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The Role of the Work Environment on the Safety Performance and Safety Management Practices: Its Influence on the Attitudes of Nurses in the Jordanian Hospitals

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Abstract: This study employs an integrated model, combining management practices studies and social theories, to examine the safety management practices and behavioural safety of Jordanian nurses from public hospitals. Our research employs Partial Least Squares (PLS-SEM) regression analysis to test the model. Hedonic value and utilitarian value are proposed as first-order reflective indicators of second-order formative value construct. The role of the work environment included for testing the difference in effect for all the relationship paths in the model. Data collected from 517 nurses present sound support for the research model. The results show that hospital management might help employees to practices of safety management, promote the positive work environment to enhance safety performance. The results also indicate that successfully investigated the associations between SMPs, work environment and safety performance in Jordanian Hospitals.

Keywords: Safety Management Practices, Safety Performance, Work Environment, Latent Variable Score, Reflective Formative Construct, Hierarchical Components Models

Introduction

International Labour Organization estimated that about 2.78 million fatalities occurred because of workplace less efficient safety systems, human factors, practices in the management and less efficient structure in the organization (ILO, 2017). Thus, about 7,500 people die every day. Of this total, 1,000 die due to workplace injuries and 6,500 die from a disease from the workplace (Hämäläinen *et al*., 2017). Estimates suggest that about 374 million persons are involved in non-fatal occupational injuries yearly (ILO, 2017; Hämäläinen *et al*., 2017). The effects of these occurrences have caused high economic costs due to workplace incidents, fatalities and injuries, which shocking and organizations need to identify issues in the workplace related to safety. Indeed, Takala and Young (2014) emphasised that the impact of safety-related costs on Gross Domestic Products ranged between 1.8% and 6.0% in various countries.

In the Middle East, work-related accidents have received much attention from researchers and practitioners (Eskandari *et al*., 2017) because mortality rates have been estimated to higher than in other parts of the world (ILO, 2011). For example, Hämäläinen *et al*. (2006) calculated that fatal occupational rates per 100,000 were 20.0 in Middle East Crescent countries, as compared to 16.1 per 100,000 in Established Market Economies like Europe and the United States and 13.1 per 100,000 in Former Socialist Countries. Only other Asian Countries like Bangladesh, Pakistan and Thailand at 23.1 per 100,000 and Sub-Sharan Africa at 21.0 per 100,000 were rated as worse.

In Jordan, the precise figures are difficult to obtain as a good database, and adequate means of collecting data are absent (Al-Wreidat, 2006; Dababneh *et al*., 2018; Al-Bsheish *et al*., 2019). Previous studies on social security figures estimated the rate of occupational fatalities in Jordan between for 25 per 100,000 per year from 1980 to 1993 (Rabbi *et al*., 1998). Other studies have found lower rates. The ILO estimated a fatality rate of 15.6 in Jordan for 2006 and the rate was calculated to be about 12.0 between 2008 and 2014 (Dababneh *et al*., 2018). In a study of hospital admissions from three significant hospitals using data from 2008 to 2012, Al-Abdallat *et al*. (2015) estimated the rate of fatality as 2 per 100.000 workers. They specifically noted a 1.1% fatalities rate among Jordanian healthcare

workers vis-à-vis other classes of workers. Thus, occupationally-induced fatalities rate among Jordanian health workers could be high in relationship to the number of health care workers in Jordan considering this position in mathematical terms.

Globally, healthcare workers (palliative care, dental, surgical, nursing, laboratory, home-based, clinical, non-clinical, etc.) are exposed to occupational accident daily while carrying out their routine tasks. "An occupational accident is an occurrence in the course of work causing physical or mental occupational injury" (Hughes and Ferret, 2016). Notwithstanding that hospitals are designed the treatment of a wide range of illnesses, they are also a channel for transmitting diseases (Brotfain *et al*., 2017; Price *et al*., 2017). The routes through which these Healthcare Workers (HCWs) sustain injuries occur while using injections, inadequate waste management systems, treatment of patients and general patient care and management. Doctors, physicians and theatre nurses also have reported injuries or contact with blood/body fluids during procedures (Martins *et al*., 2012).

Thus, a need exists to examine and understand factors that can improve safety performance and safety performance metrics of HCWs. This need cannot be overemphasised. Commonly, incidents of accidents are used to measure safety performance, but this metric suffers from several flaws. First, this metric is reactive. Second, lower accident numbers accident cannot be used to proposed safety in an organization (Beus *et al*., 2016) because they are lagging metrics. Third, as Martins *et al*. (2012) noted, organizations often do not report accidents as they occur. They also posited that organizations underreport by about 70%. In the healthcare setting, Santos and Reis (2016) noted a massive underreporting of accidents amongst nurses.

Therefore, studying factors that can improve the safety performance of HCWs is necessary both in terms of identifying key factors and in terms of developing more proactive metrics. One key element is this search is organizational factors, which have been identified as being responsible for positively shaping the safety-related behaviours of employees (McFadden *et al*., 2015). While accidents are indicators of safety performance, Beus *et al*. (2016) noted that safety behaviours are more proactive and accurate measures of safety performance in organizations. Also, mistakes and wilful transgressions that non-participation and non-compliance with safety guidelines use and the propensity to take risks characteristically lead to workplace accidents (Gibb *et al*., 2014; Griffin *et al*., 2015; Strauch, 2016). In the healthcare setting, cognitive workload (Choudhury *et al*., 2019) and a lack of management attention to the safety of HCWs have all been noted to be significant causes of poor safety performance (Carayon *et al*., 2015; Pousette *et al*., 2017).

To this end, the perceptions of employees on the level of the seven selected safety management practices implemented in their organizations are considered in this study as organizational factors that can influence their safety performance. Hence, this study highlighted the influence of seven core factors, i.e., Management Commitment to Safety, Safety Training, Safety Communication and Feedback, Safety Rules and Procedures, Workers Involvement in Safety, Safety Promotion Policies, Cooperation Facilitation represented as unidimensional by practices of safety management that have been identified across a myriad of socio-demographic settings vis-à-vis their ability to influence on safety performance outcomes among healthcare workers in this study.

Literature Review

Safety Performance

Several researchers have defined safety performance based on the nature and context of their studies. Earlier definitions in studies proposed the meaning of safety performances in terms of a set of rules, regulation and activities in enhancing safety procedures in an organization (Xia *et al*., 2018). Usually, these are self-reported (Andersen *et al*., 2018) but they are a way to promote the safety and health among the workers eventually (Zahoor *et al*., 2017). Studies have indicated that safety performance could be defined as a safety level in an organization in terms of either action or inaction involving structures, organization and systems (Fernández-Muñiz *et al*., 2017; Gunduz and Laitinen, 2018; Jahangiri *et al*., 2017). In general, safety performance is a measurement determining the safety level at the workplace, which involves accident, fatalities and injuries (Curcuruto *et al*., 2015; Mullen *et al*., 2017). Safety performance also means the tendency of incidents to happen that result in fatalities, injuries and damage of property (Erdogan *et al*., 2018).

The above definitions are all-encompassing as they relate to reactive and proactive views of what safety performance is. Also, accident indicators (Vinodkumar and Bhasi, 2010) and human factor elements (Cooper, 2015; Curcuruto *et al*., 2015; Mullen *et al*., 2017) are the main factors that contribute to establishing safety performance within organizations. As such, some other definitions of safety performance are suggested. Accordingly, Griffin and Curcuruto (2016) viewed safety performance as an actor in promoting health safety among employees, customers, public and environment. Based on the definition of safety performance, the organization seeks ways to enhance safety performance in an organization to prevent their personnel from exposure to the threats due to loss prevention in the organization (Erdogan *et al*., 2018; Osman *et al*., 2015; Wachter and Yorio, 2014).

Researchers and industry practitioners have begun to identify and suggest ways to execute practices that can influence of workers behaviours with the ultimate aim of improving safety performance (Kao *et al*., 2017; Zohar *et al*., 2014). Despite the massive number of empirical endeavours that have been executed in safety field to signify workplace practices to enhance safety performance results, the elimination of many hazards from the workplace has not been wholly achieved (MaGuire, 2017).

To conclude, further studies target in assessing the practices of the organizational and workplace which reflects on the safety performance across the industries (Durdyev *et al*., 2017; Ioannou *et al*., 2017). For the present study, safety performance help is measured by items of safety compliance and safety participation whereas safety compliance denotes activities portraying obedience to safety procedures and working safely (Neal *et al*., 2000). Contrarily, safety participation indicates "helping co-workers, promoting the safety program within the workplace, demonstrating initiative and putting effort into improving safety in the workplace" (Neal *et al*., 2000, p. 101).

Safety Management Practices

While several individual and organizational factors and their ability to influence safety performance outcomes have been discussed in the previous studies, safety management practices as a latent variable, being the core of this study will be discussed now SMPs have been defined by some researchers in the safety management research area. For example, Kirwan (1998) is of the view that safety management is practices and roles associated with organizational safety and employees. In very recent definitions, SMPs have been more clearly defined. Specifically, Marín *et al*. (2017) noted that SMPs are organizational efforts and related actions that ensure the safety and health of workers and their places of work. The more positive the safety management practices, the better safety-related behaviours are expected from the employees. Other researchers who defined SMPs based on the nature of their studies include (Auyong *et al*., 2016; Khalid *et al*., 2016; Nordlöf *et al*., 2017).

This paper proposes to examine the relationship between safety management practices such as (management commitment to safety, workers' involvement in safety, safety promotion policies, safe work procedures, safety training, safety communication and feedback and cooperation facilitation) as unidimensional latent variable and components of safety performance (safety compliance and safety participation). The safety management practices variables selected in this study are based on their frequency of examination among studies across diverse work-settings and demographic spread. Besides, few published studies have explored Safety management practices as a single measured variable. In the same vein, Vinodkumar and Bhasi (2010) report there is very few research evidence relating perceived safety management practices to safety performance, directly or indirectly as a unidimensional construct. Thus, this study seeks to obtain data which help to address these research gap.

To conclude, these variables are being examined in a work setting with scant research. To the best of the researcher knowledge, only a limited number of studies have been done in the Jordanian environment, particularly in the field of health care, with particular emphasis on nurses attached to public facilities. The healthcare sector is also being investigated because of the need to have superior safety performance that eventually leads to a reduction in accidents and injuries and possible fatalities.

Work Environment as a Mediator

Analyzing statistical mediation is common in psychology because sociologists are inquisitive on how systems work (Hayes and Preacher, 2014; Montoya and Hayes, 2017). Moreover, when researchers seek a further understanding of how and why such relationships occur and especially in an intermediary process (Montoya and Hayes, 2017), the introduction of a mediator might be worthwhile.

Work environment means that the social, physical and psychological criteria of the work environment (Bergström *et al*., 2015; Searcy *et al*., 2016). The workplace environment is related to every aspect of the approach and works management systems and how a system interrelates with employees and their workplaces (Searcy *et al*., 2016). A better work environment or perceptions could lead to indicators of organizational performance. For example, the work environment is known to have a robust effect on organizational performance (Porter *et al*., 2016; Stalpers *et al*., 2015). Thus, an assessment of the working environment as a mediator is justified in determining the link between management practices and safety performance. This study is first look and purpose-based, which contributes to the body of knowledge in the field of security research.

In the literature, the relationship between SMPs and safety performance is established and has been empirically proven in a myriad of studies across numerous work settings and socio-demographic milieu (Choudhry, 2014; Vinodkumar and Bhasi, 2010; Wachter and Yorio, 2014; Wold and Laumann, 2015). More importantly, the significant role of the work environment in affecting the safety management practices of employees has been found. However, the examination of the work environment as a mediator in

explaining the relationship between safety management practices as unidimensional and safety performance is, to the best of the researcher's knowledge unavailable.

This paper focuses on the role of a work environment in affecting the safety management practices, and safety performance is the first look and an intended original contribution to the body of knowledge in the safety research area, as little research, exists in this regard with a specific focus on the Jordanian setting. Hence, based on the above arguments, the following hypotheses are posited:

H1. There is a significant and positive relationship between safety management practices and safety compliance.
H2. There is a significant and positive relationship between safety management practices and safety participation.
H3. There is a significant and positive relationship between safety management practices and work environment.
H4. There is a significant and positive relationship between the work environment and safety compliance.
H5. There is a significant and positive relationship between the work environment and safety participation.
H6. Work environment mediates the relationship safety management practices and safety compliance.
H7. Work environment mediates the relationship safety management practices and safety compliance.

Method

Sample and Data Collection Procedure

To collect data, nurses in the Jordanian Ministry of Health hospitals located in the northern region of Jordan, particularly in the governorate of Irbid, were surveyed. In Jordan, the hospitals provide secondary and tertiary healthcare services. Data from the JMH (2016) shows that the secondary and tertiary health system in Jordan comprises 110 total hospitals categorised into the public and private health sectors. The public health sector includes 32 hospitals under the authority of the Ministry of Health (MOH). University hospitals such as the Jordan University Hospital (JUH) and King Abdullah University Hospital (KAH) and 14 related hospitals are under the control of the Royal Medical Services (RMS). Lastly, there are 62 private hospitals. Table 1 shows the healthcare sectors in Jordan and the total number of beds for each sector in 2016.

Table 1: Types of hospitals, number of hospitals and beds in the Jordanian Health Sector (2016)

Health sectors	No. of Hospitals	No. of Beds
Public health sector:	48	9235
Ministry of Health	32	5177
Royal Medical Services	14	2917
Jordan University Hospital and King Abdullah University Hospital	2	1141
Private health sector:	62	4496
Total	110	13731

Source: Jordanian Ministry of Health (JMoH) (2016).

Because this study examines safety performance in healthcare settings, it would be suitable to consider healthcare workers because they are exposed to various physical or mental occupational injury in hospitals that related to their jobs (Chalya *et al*., 2015). Based on the categorisation in Table 1, the population might include the registered nurses who are working under the control of the Ministry of Health (MOH) in eight north region hospitals.

Data Analysis and Measures

The measures of safety management practices from Vinodkumar and Bhasi (2010) and Wachter and Yorio (2014), safety compliance and safety participation were taken from Vinodkumar and Bhasi (2010) and work environment made from Tourangeau and McGilton (2004) who developed the instruments from previous works. Following their tool, we used 38 items to measure safety management practices as unidimensional, six items of the work environment and four items for each safety compliance and safety participation.

This paper focuses on the reflective-formative hierarchical latent variable model and its factual relevance (Becker *et al*., 2012; Ringle *et al*., 2012). The reflective-formative type model reflectively measures lower-order variables that, individually, do not share a similar cause but together form a widespread perception that wholly arbitrates the impact on succeeding endogenous variables (Chin, 1998). In this study, safety management practices were measured as a formative second-order variable measured by first-order reflective indicators.

The following are the three justifications for measuring value as a formative second-order construct:

1. Seven core factors, i.e., Management Commitment to Safety, Safety Training, Safety Communication and Feedback, Safety Rules and Procedures, Workers Involvement in Safety, Safety Promotion Policies, Cooperation Facilitation, together, conceptually define safety management practices
2. Practices, as mentioned above, are unique and they cannot be interchanged one for the other

3. Practices, as discussed above, are theoretically independent with no high correlation

Because safety management practices were used as higher-order reflective formative, the study examines the formative hierarchical component model by considering collinearity, the weight and the significance of the weight. According to Hair *et al*. (2018), "outer weights informative measurement models might be analyzed for their significance and relevance only if collinearity is not at a critical level" (p. 125). Therefore, collinearity issues for the second-order (safety management practices) are assessed. The evaluation of collinearity is crucial to ensure that the constructs do not measure the same factors. As presented in Table 2, the Variance Inflation Factor (VIF) values for each of the constructs were less than the cut-off value of <5 (Hair *et al*., 2017; 2018), indicating that these constructs are distinct and are measuring different aspects of safety management practices.

The suitability of the higher-order constructs was then evaluated based on their conceptual properties (Fattore *et al*., 2018; Hair *et al*., 2018). Because this study used formative higher-order components, internal consistency reliability and convergent and discriminant validity assessments are unnecessary because the items for formative constructs need not be strongly/highly correlated (Hair *et al*., 2018). Table 3 shows the formative second-order construct assessment. The bootstrapping results indicate the weights and path coefficients for each of the formative second-order constructs (Hair *et al*., 2017). The results show that the seven dimensions of safety management practices are significantly related to safety management practices.

Assessment of Significance of the Structural Model

After ascertaining the outer model, the reliability and validity of the model were achieved. The subsequent step was to evaluate the structural model (inner model) results. The main criteria in PLS-SEM for assessing the structural model are the coefficient of determination (R^2), the effect size (f^2) and the significance of the path coefficients and predictive relevance (Q^2). The structural model of the present study involved the main effects model in which the direct relationships between safety management practices and safety performance were examined and also the indirect effect in which work environment was incorporated into the relationship as mediator. Figure 1 shows the full structural model (direct and indirect effect). This study presents all the relationships as standardized beta values. Besides, the significance level was set at $p<0.05$ and $p<0.01$ (1-tailed) in testing the direct relationships of the structural model and $p<0.05$ and $p<0.01$ (2-tailed) in testing the mediating effect.

Hypotheses of the Direct Effects

In this study, a systematic model analysis of the structural model was carried out to provide a detailed picture of the results and to test hypotheses. The evaluation of the inner model begins with an examination of the direct relationships between the independent variables and the dependent variable. The size of the path coefficients was examined through PLS-SEM algorithm, and the significance of the relationship was examined through PLS-SEM bootstrapping procedure in the SmartPLS 3.2.8 (refer Fig. 1). The original number of 517 was used as the number of cases and 5,000 was used as bootstrapping samples (Hair *et al*., 2018).

Carefully considering the choice of approach to avoid misplaced modelling that may lead to bias (Becker *et al*., 2012) is important. Considering the above, this study adopted the two-stage approach (refer to Fig. 1) as it fit the operationalization of the constructs. The perspective of the proposed model in this study reflected reflective-formative constructs, in which Ringle *et al*. (2012) suggested the use of the two-stage approach to overcome the constraints of the repeated indicators approach.

Table 2: VIF of the second-order formative construct

Constructs	VIF
Management Commitment	3.270
Safety Training	2.599
Safety Communication and Feedback	3.020
Safety Rules and Procedures	2.664
Workers Involvement	2.537
Safety Promotion Policies	2.035
Cooperation Facilitation	1.772

Table 3: Weight and significance of weight of the formative constructs

					Confidence Intervals (CI)		
Relationships	Std. Weight	Std. Error	t-values	p-values	LLCI	LCI	Decision
CF -> SMP	0.401	0.116	3.743**	0.000	0.215	0.539	Significant
MC -> SMP	0.386	0.144	1.731*	0.042	0.026	0.534	Significant
PP -> SMP	0.147	0.111	1.698*	0.045	0.009	0.319	Significant
SCF -> SMP	0.322	0.152	2.264*	0.012	0.104	0.560	Significant
SRP -> SMP	0.320	0.154	1.856*	0.032	0.023	0.536	Significant
ST -> SMP	0.251	0.153	1.933*	0.027	0.039	0.428	Significant
WI -> SMP	0.526	0.134	3.895**	0.000	0.258	0.657	Significant

Note: **Significant at 0.01 (1-tailed) and *significant at 0.05 (1-tailed).

Table 4: Results of hypotheses testing (direct relationships)

					Confidence Intervals Cis		
Relationships	Std. Beta	Std. Error	t-values	p-values	LLCI	ULCI	Decision
SMP -> SC	0.112	0.046	2.427**	0.007	0.027	0.176	Supported
SMP -> SP	0.201	0.058	3.886**	0.000	0.101	0.273	Supported
SMP -> WE	0.497	0.043	11.476**	0.000	0.413	0.559	Supported
WE -> SC	0.439	0.044	9.934**	0.000	0.367	0.510	Supported
WE -> SP	0.255	0.051	4.939**	0.000	0.166	0.334	Supported

Note: **Significant at 0.01 (1-tailed) and *significant at 0.05 (1-tailed).

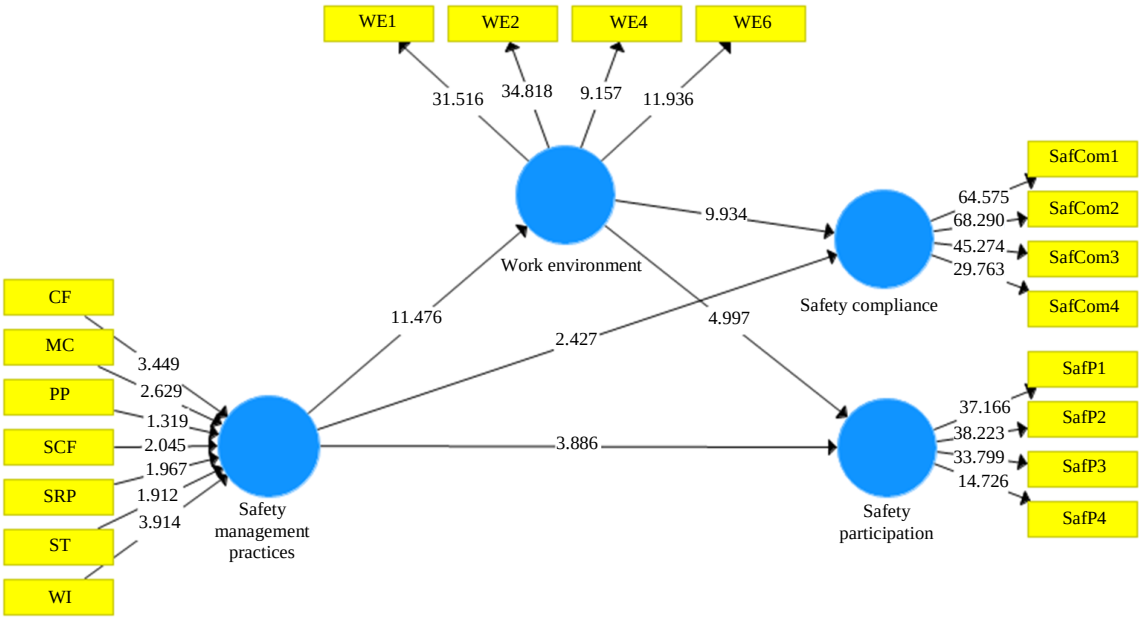

Fig. 1: Research model – two-stage model

Based on the PLS-SEM algorithm and bootstrapping procedure, as mentioned above, Fig. 1 shows the path coefficient of the independent variables and the dependent variables. The result reveals the exogenous variables had a positive coefficient with the endogenous variables. The bootstrapping results in Fig. 1 show that the relationships between the independent variables and the dependent variables are significant at p<0.01. Table 4 presents the path coefficients, t-statistics, p-values and confidence intervals.

From Table 4 and Fig. 1, five direct relationships were examined. Five were significant at the1% significant level i.e., safety management practices have significant and positive relationship with safety compliance (β = 0.112, t-value = 2.427 and p-value = 0.007), safety participation (β = 0.201, t-value = 3.886 and p-value = 0.000) and safety management practices had significant and positive relationships with work environment (β = 0.497, t-value = 11.746 and p-value = 0.000). Therefore, hypotheses H1, H2 and H3 were supported.

Work environment on the other hand has a significant and positive relationship with safety compliance (β = 0.439, t-value = 9.934 and p-value = 0.000), safety participation (β = 0.255, t-value = 4.939 and p-value = 0.000). Therefore, hypotheses H4 and H5 were supported.

Assessment of Variance Explained in the Endogenous Variables

One criterion for evaluating the suitability of the structural model in PLS-SEM is coefficient determinant (R^2) (Hair *et al*., 2018). The R^2 value is the proportion of variation in the DV(s) that can be explained by one or more predictor variable (Hair *et al*., 2017). Following the recommendation of Falk and Miller (1992), the minimum acceptable value of R2 is 0.10. Thus, the more the value of R^2 is closer to one, the bigger the percentages of variance explained. Cohen (1988) proposed another way of evaluating the R^2 value as follows: 0.02 as weak, 0.13 as moderate and 0.26 as substantial. While Chin (1998) suggests that 0.19, 0.33 and 0.67 of R^2 value in PLS-SEM can be considered as weak, moderate and substantial, respectively. Even though the value of R^2 ranges between 0 and 1, no consensus exists on its exact value. Its value depends on the research context (Hair *et al*.,

2017). Table 5 presents the values of the R2 of the endogenous variables in this study.

As presented in Table 5, the research model explains 25% of the total variance in safety compliance, 16% in safety participation and 25% of the total variance in the work environment. This suggests that the safety management practices and work environment collectively explain 25% of the total variance in safety compliance and 16% of safety participation. Additionally, safety management practices explain 25% of the total variance in the work environment. Hence, following the criteria of Cohen (1988), the R2 values of 25%, 16% and 24% for safety compliance, safety participation and work environment respectively in this study were considered as weak to substantial.

Assessment of the Effect Size (f^2)

According to Chin (1998), Effect size (f^2) relatively explains the effect of a specific or particular independent variable (IV) on the dependent variable (DV) by means changes in the (R^2). Cohen (1988) defined f^2 as "the degree to which the phenomenon is present in the population" or "the degree to which the null hypothesis is false" (p. 9). The following formula is used to express f^2 (Cohen, 1988):

$$Effect\ size: f^2 = \frac{R^2\ included - R^2\ Excluded}{1 - R^2 Included}$$

Whereas:

f^2	=	Effect sizes
R^2 *included*	=	R-square included
R^2 *excluded*	=	R-square excluded
1	=	Constant

R-included is the R^2 value of the dependent variable when a specific independent variable is included. R-excluded is the R^2 value of the dependent variable when the specific or particular independent variable is excluded from the model. F^2 values, according to Cohen (1988) describes as 0.35 as large, 0.15 as a medium and 0.02 as small. In Smart-PLS 2.0 calculating the variables effect size requires the use of above formula manually, but Smart-PLS 3.0 simplified it by automatically calculating the effect size. Because the current study used Smart-PLS 3.0, the results of the effect sizes were directly reported in Table 6.

As presented in Table 6, the effect sizes for the safety management practices on safety compliance, safety participation and work environment were 0.013, 0.036 and 0.328, respectively. Thus, the effect sizes based on Cohen's (1988) rule, this exogenous variable on criterion variables can be considered as having small, small and medium, effects, respectively. Moreover, Table 6 shows that the effects sizes for the work environment on safety compliance and safety participation were 0.194 and 0.058, respectively. Equally, based on the guidelines that Cohen (1988) provided, the results propose that the effects sizes of this exogenous variable on these two endogenous variables can be considered as medium and small respectively. It might be noted that a small f^2 does not indicate an insignificant effect. It only shows the contribution of each independent variable to the level of R^2 value.

Construct Cross-Validated Redundancy (Predictive Relevance)

In this study, to examine the predictive relevance of the model (Q-square), Stone-Geisser blindfolding was applied (Stone, 1974; Geisser, 1974). Q^2 was calculated in this study in SmartPLS 3.1.2 using the blindfolding procedure with omission distance of 7 (Tenenhaus *et al*., 2005). If a Q^2 value of an endogenous construct for a specific dependent latent variable is greater than zero, its explanatory latent variable displays predictive relevance (Chin, 1988). Hair *et al*. (2014) and Chin (1998) set three guidelines for evaluating Q^2. A Q^2 value of 0.35 shows that the model has large predictive relevance, A Q^2 value of 0.15 demonstrates that the model has medium predictive relevance; while a Q^2 value of 0.02 indicates that the model has small predictive relevance for a certain endogenous variable.

Table 7 in this current study, in the column labelled 1-SSE/SSO shows that the results of the Q^2 test for all endogenous latent constructs were above zero for safety compliance (Q^2 = 0.162), safety participation (Q^2 = 0.086) and work environment (Q^2 = 0.129) indicating predictive relevance of the model (Ramayah *et al*., 2018).

Table 5: Coefficient of determination (R^2)

Latent variables	R^2 (Variance Explained)	R^2 Percentage
Safety Compliance	0.254	25%
Safety Participation	0.156	16%
Work Environment	0.247	25%

Table 6: Effect Size (F^2)

Relationship	F^2 Value	Size
SMP -> SC	0.013	Small
WE -> SC	0.194	Medium
SMP -> SP	0.036	Small
WE -> SP	0.058	Small
SMP -> WE	0.328	Medium

Table 7: Predictive relevance of the model (construct cross-validated redundancy)

Constructs	SSO	SSE	Q^2 (= 1-SSE/SSO)
Safety Compliance	2,068.00	1,730.39	0.162
Safety Participation	2,068.00	1,887.91	0.086
Work Environment	2,068.00	1,810.39	0.129

Table 8: Results of hypotheses testing (mediation)

					Confidence Intervals Cis		
Relationships	Std. Beta	Std. Error	t-values	p-values	LLCI	ULCI	Decision
SMP -> WE -> SC	0.218	0.028	7.648	0.000	0.165	0.276	Supported
SMP -> WE -> SP	0.126	0.027	4.663	0.000	0.074	0.180	Supported

Note: **Significant at 0.01 (2-tailed) and *significant at 0.05 (2-tailed).

Having presented results of the direct effects and the related test of hypotheses, the coefficient determinant (R^2), effect size (f^2) and predictive relevance (Q^2) of the model, the analysis of mediating effects and the intending test of hypotheses is presented.

Testing for Mediation

After assessing the direct effect between exogenous and endogenous variables, the study went further to test the relationships through the role of mediator (indirect effect). In evaluating the mediation effect, many statistical methods are available to make conclusions and Confidence Intervals (CIs), such as Monte Carlo approximation to the distribution of the product DPR (Preacher and Selig, 2012), an analytical approximation to the (DPR) (MacKinnon *et al*., 2007), resampling/bootstrapping (Shrout and Bolger, 2002), asymptotic/traditional (Baron and Kenny, 1986; Sobel, 1982) and etc. Each approach has its advantages or disadvantages in terms of software availability, interpretation, empirical performance and computational ease (Falk and Biesanz, 2016). According to Falk and Biesanz (2016), "reliance on traditional methods (e.g., Sobel's test) likely results in many indirect effects that go undetected due to statistical power that is too low" (p. 11). Therefore, in the current study, the bootstrapping approach (Hair *et al*., 2018; Aguinis *et al*., 2017) was used to test for mediation. This approach is preferred for mediation analysis when using Smart-PLS.

From the results in Table 8 using bootstrapping procedure, work environment intervenes in the relationship between safety management practices and safety compliance $\beta = 0.218$, t-value = 7.648 and p-value = 0.000) and safety management practices and safety participation ($\beta = 0.126$, t-value = 4.663 and p-value = 0.000). Therefore, H6 and H7 were supported.

Discussion

With regard to the link between management practices, safety performance and the role of the work environment, this section is the core of the paper which intends to discuss and analyze the whole empirical model developed to guide this study. The study on the link between safety management practices, work environment and safety performance, such as quality of health care outcomes is an essential topic in the organizational sciences. Little research has been conducted examining this relationship in hospital settings.

The findings of a study conducted in Middle east i.e., Jordanian hospitals (Al-Bsheish *et al*., 2019), for instance, revealed strong associations between organizational factors and safety performance as well as organizational outcomes including physical and mental occupational accidents. It has identified key measures of health outcomes. These were using injections, poor waste management systems, treatment of patients and during general patient care and management. Indeed, doctors, physicians and theatre nurses have reported injuries or contact with blood/body fluids while conducting serious or minor sessions (Martins *et al*., 2012).

Previous empirical research in the field suggests the need to continuously improve and innovate management practices so as to improve individual and organizational outcomes, including quality of healthcare as well as health care worker satisfaction in hospitals. Moreover, some studies indicate that improving the quality of health services leads to improve functional outcomes of health care worker (Lievens and Vlerick's, 2013; Newhouse *et al*., 2013).

Interestingly, no consensus exists as to how safety management practices influence safety performance, especially among employees in highly regulated work settings (Mashi, 2014). Consequently, while it is well-established that different SMPs influence safety performance (Jaafar *et al*., 2017; Nordlöf *et al*., 2017; Vinodkumar and Bhasi, 2010), very little has been done in terms of theoretical development and research explicitly explaining the fundamental mechanisms on how SMPs affect safety performance differentially (Cheng *et al*., 2012). Additionally, environmental and safety management concepts have rarely been examined in a single study (Hajmohammad and Vachon, 2014). Thus, this study filled this gap.

A better work environment or perceptions of a good work environment lead to the betterment of several organizational performance indicators. For example, the work environment is noted to have a powerful influence on organizational outcomes (Porter *et al*., 2016; Stalpers *et al*., 2015; Searcy *et al*., 2016; Zúñiga *et al*., 2015) and effects on health and survival (Johari *et al*., 2017). However, the examination of the work environment as a mediator in explaining the relationship between safety management practices and safety performance is, to the best of the researcher's knowledge

unavailable. Thus, this is a first look and an intended original contribution to the body of knowledge in the safety research area.

Also, this study found the mediation of the work environment in safety management practices and safety performance. According to some studies, SMPs are becoming a critical key to the improvement of the work environment (Hohnen and Hasle, 2018). For instance, safety management is represented as an essential part of construction management on building engineering in China, which has a pleasant work environment (Lu *et al*., 2015). Additionally, a practice of safety management is selected as an antecedent of the work environment because it is theory-driven.

Consistent with the Social Exchange Theory (SET) (Cropanzano *et al*., 2017), the expectation of this current study is that, when nurses perceive high safety management practices occasioned by the activities of management in relation to the safety of the nurses, then the nurses might develop positive perceptions of the comfortability and user-friendly nature of their work environment. In turn, lead them to their ensuring improvements in their safety performance indicators. Interestingly, in the safety research area, this position has been proven (Johari *et al*., 2017; Reader *et al*., 2017; Zohar *et al*., 2014).

A possible reason for this is due to the size of the hospitals in Jordan. It is worthy to note that all of the hospitals in this study are secondary hospitals. These hospitals are large and have adequate resources compared to primary hospitals. Secondary hospitals can ensure adherence to strict SMP in terms of safety to the nurses to improve their safety performance.

Implications, Recommendations and Conclusion

Taken together, the findings of this research reported partial support for the key theoretical propositions. The results of the study have provided theoretical and practical implications in the domain of occupational safety and health management. Specifically, this study suggests that the work environment would mediate the relationship between safety management practices as a latent variable and components safety performance. As for practical ramifications, the research results validated the notion that practices of safety management through the work environment are of utmost importance in complying with safety rules and procedures at work.

Inherently, in reviewing the existing policies and procedures about occupational safety and health, the factors above deserve a higher level of scrutiny in any hospitals. This is attributed to the sense that the work environment is indeed comfortable, safe and user-friendly enough for them to carry out their tasks. Also, a positive perception of nurses that their work environment is well-placed for them to work safely might lead them to comply with safety rules and procedures at work and promote safety programs in the workplace.

This study has highlighted several trends for further research efforts. Future research might replicate the framework of this study in other settings, such as construction and mining and quarrying industries because these sectors are also considered as high-risk industries. Importantly, studies on safety issues in these industries may yield interesting perspectives and understandings regarding safety performance in various areas. A comparative study of industries, such as manufacturing, agriculture, construction, as well as mining and quarrying, would be beneficial in a further understanding of factors related to safety compliance and overall performance safety in the different natures of work. Besides that, future studies might consider adopting other approaches, for instance, a qualitative research design, in analysing issues on the reasons why employees are ignoring complying with safety rules and procedures.

Finally, the above positions brought to light the prevalent factors used in measuring safety performance, including accidents and injuries, safety compliance and safety participation. Interestingly, risky behaviour, as another, yet an under-researched component of safety performance, is worth examining because of its striking relationship, which is yet a different objective measure of safety performance. The need to examine risky behaviour as a core component of safety performance is predicated on Ramanujam and Goodman (2003), who advanced the concept of latent errors. Also, this research suggests the need for more evidence towards examining safety management practices as a unidimensional construct.

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Author's Contributions

Authors' contributions both of authors contributed to the conception of this paper. The first author contributed to the design, data collection, drafting and revision of the final manuscript. Both authors read and approved the final manuscript.

Ethics

Ethics approval and consent to participate in Ethical approval were waived by the Ministry of Health in Jordan and the Ministry of Health in Jordan. This study was considered a quality improvement study with a focus on the system of safety level and information

collected did not include personal data. The confidentiality and anonymity of responses were ensured at all times. No names or identifiers were linked to any of the findings emerging from the study.

References

Aguinis, H., J.R. Edwards and K.J. Bradley, 2017. Improving our understanding of moderation and mediation in strategic management research. Organiz. Res. Meth., 20: 665-685.

Al-Abdallat, E.M., A.M.A. Oqailan, R. Al Ali, A.A. Hudaib and G.A.M. Salameh, 2015. Occupational fatalities in Jordan. J. Forensic Legal Med., 29: 25-29. DOI: 10.1016/j.jflm.2014.11.001

Al-Bsheish, M., M. bin Mustafa, M. Ismail, A. Meri and M. Dauwed, 2019. Perceived management commitment and psychological empowerment: A study of intensive care unit nurses' safety. Safety Sci., 118: 632-640. DOI: 10.1016/j.ssci.2019.05.055

Al-Wreidat, A., 2006. The national occupational safety and health profile of the Hashemite Kingdom of Jordan.

Auyong, H.N., S. Zailani and L. Surienty, 2016. Perceived safety management practices in the logistics sector. Work, 53: 729-735.

Andersen, L.P., L. Nørdam, T. Joensson, P. Kines and K.J. Nielsen, 2018. Social identity, safety climate and self-reported accidents among construction workers. Constr. Manage. Econom., 36: 22-31.

Baron, R.M. and D.A. Kenny, 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. J. Personality Soc. Psychol., 51: 1173-1182. DOI: 10.1037/0022-3514.51.6.1173

Becker, J.M., K. Klein and M. Wetzels, 2012. Hierarchical latent variable models in PLS-SEM: Guidelines for using reflective-formative type models. Long Range Plann., 45: 359-394. DOI: 10.1016/j.lrp.2012.10.001

Bergström, J., M. Miller and E. Horneij, 2015. Work environment perceptions following relocation to open-plan offices: A twelve-month longitudinal study. Work, 50: 221-228.

Beus, J.M., M.A. McCord and D. Zohar, 2016. Workplace safety: A review and research synthesis. Organiz. Psychol. Rev., 6: 352-381. DOI: 10.1177/2041386615626243

Brotfain, E., I. Livshiz-Riven, A. Gushansky, A. Erblat and L. Koyfman *et al*., 2017. Monitoring the hand hygiene compliance of healthcare workers in a general intensive care unit: Use of continuous closed circle television versus overt observation. Am. J. Infect. Control, 45: 849-854. DOI: 10.1016/j.ajic.2017.03.015

Carayon, P., P. Hancock, N. Leveson, I. Noy and L. Sznelwar *et al*., 2015. Advancing a sociotechnical systems approach to workplace safety-developing the conceptual framework. Ergonomics, 58: 548-564. DOI: 10.1080/00140139.2015.1015623

Chalya, P.L., J. Seni, M.F. Mushi, M.M. Mirambo and H. Jaka *et al*., 2015. Needle-stick injuries and splash exposures among health-care workers at a tertiary care hospital in north-western Tanzania. Tanzania J. Health Res., 17: 1-15.

Cheng, E.W., N. Ryan and S. Kelly, 2012. Exploring the perceived influence of safety management practices on project performance in the construction industry. Safety Sci., 50: 363-369. DOI: 10.1016/j.ssci.2011.09.016

Chin, W.W., 1998. The Partial Least Squares Approach to Structural Equation Modelling. In: Modern Methods for Business Research, Marcoulides, G.A. (Ed.), Lawrence Erlbaum, Mahwah, NJ., pp: 295-358.

Choudhry, R.M., 2014. Behaviour-based safety on construction sites: A case study. Accident Anal. Prevent., 70: 14-23. DOI: 10.1016/j.aap.2014.03.007

Choudhury, A., O. Asan and M. Mansouri, 2019. Role of artificial intelligence, clinicians and policymakers in clinical decision making: A systems viewpoint. Proceedings of the 5th IEEE International Symposium on Systems Engineering, (SSE' 19), Scotland.

Cropanzano, R., E.L. Anthony, S.R. Daniels and A.V. Hall, 2017. Social exchange theory: A critical review with theoretical remedies. Acad. Manage. Annals, 11: 479-516. DOI: 10.5465/annals.2015.0099

Cohen, J., 1988. Statistical Power Analysis for the Behavioural Sciences. 1st Edn., Lawrence Erlbaum Associates, Hillsdale, NJ.

Cooper, D., 2015. Effective safety leadership: Understanding types and styles that improve safety performance. Profess. Safety, 60: 49-53.

Curcuruto, M., S.M. Conchie, M.G. Mariani and F.S. Violante, 2015. The role of prosocial and proactive safety behaviours in predicting safety performance. Safety Sci., 80: 317-323. DOI: 10.1016/j.ssci.2015.07.032

Dababneh, A., R.H. Fouad and A.J.H. Majeed, 2018. Assessment of occupational safety and health performance indicators for Jordan. J. Fundamental Applied Sci., 10: 162-169.

Durdyev, S., S. Mohamed, M.L. Lay and S. Ismail, 2017. Key factors affecting construction safety performance in developing countries: Evidence from Cambodia. Constr. Econom. Build., 17: 48-65.

Erdogan, B., A. Ozyilmaz, T.N. Bauer and O. Emre, 2018. Accidents happen: Psychological empowerment as a moderator of accident involvement and its outcomes. Personnel Psychol., 71: 67-83. DOI: 10.1111/peps.12228

Eskandari, D., M.J. Jafari, Y. Mehrabi, M.P. Kian and H. Charkhand *et al*., 2017. A qualitative study of organizational factors affecting occupational accidents. Iranian J. Public Health, 46: 380-388.

Falk, R.F. and N.B. Miller, 1992. A Primer for Soft Modelling. 1st Edn., University of Akron Press, Akron, OH.

Fattore, M., M. Pelagatti and G. Vittadini, 2018. A least-squares approach to latent variables extraction in formative-reflective models. Comput. Stat. Data Anal., 120: 84-97. DOI: 10.1016/j.csda.2017.11.006

Fernández-Muñiz, B., J.M. Montes-Peón and C.J. Vázquez-Ordás, 2017. The role of safety leadership and working conditions in safety performance in process industries. J. Loss Prevent. Process Industries, 50: 403-415. DOI: 10.1016/j.jlp.2017.11.001

Geisser, S., 1974. A predictive approach to the random effect model. Biometrika, 61: 101-107.

Gibb, A., H. Lingard, M. Behm and T. Cooke, 2014. Construction accident causality: Learning from different countries and differing consequences. Constr. Manage. Econom., 32: 446-459. DOI: 10.1080/01446193.2014.907498

Griffin, M.A. and M. Curcuruto, 2016. Safety climate in organizations. Annual Rev. Organiz. Psychol. Organiz. Behav., 3: 191-212. DOI: 10.1146/annurev-orgpsych-041015-062414

Griffin, T.G.C., M.S. Young and N.A. Stanton, 2015. Human Factors Models for Aviation Accident Analysis and Prevention. Ashgate Publishing Company, Farnham, England.

Gunduz, M. and H. Laitinen, 2018. Observation based safety performance indexing method for construction industry-validation with SMEs. KSCE J. Civil Eng., 22: 440-446.

Hair Jr., J.F., G.T.M. Hult, C. Ringle and M. Sarstedt, 2014. A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). SAGE Publications, Incorporated.

Hair, J.F., G.T.M. Hult, C.M. Ringle and M. Sarstedt, 2017. A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM). 1st Edn., SAGE Publications, Thousand Oaks, CA.

Hair, J.F., M. Sarstedt, C.M. Ringle and S.P. Gudergan, 2018. Advanced Issues in Partial Least Squares Structural Equation Modeling. 1st Edn., SAGE Publications, Los Angeles, CA.

Hajmohammad, S. and S. Vachon, 2014. Safety culture: A catalyst for sustainable development. J. Bus. Eth., 123: 263-281. DOI: 10.1007/s10551-013-1813-0

Hämäläinen, P., J. Takala and T.B. Kiat, 2017. Global estimates of occupational accidents and work-related illnesses. Proceedings of the World Congress on Safety and Health at Work, Sept. 3-4, Singapore.

Hämäläinen, P., J. Takala and K.L. Saarela, 2006. Global estimates of occupational accidents. Safety Sci., 44: 137-156. DOI: 10.1016/j.ssci.2005.08.017

Hayes, A.F. and K.J. Preacher, 2014. Statistical mediation analysis with a multi categorical independent variable. Brit. J. Math. Stat. Psychol., 67: 451-470. DOI: 10.1111/bmsp.12028

Hughes, P. and E. Ferrett, 2016. International Health and Safety at Work: For the NEBOSH International General Certificate in Occupational Health and Safety. 3rd Edn., Routledge, England, pp: 152.

Hohnen, P. and P. Hasle, 2018. Third party audits of the psychosocial work environment in occupational health and safety management systems. Safety Sci., 109: 76-85. DOI: 10.1016/j.ssci.2018.04.028

ILO, 2011. Introductory report: Global trends and challenges on occupational safety and health world congress on safety and health at work. International Labour Organization.

ILO, 2017. Snapshots on Occupational Safety and Health (OSH). International Labour Organization.

Ioannou, C., D. Harris and N. Dahlstrom, 2017. Safety management practices hindering the development of safety performance indicators in aviation service providers. Aviat. Psychol. Applied Human Factors, 7: 95-106. DOI: 10.1027/2192-0923/a000118

Jaafar, S.B., W.W. Choong and A.H.B. Mohamed, 2017. Facilities maintenance employees' priority of safety management practices: A research study in Malaysia. Facilities, 35: 319-334. DOI: 10.1108/F-03-2015-0012

Jahangiri, M., K.S. Zadeh, O. Bashar and H.S. Zadeh, 2017. Investigating effective factors on risk perception, safety attitude and safety performance of construction workers of Shiraz city, 2012. J. Health Field, 1: 30-36.

Johari, J., T.F. Yean and Z. Adnan, 2017. Demystifying the empirical link between safety climate, safety communication, work environment and unsafe behaviour at work. J. Pengurusan, 50: 35-43. DOI: 10.17576/pengurusan-2017-50-04

JMH, 2016. Periodic-newsletters. Jordanian Ministry of Health.

Kao, K.Y., C. Spitzmuller, K.P. Cigularov and C.L. Thomas, 2017. A moderated mediation model of safety knowledge, safety attitude and safety performance. Acad. Manage. Proc. DOI: 10.5465/ambpp.2016.219

Khalid, K., S.H.M. Hussain and A.M. Ahmad, 2016. The relationship between safety management practices and safety performance in the Malaysian construction industry: The mediating moderating role of safety motivation. Adv. Sci. Lett., 22: 1340-1243. DOI: 10.1166/asl.2016.6607

Kirwan, B., 1998. Safety Management Assessment and Task Analysis - a Missing Link? In: Safety Management: The Challenge of Change, Hale, A.R. and M.S. Baram (Eds.), Pergamon, Oxford, United Kingdom, pp: 67-92.

Lievens, I. and P. Vlerick, 2014. Transformational leadership and safety performance among nurses: The mediating role of knowledge-related job characteristics. J. Adv. Nurs., 70: 651-661.

Lu, Y., Q. Li, Z. Zhou and Y. Deng, 2015. Ontology-based knowledge modeling for automated construction safety checking. Safety Sci., 79: 11-18. DOI: 10.1016/j.ssci.2015.05.008

MacKinnon, D.P., M.S. Fritz, J. Williams and C.M. Lockwood, 2007. Distribution of the product confidence limits for the indirect effect: Program PRODCLIN. Behav. Res. Meth., 39: 384-389.

Maguire, R., 2017. Safety Cases and Safety Reports: Meaning, Motivation and Management. Ashgate Publishing Limited, Farnham, England.

Marín, L.S., H. Lipscomb, M. Cifuentes and L. Punnett, 2017. Associations between safety climate and safety management practices in the construction industry. Am. J. Industrial Med., 60: 557-568. DOI: 10.1002/ajim.22723

Martins, A., A.C. Coelho, M. Vieira, M. Matos and M.L. Pinto, 2012. Age and years in practice as factors associated with needlestick and sharps injuries among healthcare workers in a Portuguese hospital. Accident Anal. Prevent., 47: 11-15. DOI: 10.1016/j.aap.2012.01.011

Mashi, M.S., 2014. Moderating effect of consideration of future safety consequences on the relationship between safety management practices and safety performance among healthcare workers: A conceptual analysis. Int. J. Acad. Res. Bus. Soc. Sci., 4: 402-411. DOI: 10.6007/IJARBSS/v4-i6/970

McFadden, K.L., G.N. Stock and C.R. Gowen III, 2015. Leadership, safety climate and continuous quality improvement: Impact on process quality and patient safety. Healthcare Manage. Rev., 40: 24-34. DOI: 10.1097/HMR.0000000000000006

Montoya, A.K. and A.F. Hayes, 2017. Two-condition within-participant statistical mediation analysis: A path-analytic framework. Psychol. Meth., 22: 6-27. DOI: 10.1037/met0000086

Mullen, J., E.K. Kelloway and M. Teed, 2017. Employer safety obligations, transformational leadership and their interactive effects on employee safety performance. Safety Sci., 91: 405-412. DOI: 10.1016/j.ssci.2016.09.007

Neal, A., M.A. Griffin and P.M. Hart, 2000. The impact of organizational climate on safety climate and individual behaviour. Safety Sci., 34: 99-109. DOI: 10.1016/S0925-7535(00)00008-4

Newhouse, R.P., C.D. Himmelfarb, L. Morlock, K.D. Frick and P. Pronovost *et al*., 2013. A phased cluster-randomized trial of rural hospitals testing a quality collaborative to improve heart failure care: Organizational context matters. Medical Care, 51: 396-403.

Nordlöf, H., B. Wiitavaara, H. Högberg and R. Westerling, 2017. A cross-sectional study of factors influencing occupational health and safety management practices in companies. Safety Sci., 95: 92-103. DOI: 10.1016/j.ssci.2017.02.008

Osman, R., N. Awang, S.A.H.S. Hassan and N.M. Yusof, 2015. Level of awareness on Behaviour-Based Safety (BBS) in manufacturing industry towards reducing workplace incidents. Int. J. Educ. Res., 3: 77-88.

Porter, T.H., K.D. Riesenmy and D. Fields, 2016. Work environment and employee motivation to lead: Moderating effects of personal characteristics. Am. J. Bus., 31: 66-84. DOI: 10.1108/AJB-05-2015-0017

Pousette, A., P. Larsman, M. Eklöf and M. Törner, 2017. The relationship between patient safety climate and occupational safety climate in the healthcare-a multi-level investigation. J. Safety Res., 61: 187-198. DOI: 10.1016/j.jsr.2017.02.020

Preacher, K.J. and J.P. Selig, 2012. Advantages of Monte Carlo confidence intervals for indirect effects. Commun. Meth. Measures, 6: 77-98.

Price, J.R., K. Cole, A. Bexley, V. Kostiou and D.W. Eyre *et al*., 2017. Transmission of Staphylococcus aureus between health-care workers, the environment and patients in an intensive care unit: A longitudinal cohort study based on whole-genome sequencing. Lancet Infect. Dis., 17: 207-214. DOI: 10.1016/S1473-3099(16)30413-3

Rabbi, A., L. Jamous, B.A. Abudhaise and R.H. Alwash, 1998. Fatal occupational injuries in Jordan during the period 1980 through 1993. Safety Sci., 28: 177-187. DOI: 10.1016/S0925-7535(98)80007-6

Ramanujam, R. and P.S. Goodman, 2003. Latent errors and adverse organizational consequences: A conceptualization. J. Organiz. Behav., 24: 815-836. DOI: 10.1002/job.218

Ramayah, T., J. Cheah, F. Chuan, H. Ting and M.A. Memon, 2018, Partial Least Squares Structural Equation Modeling (PLS-SEM) Using SmartPLS 3.0: An Updated and Practical Guide to Statistical Analysis. 2nd Edn., Pearson Limited, Kuala Lumpur.

Reader, T.W., K. Mearns, C. Lopes and J. Kuha, 2017. Organizational support for the workforce and employee safety citizenship behaviors: A social exchange relationship. Human Relat., 70: 362-385. DOI: 10.1177/0018726716655863

Ringle, C.M., M. Sarstedt and D.W. Straub, 2012. Editor's comments: A critical look at the use of PLS-SEM in MIS quarterly. MIS Q., 36: 3-14. DOI: 10.2307/41410402

Santos, P.H.S. and L.A.D. Reis, 2016. Underreporting of accidents at work in nursing professionals: Integrative review. J. Nurs. UFPE Online, 10: 640-646.

Searcy, C., S.M. Dixon and W.P. Neumann, 2016. The use of work environment performance indicators in corporate social responsibility reporting. J. Cleaner Product., 112: 2907-2921.

Shrout, P.E. and N. Bolger, 2002. Mediation in experimental and nonexperimental studies: New procedures and recommendations. Psychol. Meth., 7: 422-445.

Sobel, M.E., 1982. Asymptotic confidence intervals for indirect effects in structural equation models. Sociol. Methodol., 13: 290-312.

Stalpers, D., B.J. de Brouwer, M.J. Kaljouw and M.J. Schuurmans, 2015. Associations between characteristics of the nurse work environment and five nurse-sensitive patient outcomes in hospitals: A systematic review of the literature. Int. J. Nurs. Stud., 52: 817-835. DOI: 10.1016/j.ijnurstu.2015.01.005

Strauch, B., 2016. Decision errors and accidents: Applying naturalistic decision making to accident investigations. J. Cognitive Eng. Dec. Mak., 10: 281-290.

Stone, M., 1974. Cross-validatory choice and assessment of statistical predictions. J. Royal Stat. Society, 36: 111-147.

Takala, J. and E. Young, 2014. Mortality estimates of occupational injuries and ill health in Singapore.

Tenenhaus, M., V.E. Vinzi, Y.M. Chatelin and C. Lauro, 2005. PLS path modeling. Comput. Stat. Data Anal., 48: 159-205.

Tourangeau, A.E. and K. McGilton, 2004. Measuring leadership practices of nurses using the leadership practices inventory. Nurs. Res., 53: 182-189. DOI: 10.1097/00006199-200405000-00005

Vinodkumar, M.N. and M. Bhasi, 2010. Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation. Accident Anal. Prevent., 42: 2082-2093. DOI: 10.1016/j.aap.2010.06.021

Wachter, J.K. and P.L. Yorio, 2014. A system of safety management practices and worker engagement for reducing and preventing accidents: An empirical and theoretical investigation. Accident Anal. Prevent., 68: 117-130. DOI: 10.1016/j.aap.2013.07.029

Wold, T. and K. Laumann, 2015. Safety management systems as communication in an oil and gas producing company. Safety Sci., 72: 23-30. DOI: 10.1016/j.ssci.2014.08.004

Xia, N., M.A. Griffin, X. Wang, X. Liu and D. Wang, 2018. Is there an agreement between worker self and supervisor assessment of worker safety performance? An examination in the construction industry. J. Safety Res., 65: 29-37. DOI: 10.1016/j.jsr.2018.03.001

Zahoor, H., A.P. Chan, W.P. Utama, R. Gao and I. Zafar, 2017. Modelling the relationship between safety climate and safety performance in developing the construction industry: A cross-cultural validation study. Int. J. Environ. Res. Public Health, 14: 351-351. DOI: 10.3390/ijerph14040351

Zohar, D., Y.H. Huang, J. Lee and M. Robertson, 2014. A mediation model linking dispatcher leadership and work ownership with safety climate as predictors of truck driver safety performance. Accident Anal. Prevent., 62: 17-25.

Zúñiga, F., D. Ausserhofer, J.P. Hamers, S. Engberg and M. Simon *et al*., 2015. Are staffing, work environment, work stressors and rationing of care related to care Workers' perception of the quality of care? A cross-sectional study. J. Am. Med. Directors Assoc., 16: 860-866. DOI: 10.1016/j.jamda.2015.04.012