organizational and psychological safety systems and safety outcomes, they need to be cognitively engaged in the present situation and automatically react beyond what is traditionally written in the company's safety procedures, plans, processes, and policies in order to be adaptive in the workplace especially in uncertain situations. This sub-Saharan African based research extends the external validity of Wachter and Yorio's Western perspective based research. In other words, the idea of workers being the "safety system" is becoming a global truth across the Atlantic.

According to Rich et al. (2010), workers are said to be engaged when they simultaneously put in their physical, emotional, and cognitive energies into their work. Although Rich et al. did not state explicitly the relative proportions of the energies that engaged workers are expected to invest into their job roles, Wachter and Yorio's (2010) study indicates that the mediating role of cognitive engagement is stronger than the mediating role of emotional engagement, a result that is consistent with the results in the present study. Thus, these study results buttress using worker-centric human performance tools often adopted by high performing organization; the use of tools that increases cognitive vigilance

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of workers. Consistent with the works of Wachter and Yorio, and Rich et al. (2010), the best human performance improvement tools are those that allow workers to cognitively scan their work environment and momentarily attend to deficiencies within the scanned environment.

Practical Implications for Managers and Safety Professionals

The results of this study have a number of managerial, research and practice implications. First, previous research has shown safety climate, safety culture, and safety management practices as antecedents of safety outcomes, while safety knowledge and safety motivation have been shown as determinants of safety outcomes, with safety training as the major safety intervention strategy (e.g. Griffin & Neal, 2006; Neal, Griffin & Hart, 2000; Wachter & Yorio, 2014). These results suggest organizations create an enabling environment by creating meaningful work where employees can experience joy in the context of a community. Organizations can create this enabling work environment by considering the spiritual values of the employees, setting up employee support programs, and valuing their employees. The results of this study suggest that an enabling work environment will benefit organizations by increasing safety compliance, safety participation, and decreasing the number of injuries suffered by employees.

Second, previous research suggests organizations use safety training, safety motivation and safety skills to improve workplace safety. This research demonstrates cognitive engagement mediates the relationship of mindfulness, workplace spirituality and safety outcomes. Thus, organization managers should not only make and implement policies that increase workplace spirituality and mindfulness, but also those that cognitively engage workers in safety activities.

According to Shekari (2015), emotionally engaged workers are not necessarily the hardest-working workers in an organization, and emotional engagement is not a prerequisite for problem solvers in organizations. These findings could explain the reason why, despite

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the fact that the absolute level of workers' emotional engagement is higher than the level of workers' cognitive engagement in this study's results, workers' emotional engagement is not the mechanism through which mindfulness and workplace spirituality improves safety outcomes.

Similar to other research (Wachter & Yorio, 2014), the mediating effect of cognitive engagement on the relationship between the antecedents and safety outcomes is higher than the mediating effect of emotional engagement on the relationship between the antecedents and safety outcome. This implies that managers need to focus on interventions that truly make employees intellectually believe that organization is interested in their wellbeing. This would make workers exhibit citizenship behaviors that improve human safety performance, rather than the more unproductive emotional engagement that naturally accompanies collectivistic culture.

Furthermore, at the "sharp end," human performance safety improvement or site safety is heavily dependent on situational awareness and an enabling work environment where workers express their inner lives through cognitive engagement. Evidence from this study supports the argument that managers need to embark on mindfulness training that conditions workers to be oriented in the present and simultaneously react and respond to work environment signals, rather than following reactionary behaviors that are habitual. Various intervention strategies are available for managers to cognitively engage workers. These include acceptance and commitment therapy (ACT), mindfulness-based cognitive therapy (MBCT), dialectical behavior therapy (DBT), and other methods (Hayes, Strosahl, & Wilson, 1999; Linehan, 1997; Segal, Williams, & Teasdale, 2002).

The result of this research shows that while cognitive engagement fully mediated the relationships between the antecedent variables and two of the safety outcomes (safety compliance and injuries), emotional engagement did not mediate any relationship. This

finding has an important managerial implication: given competing resources available, safety

interventions should focus on developing skills around building attention and awareness

leading to cognitive engagement. However, following Kahn's (1990) assertion that

engagement involves both cognitive and emotional engagement, organizations still have to

fully invest in intervention strategies that also emotionally win the hearts of workers.

Campbell, McCloy, Oppler, and Sager (1993) posit knowledge, skill, and motivation

are the only determinants of performance. Neal et al. (2000) assert that an individual must

have the knowledge, motivation and skill to perform work safely and comply with safety

procedures. However, extending Campbell et al.'s assertion, this study shows there are

additional individual differences in performance, such as the levels of workers' mindfulness,

spirituality and cognitive engagement, which determine safety outcomes. This is consistent

with other studies that have confirmed additional determinants of safety outcomes (e.g.,

Hesketh & Neal, 1999; Wachter & Yorio, 2014). This study's findings have implications for

researchers and workplace safety practitioners: design of safety interventions should not

narrowly aim at improving safety motivation, skill, and knowledge. Rather, employers should

encourage mindfulness and workplace spirituality through enabling workplace policies,

plans, processes, procedures, and through a work environment that showcases workers'

interconnectivity, expression of inner life, and sense of joy.

Limitations and Implications for Future Research

It is indisputable that the findings of this research have some professional and

managerial implications; however, there are some limitations with this research that deserve

note.

First, due to cost, time and resources limitations, a descriptive and cross-sectional

research method was adopted. Although strong and logical empirical reasons to presume

causality were provided, as reflected in the theoretical model, both correlation studies and

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SEM used do not actually provide evidence of cause-and-effect relationships. The model presented here is one of the plausible models. Therefore, future research based on longitudinal studies is needed to establish causation for this model and provide evidence of other plausible models.

This study was conducted in Nigeria; therefore, absolute care should be exercised in generalizing the findings of this research to other cultures. Different national cultures exhibit different beliefs, norms and value systems which have been found to influence workers' safety attitude and behavior (Hampden-Turner & Trompenaars, 1994; Hofstead, 1994; Mohamed, Ali & Tam, 2009). For instance, the collectivist, high power distance, and masculine nature of Nigerian society is likely to inflate workers' perceived levels of workplace spirituality and workers' emotional engagement scores, because worker and employer relationships in this type of society are perceived in moral terms, and employees identify with organizations that take care of them (Hofstead, 1994). Therefore, an interesting future area to extend this model is to control for the effects of national culture on workplace spirituality, mindfulness, and worker' engagement.

A common method of obtaining information on perceptions is through a questionnaire survey which was used to collect data in this research. This type of survey is likely to introduce method bias or method variance. However, this research tested a measurement model where all latent factors loaded onto a dimension that represents human performance improvement and compared this model with higher-order multidimensional models for each of the constructs. The absolute and relative poor fit of the one-factor model indicate that common bias did not have much effect on the model or the tests results (Guo et al. 2016).

Second, the proposed model in this research was very complex, and the tests of mediation were dependent on complex relationships that a common bias method was unlikely

to show significant effects on (Rich et al, 2010). This notwithstanding, future research that does not rely solely on self-reports could be used to validate this research.

This research was limited to investigating workers' emotional engagement and cognitive engagement as mediators. Although organizational literature shows that these two factors are associated with positive safety outcomes, there could be other potential factors that can mediate the relationship between the antecedent variables and safety outcomes. For instance, workers' physical engagement could also have been investigated as a mediator. Therefore, further studies should be conducted to identify these additional mediating factors.

If the outcomes of this research, which was done in selected construction and manufacturing industries, were extrapolated and generalized, then improved workplace spirituality, mindfulness, and engagement components would be expected to generally improve organizational safety, without regarding specific work context as a confounding factor. Therefore, it may be necessary to address in future research whether the findings of this research hold for all work contexts or just construction and manufacturing industries.

Additionally, this research was based on data collected from a combination of industries: oil and gas, construction, and food and beverages manufacturing industries; the research was not done in a single specific industry. It is possible that the culture of a specific industry biased the results of the study. Therefore, future studies could be conducted in specific industries, instead of using data collected from multiple industries.

This framework can guide future research in several ways. It is possible to incorporate additional dimensions of workplace spirituality and mindfulness in studies like these. Since different organizations use additional or different lagging and leading indicators as measures of safety outcomes, organizations can incorporate their specific measures of safety outcomes into this framework in order to examine their relationship with the antecedent variables.

Conclusion

The concept of mindfulness, together with the concept of workplace spirituality, provides a useful framework for improving human safety performance. The results of this research show that workplace spirituality and mindfulness represent useful avenues organizations can explore to improve their safety performance by promoting cognitive engagement. Practices developed around increasing organizational workplace spirituality and mindfulness of employees are pivotal in planning and implementing workplace safety intervention programs that ensure workers participate and comply with safety programs that ultimately lead to injury reduction.

The results of this study further prove that workers' job engagement, specifically, cognitive engagement, is an important vehicle that transmits the tandem effects of organizational and personal factors (workplace spirituality and mindfulness) to influencing different aspects of human safety performance. This implies that when organizations plan to develop intervention programs to improve workplace spirituality and mindfulness, they should also win the minds of the workers by cognitively engaging them.

Therefore, it may not be enough for organizations to implement organizational and psychological strategies that only improve organizations' levels of workplace spirituality and workers' mindfulness. Organizations may have to also nurture the cognitive aspect of the workers. All of these aspects put workers at the center of the safety management system.

Whereas previous related research has focused on the importance of the levels of engagement on mediating certain aspects of organizational factors and organizational safety performance, this study provides a systematic foundational framework for including (1) the role of workplace spirituality and mindfulness as organizational and behavioral antecedents to safety outcomes and (2) the role of job-focused cognitive and emotional workers' engagement mediating these antecedents with safety outcomes, into the mainstream of safety

sciences. This emphasizes the synergy inherent in combining organizational and behavioral approaches to human safety performance in safety intervention programs.

Thus, this framework provides two alternative and connected approaches which are– organizational-based and psychological based that will aid in the design of workplace safety intervention programs to improve human safety performance. The results of this study, therefore, provide a formidable empirical basis in developing a holistic model that links organizational and psychological factors to human performance improvement in the workplace, by safety practitioners and researchers.

However, with reference to the inability of emotional engagement to mediate the relationship of the antecedent variables and the safety outcomes in this study (contrary to similar studies), it is becoming increasingly acceptable that organizations acknowledge and operate within a distinct social and cultural boundary (Ahiauzu, 1986; Aluko, 2003; Cotgrove, 1978; Hofstede, 1991; Zakaria, 1977). Therefore, organizational leaders need to understand the cultural dynamics of the environment where their organizations operate in order to perform optimally. This has special implications for organizations and safety professionals that operate across national boundaries. Since national culture is an embodiment of political, economic, and societal values prevalent in a particular nation, national culture has to be taken into consideration by multi-national companies when implementing any safety intervention strategies or safety management systems.

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Appendix A

Dissertation IRB Approval Letter

IUP Indiana University of Pennsylvania
www.iup.edu

Institutional Review Board for the
Protection of Human Subjects
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
/rb-research@iup.edu
www.iup.edu/IRD

November 29, 2017

Dear Kasarachi Nnadede:

Your proposed research project, "Human Performance Improvement: Towards a Framework for Linking Workplace Spirituality, Mindfulness, Worker Engagement and Safety Outcomes," (Log No. 17-294) has been reviewed by the IRB and is approved. In accordance with 45CFR46.101 and IUP Policy, your project is exempt from continuing review. This approval does not supersede or obviate compliance with any other University requirements, including, but not limited to, enrollment, degree completion deadlines, topic approval, and conduct of university-affiliated activities.

You should read all of this letter, as it contains important information about conducting your study.

Now that your project has been approved by the IRB, there are elements of the Federal Regulations to which you must attend. IUP adheres to these regulations strictly:

1. You must conduct your study exactly as it was approved by the IRB.

2. Any additions or changes in procedures must be approved by the IRB before they are implemented.

3. You must notify the IRB promptly of any events that affect the safety or well-being of subjects.

4. You must notify the IRB promptly of any modifications of your study or other responses that are necessitated by any events reported in items 2 or 3.

The IRB may review or audit your project at random or for cause. In accordance with IUP Policy and Federal Regulation (45CFR46.113), the Board may suspend or terminate your project if your project has not been conducted as approved or if other difficulties are detected

Although your human subjects review process is complete, the School of Graduate Studies and Research requires submission and approval of a Research Topic Approval Form (RTAF) before you can begin your research. If you have not yet submitted your RTAF, the form can be found at http://www.iup.edu/page.aspx?id=91683 .

While not under the purview of the IRB, researchers are responsible for adhering to US copyright law when using existing scales, survey items, or other works in the conduct of research. Information regarding copyright law and compliance at IUP, including links to sample permission request letters, can be found at http://www.iup.edu/page.aspx?id=165526.

I wish you success as you pursue this important endeavor.

Sincerely,

Jennifer Roberts, Ph.D.
Chairperson, Institutional Review Board for the Protection of Human Subjects
Professor of Criminology

JLR:bkj

Cc: Jan Wachter, Faculty Advisor

INFORMED CONSENT FORM

Human Performance Improvement: Towards A Framework for Linking Workplace Spirituality, Mindfulness, Workers' Engagement, and Safety Outcomes

My name is Kasarachi Sylvester Nnadede. I am a doctoral student in the Department of Safety Sciences at Indiana University of Pennsylvania, USA. I am currently conducting my dissertation on improving workplace safety performance by developing a framework linking workplace spirituality, mindfulness, workers' engagement, and safety outcomes. You are invited to participate in the study. The following information is being provided to you so you can make an informed decision whether to participate or not. You are eligible to participate because you meet the criteria: (1) You are at least 18 years old and (2) You work for this organization.

Purpose and Benefits of this Study:

The current study has been designed to develop a framework for linking workplace spirituality, mindfulness, workers' engagement, and safety outcomes. Upon completion of this study, we expect to gain a better understanding on these organizational and psychological latent constructs could be used to improve workplace safety.

Your Involvement in this Study:
You will firstly read this consent form. Then you will complete the questionnaire. It will take you about ten minutes to complete the survey

Potential Risks
No risk beyond the minimal risks of daily living will be involved.

Your participation in this study is voluntary.
You are free to choose if you want to participate in this study or not participate. Participation or non-participation will neither affect your career in this company nor your relationship with the organisation you work for. You can withdraw at any point during the study simply by closing the survey and your data will be discarded. Your hierarchy will not know whether you participated in this study, because all your responses will be anonymous. The physical data collected will be kept in a locked file cabinet that can be accessed only by the lead researcher

and the digital data will be kept in a password protected hard disk. When the study is finished, the study results may be presented at conferences and/or published in academic journals, but the name of the participating organization shall not be publicly disclosed. The information will only be used for academic purposes.

Your completion of the surveys implies your consent. Your data would not be able to be withdrawn after submission as there would be no way of knowing which data belonged to which individual.

Thank you for consideration and assistance with this study. If you have any questions or would like additional information, please contact Kasarachi Sylvester Nnadede, the lead researcher.

Lead Researcher: Kasarachi Sylvester Nnadede
Doctoral Student
Department of Safety Sciences
Indiana University of Pennsylvania, USA
+234(0)8038855671
qdcv@iup.edu

Faculty Sponsor: Dr. Jan Keith Wachter
PhD program coordinator
Department of Safety Sciences
Johnson Hall 137
Indiana University of Pennsylvania, USA
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THIS PROJECT HAS BEEN APPROVED BY THE INDIANA UNIVERSITY OF PENNSYLVANIA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS (PHONE 724.357.7730).

Appendix C

Research Survey Instrument

The Background Questionnaire

Age:

Gender: ☐ M ☐ F

How many years have you worked for this organization?

What is your highest educational level attained?

☐ No formal education; ☐ Primary education; ☐ Secondary education

☐ Tertiary education.

Please following the direction of the arrow, rate each of the following statements using scale 1 (strongly disagree) to 10 (strongly agree) according to what best represents your own opinion of what is generally true for you.

Workers' Engagement Survey Items

1	2	3	4	5	6	7	8	9	10
Strongly disagree									Strongly agree

	EMOTIONAL ENGAGEMENT
	1. I am enthusiastic in my job
	2. I feel energetic at my job
	3. I am interested in my job
	4. I am proud of my job
	5. I feel positive about my job
	6. I am excited about my job
	COGNITIVE ENGAGEMENT
	7. At work, my mind is focused on my job.
	8. At work, I pay a lot of attention to my job.
	9. At work, I focus a great deal of attention on my job.
	10. At work, I am absorbed by my job.
	11. At work, I concentrate on my job.
	12. At work, I devote a lot of attention on my job.

Adapted with permission from "Job Engagement: Antecedents and Effects on Job Performance," by Rich et al., 2010, *Academy of Management Journal, 53*(2) 617 – 635. Copyright 2010 by the Academy of Management Journal.

Safety Outcomes Survey Items

1	2	3	4	5	6	7	8	9	10
Strongly disagree									Strongly agree

	SAFETY COMPLIANCE
	1. I am conscious of my safety when I work
	2. I use all necessary safety equipment to do my job.
	3. I use the correct safety procedures for carrying out my job.
	4. I ensure highest level of safety when I carry out my job.
	SAFETY PARTICIPATION
	5. I promote the safety program within the organization
	6. I put in extra effort to improve the safety of the workplace
	7. I voluntarily carry out task or activities that help improve workplace safety.

Adapted with permission from "A Study of the Lagged Relationships Among Safety Climate, Safety Motivation, Safety Behavior, and Accidents at the Individual and Group Levels," by Neal, Andrew; Griffin, Mark. 2006, *Journal of American Psychological Association*. Copyright 2006 by American Psychological Association.

Mindfulness Survey Items

1	2	3	4	5	6	7	8	9	10
Strongly disagree									Strongly agree

	1. When I'm walking, I deliberately notice the sensations of my body moving.
	2. I'm good at finding words to describe my feelings.
	3. When I take a shower or bath, I stay alert to the sensations of water on my body.
	4. I can easily put my beliefs, opinions, and expectations into words.
	5. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
	6. It's hard for me to find the words to describe what I'm thinking.
	7. I pay attention to sensations, such as the wind in my hair or sun on my face.
	8. I have trouble thinking of the right words to express how I feel about things.
	9. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
	10. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
	11. I notice the smells and aromas of things.
	12. Even when I'm feeling terribly upset, I can find a way to put in into words.
	13. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
	14. It seems I am "running on automatic" without much awareness of what I'm doing.
	15. My natural tendency is to put my experiences into words.
	16. I can usually describe how I feel at the moment in considerable detail.

Adapted with permission from "Using Self-Report Assessment Methods to Explore Facets of Mindfulness," by Baer, Smith, Hopkins, Krietemeyer, and Toney, 2006, *Assessment 13*(1), 27 – 45. Copyright 2006 by SAGE Publications.

Workplace Spirituality Survey Items

Workplace spirituality scale was adapted from "Individual Spirituality at Work and Its Relationship with Job Satisfaction, Propensity to Leave and Job Commitment: An Exploratory Study among Sales Professionals," by Vaibhav Chawla and Sridhar Guda, 2010, *Journal of Human Values 16*(2) 157 – 167. Copyright at SAGE Publications.
Fifteen (15) items classified under "sense of community," "meaningful work," and "inner life." were extracted from the 32 items survey. Due to copyright restrictions, these survey items cannot be captured here.

How many injuries have you personally sustained (suffered) at work within the last O**NE** year?_____

NB: Injuries could be related to head, neck, eyes, shoulders, arms, legs, wrist, ankles, hands, upper back, lower back, feet and others. Injuries can include minor injuries as well as major injuries.

Appendix D

Copyrights Permission Approval Correspondences

*

From: KASARACHI NNADEDE <qdcv@iup.edu>
Sent: Tuesday, April 10, 2018 3:16 AM
To: PermissionsUK <PermissionsUK@sagepub.com>
Subject: Permission to use your Five Facets of mindfulness questionnaire

Hello,

My name is Kasarachi Sylvester Nnadede; a Safety Sciences PhD student at Indiana University of Pennsylvania, USA. I am currently researching on a topic that says " Human Performance Improvement: Towards a Framework Linking Workplace Spirituality, Mindfulness, Workers Engagement, and Safety Outcomes.

I have found the Five Facets of Mindfulness scale developed by Baer, Smith, Hopkins, Krietemeyer, and Toney (2006) in *Assessment* 2006; 13; 27, DOI: 10.1177/1073191105283504 in their article " Using Self-Report Assessment methods to Explore Facets of Mindfulness" highly invaluable to my dissertation. This article was published by Sage @ 2006 SAGE Publications.

I would like to use the "Observing" and "Acting with awareness" items of this scale for data collection for my dissertation.

Please could you direct me on how to get formal permission to use part of this scale as part of my survey instruments.

Best regards,
Kasarachi Sylvester Nnadede

176

P   **permissions (US) <permissions@sagepub.com>**   👍   ↩ Reply | ⌄
    Wed 4/25, 4:49 PM
    KASARACHI NNADEDE ⌄

Inbox

Hello Kasarachi,

Thank you for your request. I am happy to report that you can consider this email as permission to use the "Observing" and "Acting with awareness" items from the Five Facets of Mindfulness scale as detailed below in your upcoming dissertation research. Please note that this permission does not cover any 3rd party material that may or may not be found within the work. Distribution of the scale materials must be controlled, meaning only to the participants engaged in the research or enrolled in the educational activity. All copies of the material should be collected and destroyed once all data collection and research on this project is complete. Any other type of reproduction or distribution of scale materials content is not authorized without written permission from the publisher

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All the Best,
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--
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Sent: 10 April 2018 10:44
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Subject: Permission to use James reason's Figure on principal error types

Hello,

My name is Kasarachi Sylvester Nnadede; a Safety Sciences PhD student at Indiana University of Pennsylvania, USA. I am currently researching on a topic that says " Human Performance Improvement: Towards a Framework Linking Workplace Spirituality, Mindfulness, Workers Engagement, and Safety Outcomes.

I would like to use the attached figure I extracted from "Managing the Risk of Organizational Accidents" by James Reason, in my dissertation. The book's ISBN and other identities are: ISBN 9781840141054, An Ashgate Book, published by Routledge, Copyright 1997 James reason.

Please could you direct me on how to get formal permission to use this figure in my dissertation.

72 *Managing the Risks of Organizational Accidents*

Figure 4.8 Summary of the principal error types

Best regards,
Kasarachi

From: Academic Books Permissions <mpkbookspermissions@tandf.co.uk>
Sent: Tuesday, April 10, 2018 9:56:23 AM
To: KASARACHI NNADEDE
Subject: RE: Permission to use James reason's Figure on principal error types

Dear Kasarachi

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Further to your email, permission is granted for use of the above material in your forthcoming dissertation, subject to the following conditions:

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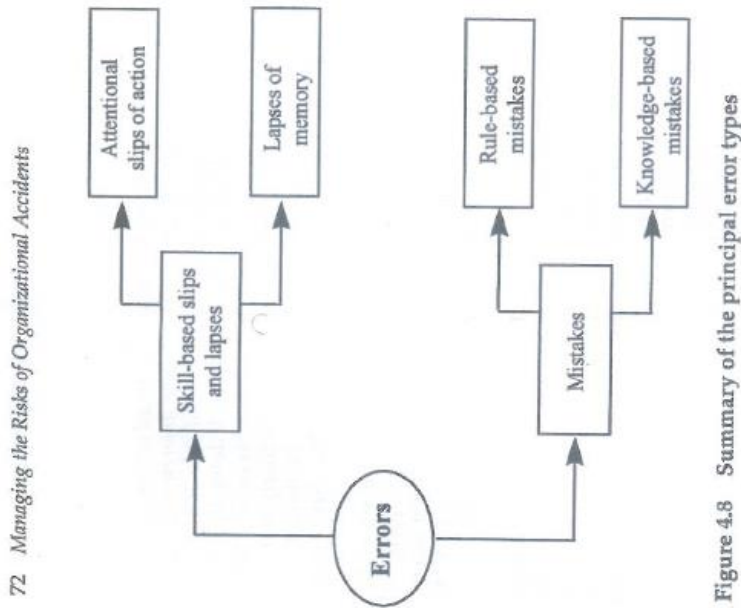Sent: 11 April 2018 11:06
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Hello Annette,

Thanks for your urgent reply to mail. Please I would like to have a further clarification on this issue.

This is a Ph.D dissertation I am conducting at a University in the United States of America. After defending this dissertation, it is mandatory in the USA that every Ph.D dissertation is loaded electronically into PROQUEST, a database that houses every Ph.D dissertation.

I would like to know if I need a separate permission before I load the dissertation electronically into PROQUEST.

Best regards,
Kasarachi

RE: Permission to use James reason's Figure on principal error types

AP Academic Books Permissions <mpkbookspermissions@tandf.co.uk>   👍   ↩ Reply | ∨
Thu 4/12, 6:56 AM
KASARACHI NNADEDE ☒

Dear Kasarachi

Thank you for your email. You do not need to make a separate request.

We realise there are requirements for submitting work to academic institutions, so provided the work is only being uploaded as per those requirements, and in this case to PROQUEST, that is acceptable and within the permission we have granted.

Kind regards

Annette

/\/ Management

From: KASARACHI NNADEDE [mailto:qdcv@iup.edu]
Sent: Sunday, April 8, 2018 4:50 AM
To: Permissions@aom.org
Subject: Copyright permission to use Rich et al (2010) survey scale.

Hello,

My name is Kasarachi Sylvester Nnadede; a Safety Sciences PhD student at Indiana University of Pennsylvania, USA. I am currently researching on a topic that says " Human Performance Improvement: Towards a Framework Linking Workplace Spirituality, Mindfulness, Workers Engagement, and Safety Outcomes.

I have found the Job Engagement Scale developed by Rich, Lepine, and Crowford (2010) in their article " Job Engagement: Antecedents and Effects on Job Performance" highly invaluable to my dissertation. This article was published in Academy of Management Journal, 2010, Vol. 53, No 3, 617-635.

I would like to extract and use for my dissertation, the 12 items that make up the Emotional and Cognitive Engagement aspects of the scale.

Please could you direct me on how to get formal permission to use part of this scale as part of my survey instruments.

Best regards,
Kasarachi Sylvester Nnadede

RE: Copyright permission to use Rich et al (2010) survey scale.

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With best wishes,

Irina

Irina Burns
Senior Managing Editor and Licensing Services Manager
Academy of Management
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RE: Permission to use workplace spirituality scale by Chawla, V & Guda, S (JHV 16:...)

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Appendix E

SPSS Output: Descriptive Statistics

Table 20

Descriptive Statistics of the Participants

	N	Mean	Std. Deviation
Age of the participants	251	34.430	6.7674
Gender of participants	251	1.1394	.34710
Number of years participant has worked for the organisation	251	6.163	3.3778
Valid N (listwise)	251		

SPSS Output: Dubin Watson Test for Independence of Residuals

Table 21

Dubin-Watson Test for Independence of Residuals

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.822[a]	.676	.672	.73350	.676	171.776	3	247	.000	1.941

a. Predictors: (Constant), MSP, ACF, MSC

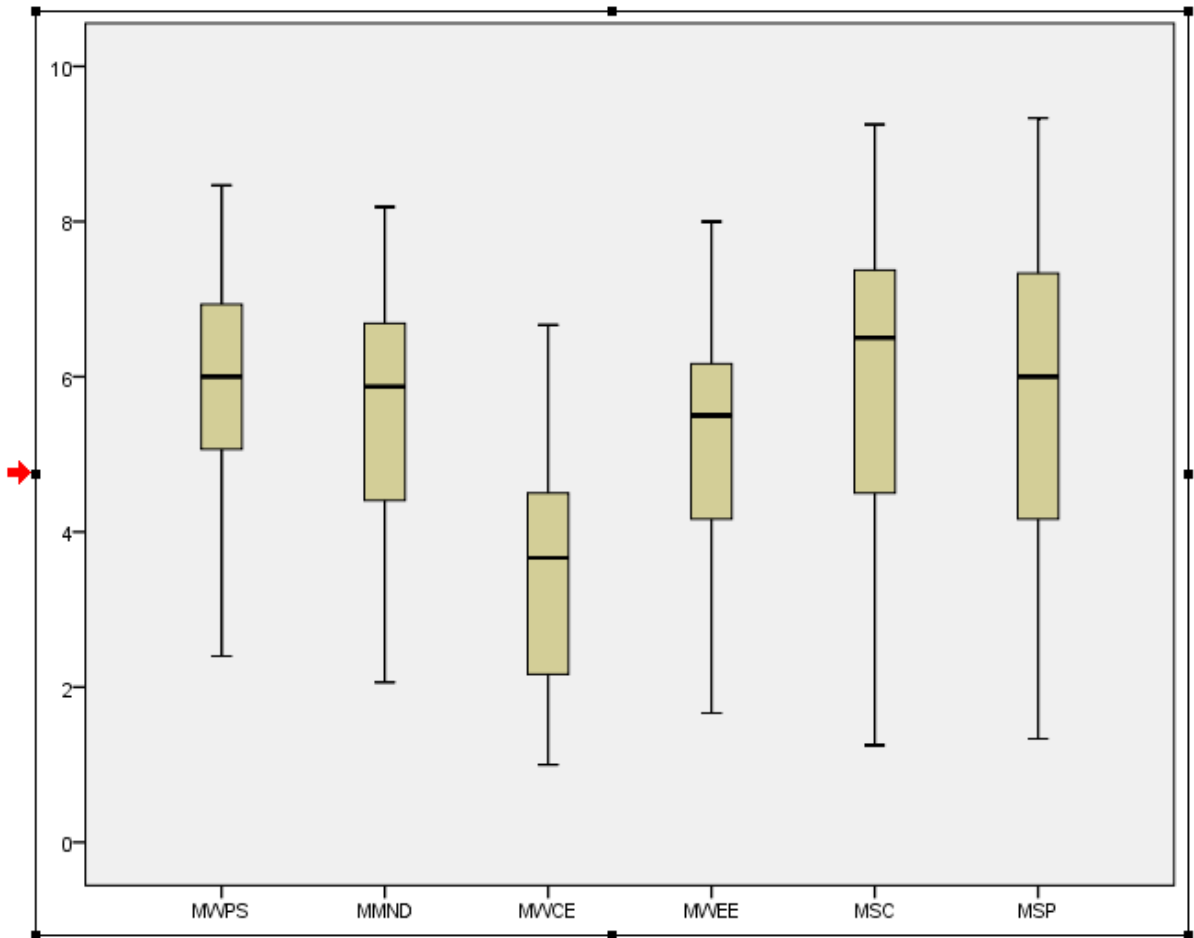b. Dependent Variable: MWPS

SPSS Output: Box-plot Test for Outliers

Figure 12. Box-plot test of key variables for outliers

SPSS Output: Tests for Multicollinearity

Table 22

Casewise Diagnostics of Mindfulness Data

Casewise Diagnostics[a]

Case Number	Std. Residual	MWPS	Predicted Value	Residual
3	4.062	7.27	4.2875	2.97922
26	3.102	6.13	3.8579	2.27543

a. Dependent Variable: MWPS

Table 23

Correlation fugures of Mindfulness and Safety Outcome Variables

Coefficient Correlations[a]

Model			MSP	ACF	MSC
1	Correlations	MSP	1.000	.070	-.553
		ACF	.070	1.000	.516
		MSC	-.553	.516	1.000
	Covariances	MSP	.001	.000	-.001
		ACF	.000	.004	.001
		MSC	-.001	.001	.002

a. Dependent Variable: MWPS

Table 24

Tolerance and VIF values of the key Variables

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound	Correlations Zero-order	Correlations Partial	Correlations Part	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	4.445	.317		14.036	.000	3.822	5.069					
	ACF	-.408	.059	-.335	-6.868	.000	-.525	-.291	-.709	-.400	-.249	.553	1.809
	MSC	.342	.041	.484	8.306	.000	.261	.423	.778	.467	.301	.386	2.593
	MSP	.064	.031	.103	2.052	.041	.003	.125	.603	.129	.074	.523	1.913

a. Dependent Variable: MWPS
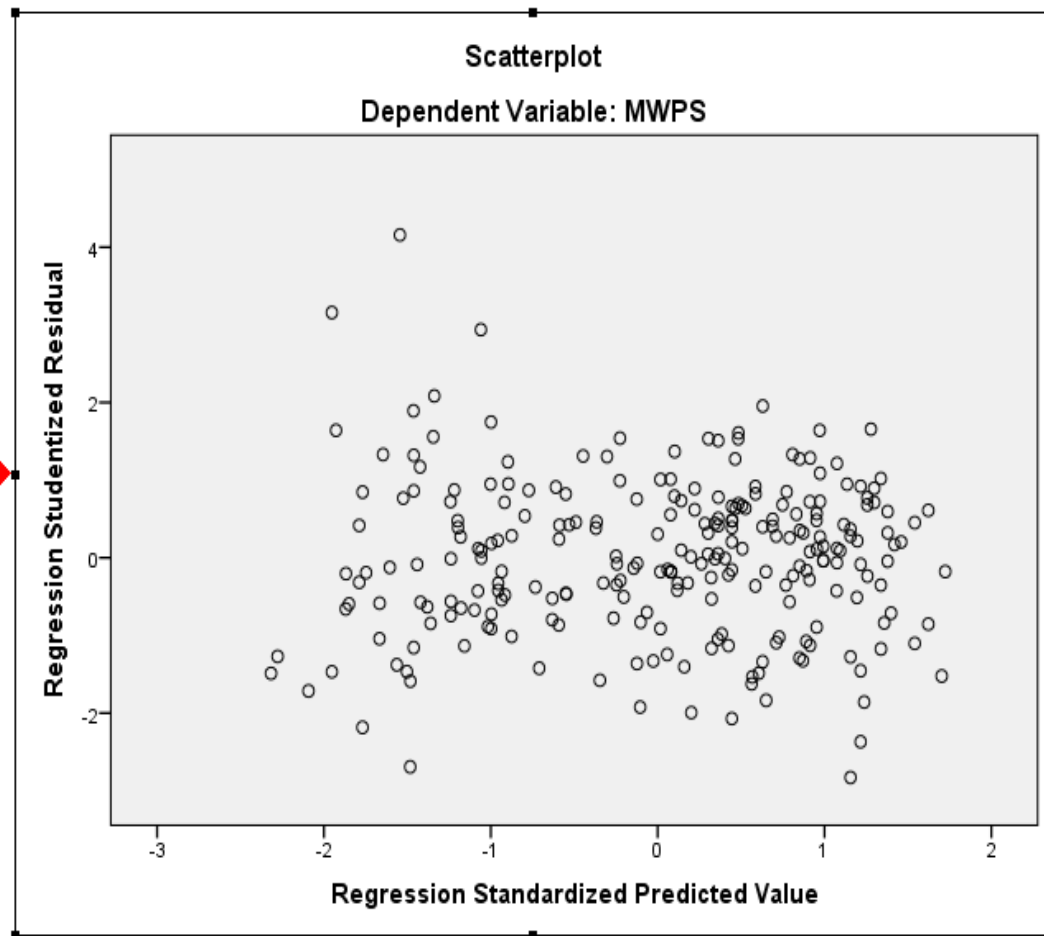
Appendix I

SPSS Output: Test for Homoscedasticity

Figure 13. Scatterplot of regression studentized residual against regression standadized predicted value of mindfulness

SPSS Output: Tests for Linearity
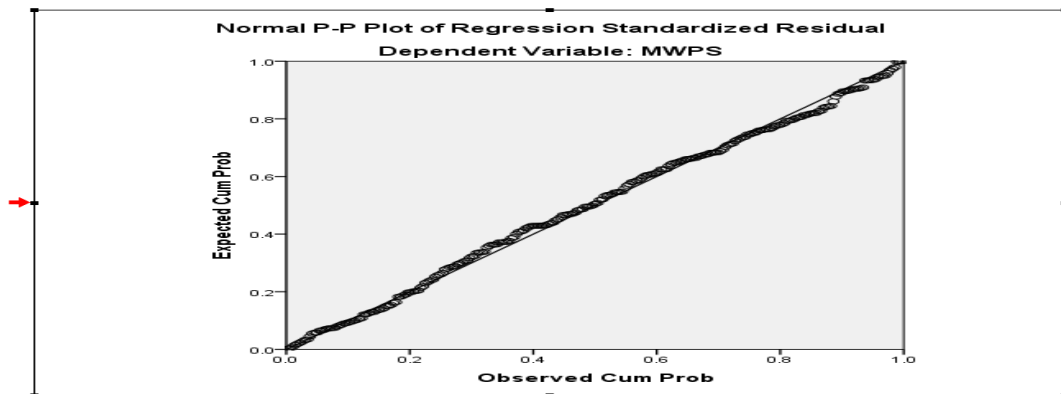
Figure 14. Normal P-P Plot of regression standardized residual versus observed cumulative probability of workplace spirituality.

Figure 15. Scatterplot of workplace spirituality versus regressed standardized residual.

Figure 16. Scatterplot of workplace spirituality versus injury frequency

Appendix K

Example SPSS Output: Tests for Normality

Figure 17. Normal Q-Q plot of studentized deleted residual of expected versus observed values.

Charts

Figure 18. Histogram of mindfulness data.

AMOS Output: Factors Loading

Table 25

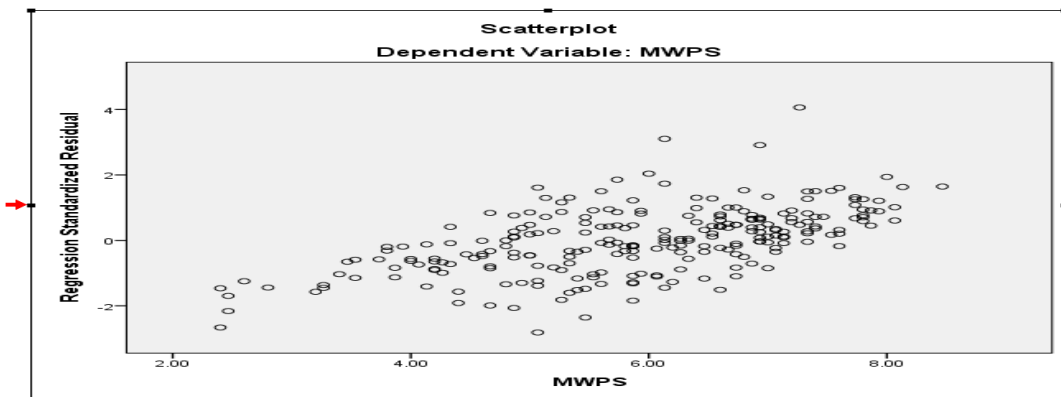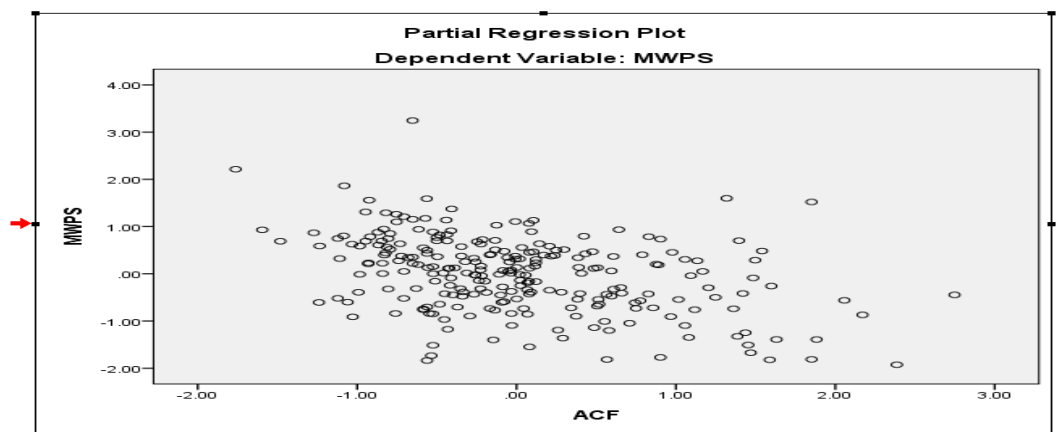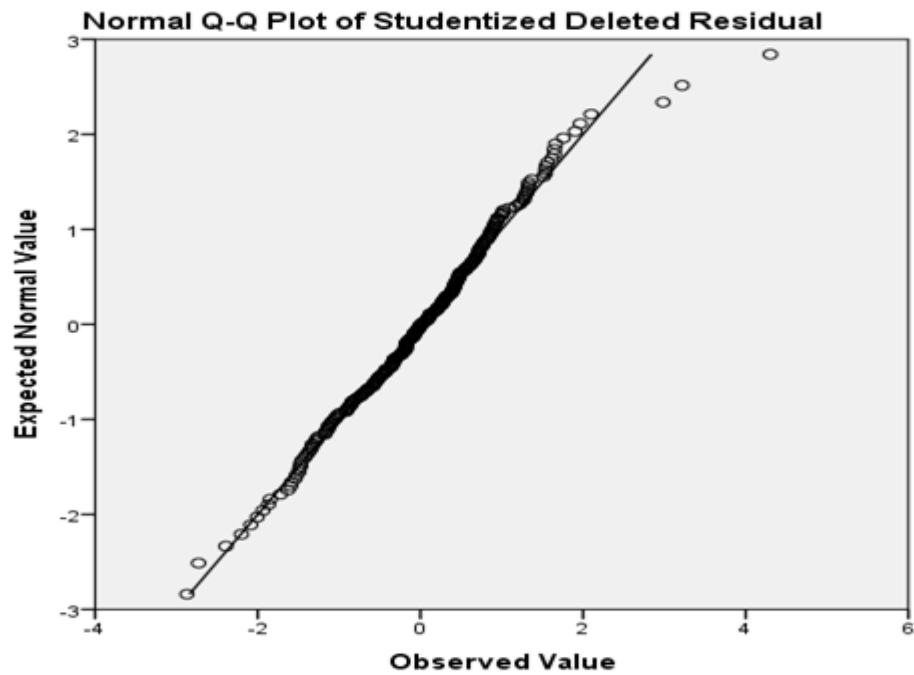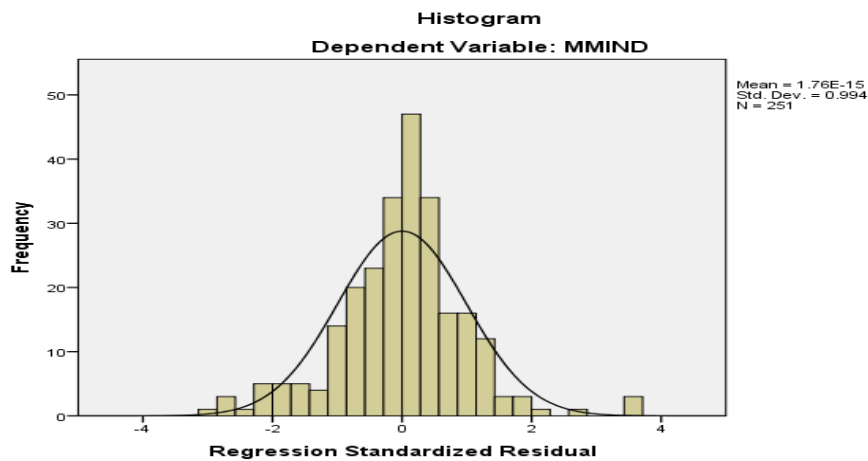*Factor Loadings of all Instrument Items on the Latent Variables.*

			Estimate
Wsc6	←-	MWSC	.835
Wsc5	←-	MWSC	.804
Wsc4	←-	MWSC	.802
Wsc3	←-	MWSC	.871
Wsc2	←-	MWSC	.896
Wsc1	←-	MWSC	.799
Wil4	←-	MWIL	.860
Wil3	←-	MWIL	.885
Wil2	←-	MWIL	.944
Wil1	←-	MWIL	.899
Wmw5	←-	MWMW	.879
Wmw4	←-	MWMW	.847
Wmw3	←-	MWMW	.868
Wmw2	←-	MWMW	.836
Wmw1	←-	MWMW	.783
MF8	←-	MMF	.933
MF7	←-	MMF	.916
MF6	←-	MMF	.931
MF5	←-	MMF	.887
MF4	←-	MMF	.898
MF3	←-	MMF	.898
MF2	←-	MMF	.847
MF1	←-	MMF	.863
MFB8	←-	MMEE	.981
MFB7	←-	MMEE	.977
MFB6	←-	MMEE	.975
MFB5	←-	MMEE	.967
MFB4	←-	MMEE	.963
MFB3	←-	MMEE	.975
MFB2	←-	MMEE	.972
MFB1	←-	MMEE	.980
Sc1	←-	ASC	.758
Sc2	←-	ASC	.786
Sc3	←-	ASC	.746
Sc4	←-	ASC	.855
Sp1	←-	ASP	.827
Sp2	←-	ASP	.887

Table 25 (Continued)

Factor Loadings of all Instrument Items on the Latent Variables.

Sp3	←-	ASP	.844
WCE2	←-	AWCE	.973
WCE3	←-	AWCE	.956
WCE4	←-	AWCE	.949
WCE5	←-	AWCE	.943
WCE6	←-	AWCE	.963
WEE6	←-	AWEE	.972
WEE5	←-	AWEE	.954
WEE4	←-	AWEE	.948
WEE3	←-	AWEE	.952
WEE2	←-	AWEE	.952
WEE1	←-	AWEE	.957

Appendix M

AMOS Outputs: Ten-factor Measurement Model fit Summary

Table 26

Model fit Summary for the Ten-factor Measurement Model

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	127	2442.691	1199	.000	2.037
Saturated model	1326	.000	0		
Independence model	51	20147.594	1275	.000	15.802

Table 27

Baseline Comparisons for the Ten-factor Measurement Model

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.879	.871	.934	.930	.934
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Table 28

RMSEA for the Ten-factor Measurement Model

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.064	.061	.068	.000
Independence model	.243	.240	.246	.000

AMOS Outputs: The Hypothesized Structural Model Fit Summary

Table 29

Model fit Summary for the Hypothesized Structural Model

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	123	2475.29	1204	.000	2.060
Saturated model	1326	.000	0		
Independence model	51	20847.003	1275	.000	16.351

Table 30

Baseline Comparisons for the Hypothesized Structural Model

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.883	.876	.937	.933	.937
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Table 31

RMSEA for the Hypothesized Structural Model

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.064	.061	.068	.000
Independence model	.248	.245	.251	.000

Appendix O

AMOS Outputs: Alternative (Nested) Model fit Summary

Table 32

Model fit Summary for the Alternative (Nested) Model

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	103	2108.590	932	.000	2.262
Saturated model	1035	.000	0		
Independence model	45	16861.006	990	.000	17.031

Table 33

Baseline Comparison for the Alternative (Nested) Model

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.875	.867	.926	.921	.926
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Table 34

RMSEA for the Alternative (Nested) Model

RMSEA

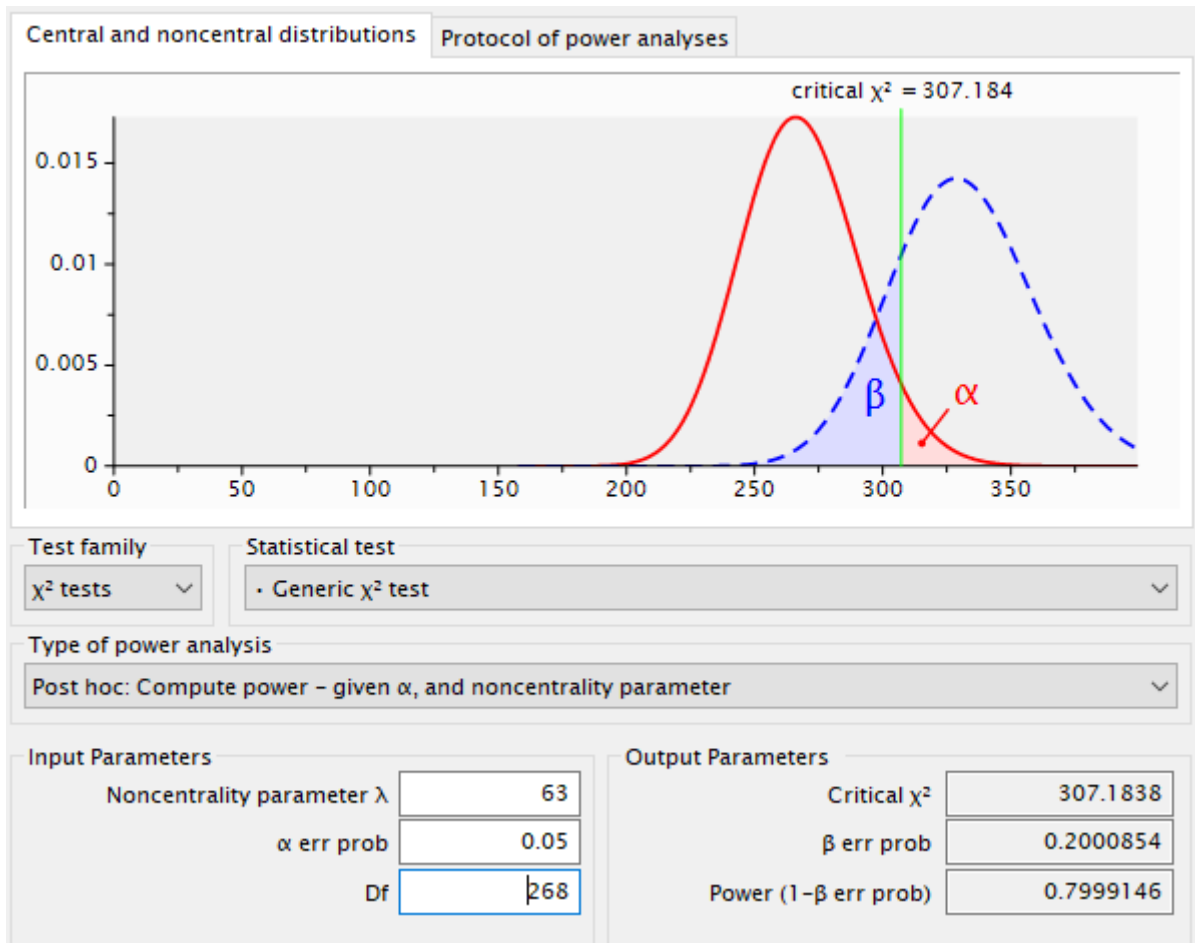| Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.071	.067	.075	.000
Independence model	.253	.250	.257	.000

Appendix P

G*Power Output: Nested Models Power Analysis

Figure 19. Nested models power analysis using G*Power

AMOS Path Diagram of the Relationship Between the Antecedents and Outcomes Variables
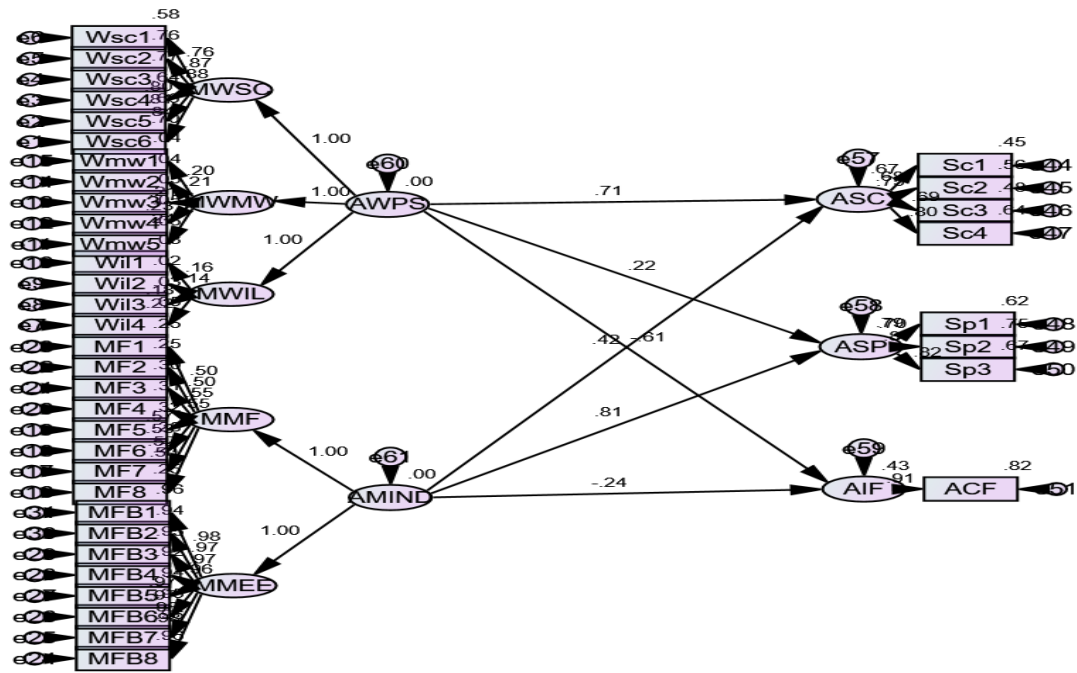

Figure 20. AMOS path diagram of the relationship between the antecedents and outcomes variables.

Table 35

Direct Effects of the Antecedents on the Outcome Variables

ASC	<---	AWPS	.530	.056	9.430	***	par_35
ASP	<---	AWPS	.191	.041	4.692	***	par_36
AIF	<---	AWPS	-.384	.040	-9.624	***	par_37
ASC	<---	AMIND	.301	.040	7.528	***	par_38
ASP	<---	AMIND	.686	.049	13.940	***	par_39
AIF	<---	AMIND	-.146	.034	-4.272	***	par_40

*** *p* <.001 (two-tailed).

AMOS Path Diagram of the Mediating Effect of WCE on the Relationship of MND and Safety Outcomes; and Mediating Effect of WEE on the Relationship of WPS and Safety Outcomes.

Figure 21. AMOS path diagram of the mediating effect of WCE on MND and safety outcomes; and mediating effect of WEE on WPS and safety outcomes.

AMOS Direct and Indirect Effect Tests of Mediating Effect of WCE on the Relationship of
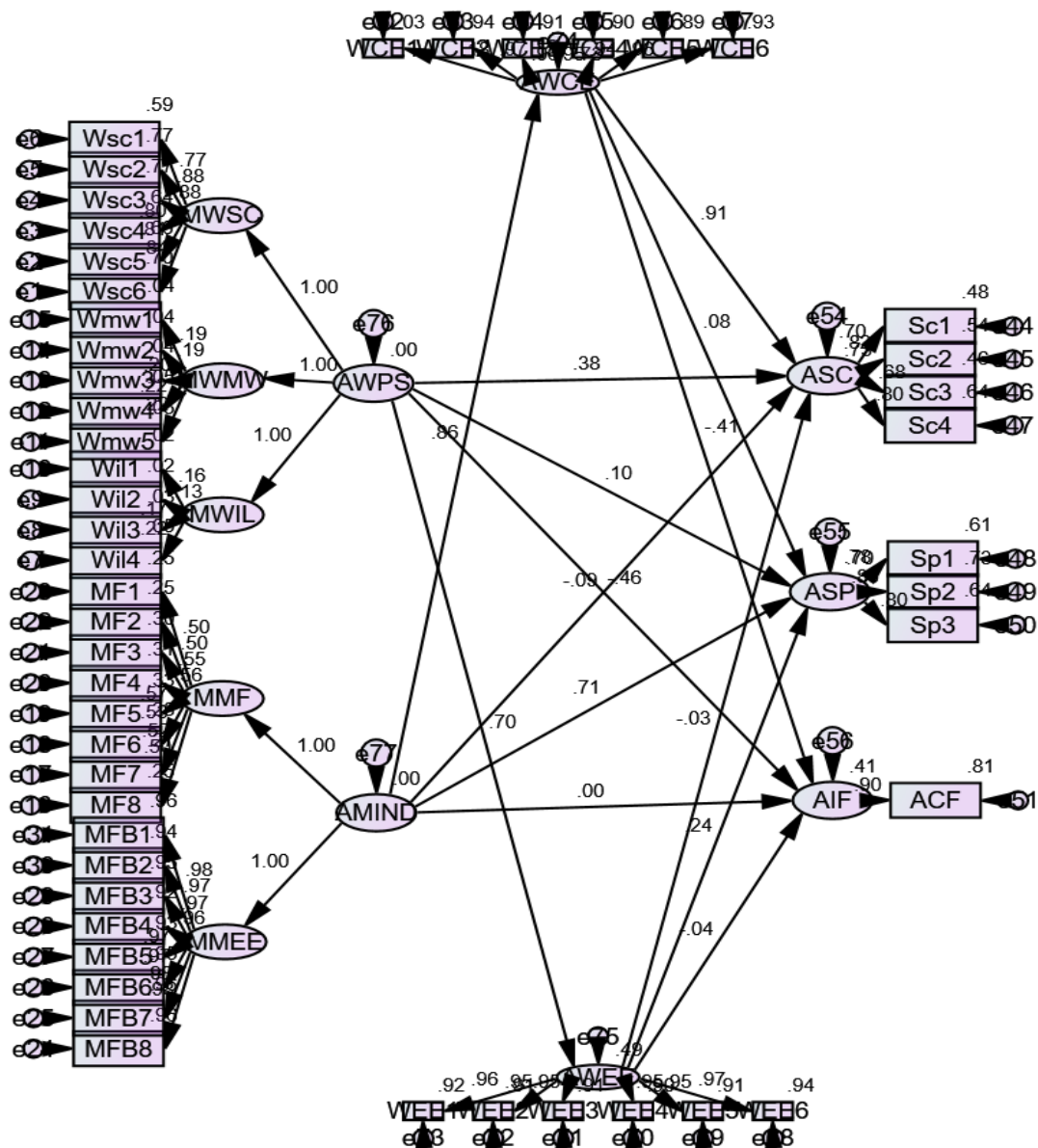MND and Safety Outcomes; and Mediating Effect of WEE on the Relationship of WPS and
Safety Outcomes.

Table 36

Tests of Indirect Effect of WCE on MND and Safety Outcomes and Indirect Effect of WEE on

MND and Safety Outcomes

Indirect Effects - Two Tailed Significance (

	AMIND	AWPS	A
AWEE	...	...	
AWCE	...	...	
AIF	.001	.677	
ASP	.637	.058	
ASC	.001	.649	

Table 37

Tests of Direct Effect of the Antecedent Variables on the Safety Outcomes After Introducing

WEE and WCE as Mediators Into the Model

Direct Effects - Two Tailed Significance

	AMIND	AWPS
AWEE	...	.001
AWCE	.001	...
AIF	.957	.002
ASP	.001	.482
ASC	.611	.006

Note. AMIND = Mindfulness; AWPS = Workplace spirituality; AWEE = Workers' emotional engagement;
AWCE = Workers' cognitive engagement; AIF = Injury frequency; ASP = Safety participation; ASC = Safety
compliance.

AMOS Path Diagram of the Mediating Effect of WCE on the Relationship of WPS and Safety Outcomes; and Mediating Effect of WEE on the Relationship of MND and Safety Outcomes.

Figure 22. AMOS path diagram of the mediating effect of WCE on WPS and safety outcomes; and mediating effect of WEE on MND and safety outcomes.

AMOS Direct and Indirect Effect Tests of the Mediating Effect of WCE on the Relationship
of WPS and Safety Outcomes; and Mediating Effect of WEE on the Relationship of MND
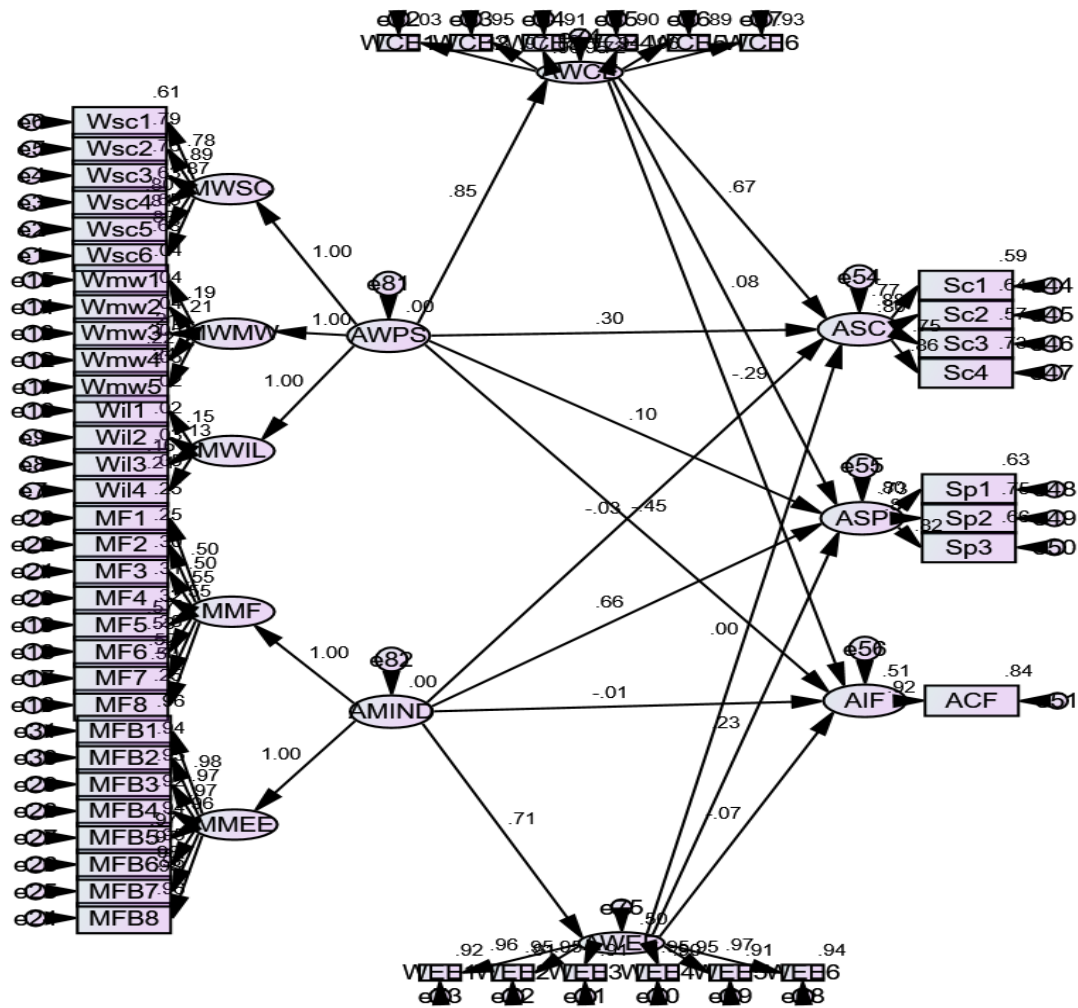and Safety Outcomes.

Table 38

Tests of Indirect Effect of WCE on WPS and Safety Outcomes and Indirect Effect of WEE on

MND and Safety Outcomes

Indirect Effects - Two Tailed Significanc

	AMIND	AWPS
AWEE	...	...
AWCE	...	...
AIF	.390	.021
ASP	.054	.699
ASC	.906	.001

Table 39

Tests of Direct Effect of the Antecedents on the Safety Outcomes After Introducing WEE and

WCE as Mediators into the Model

Direct Effects - Two Tailed Significance (B(

	AMIND	AWPS	A\
AWEE	.001	...	
AWCE	...	.001	
AIF	.919	.002	
ASP	.001	.471	
ASC	.830	.014	

Note. AMIND = Mindfulness; AWPS = Workplace spirituality; AWEE = Workers' emotional engagement;
AWCE = Workers' cognitive engagement; AIF = Injury frequency; ASP = Safety participation; ASC = Safety
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