Measuring hotel employee perceived job risk: Dimensions and scale development

Abstract

Purpose – The primary purpose of this research was to identify the dimensions of hotel employees' job risk perceptions and develop a multidimensional scale for measuring perceived risk.

Design/methodology/approach – Four studies in a mixed-method design were conducted to develop and validate the scale of hotel employees' perceived job risk (HEPJR). Study 1 identified the dimensions and initial items of HEPJR through a literature review and in-depth interviews. In Study 2, an explanatory factor analysis was conducted to refine the preliminary items. Study 3 further refined the HEPJR scale through confirmatory factor analysis. Study 4 provided empirical support for a 19-item scale through cross-validation analysis.

Findings – A reliable and valid scale was developed to measure five dimensions of HEPJR: perceived human, equipment, internal and external environmental, and management risks. HEPJR and its dimensions significantly predict negative safety consequences and negative job satisfaction.

Research limitations/implications – Employees of medium- and high-star-rated hotels in China were surveyed. Future research should test the HEPJR scale with other types of lodging formats (e.g., budget hotels, homestays, or cruise ships) and in different countries or regions.

Practical implications – Given the increasingly serious job risks faced by hotel employees, the

HEPJR scale can become a benchmark for job risk identification, accident prevention, and safety

management.

Originality/value – The scale provides a clear conceptualization and an appropriate

measurement tool for HEPJR from a risk-source perspective.

Keywords – Perceived job risk; Accident causation theory; Hotel employees; Scale development;

China

Article Type – Research paper

1. Introduction

Hospitality is an employee-dependent business and employee safety and security at work are essential for the provision of high-quality services to guests, and consequently the sustainable development of the industry (Zopiatis, Constanti, & Theocharous, 2014). Unfortunately, due to high levels of employees' perceived risks at work, many hotels experience high turnover rates, poor job satisfaction, and low productivity (Chen, Chang, & Wang, 2018; Hsieh, Apostolopoulos, & Sönmez, 2013; Krause, Scherzer, & Rugulies, 2005; Zhao et al., 2016). These challenges represent an obstacle to the sustainable development of the hospitality industry, particularly in China and other countries where there is rapid growth (Mohsin, Lengler, & Aguzzoli, 2015; Sun, 2014). Hotel employees' job risks must be systematically examined.

Job risks refer to the dangers that workers face when performing their duties (Ale et al., 2008), and employees' evaluation of risks constitutes perceived job risk (Basha & Maiti, 2013). Hotel employees are exposed to several potential risks when working. Risks may arise from improper behavior of customers or colleagues (Harris & Reynolds, 2004; Gill et al., 2002), or result from equipment-level hazards (Krause et al., 2005; Chan & Lam, 2013; Sierra, Rubio-Romero, & Gámez, 2012). Risk factors may also result from the external environment, such as natural disasters and refugee crises (Chien & Law, 2003; Ivanov & Stavrinoudis, 2018). All these factors affect employees' assessment of their risks at work. However, the hospitality industry still lacks adequate knowledge and effective management practices of the job risks that employees face.

Extant research has focused on the characteristics of job risk, while an in-depth exploration of measurement scales remains a gap in the literature. Previous studies have predominantly investigated HEPJR in relation to specific groups (Sönmez et al., 2018), positions (Krause et al., 2005), and risk issues (Bach & Pizam, 1996) and explored occupational injury disparities across gender, race, and injury type (Buchanan et al., 2010). Also, some negative societal images of hotel work come from the perception of job risks, and these negative images are factors influencing employee recruitment. Several researchers have analyzed the diversity, universality, and complexity of job risks and insecurity to explain employee job risk (Akbiyik, 2016; Tian, Zhang, & Zou, 2014). However, job insecurity and job risk are two different constructs. Job security attaches great importance to job stability, while job risk includes potential risks that arise from various sources ranging from human, equipment, management to the environment (Leveson, 2004, 2011) and endanger personal, property, and psychological safety (Basha & Maiti, 2013).

This research fills the literature gap by developing a reliable and valid scale for HEPJR based on accident causation theory, which defines the construct and identifies the sources of risks. The development of this scale provides a new avenue for hospitality research. Also, hotel managers will be equipped with a novel tool to measure employee perceived risk at work. This research has practical implications for hotel managers to reduce accidents and promote sustainable hotel development.

This article is organized as follows. First, based on accident causation theory, a clear conceptualization of HEPJR is provided from the risk-source perspective. Second, a reliable and

valid tool for measuring HEPJR is proposed through a mixed-method research design. Finally,

the theoretical contributions and practical implications are discussed.

2. Literature review

2.1. *Accident causation theory*

According to accident causation theory, the laws and common patterns of accidents can be identified so that similar accidents can be prevented at the source (Dulac, 2007; Grant et al., 2018; Li, Zhang, & Liang, 2017). The occurrence of accidents often has common patterns and triggers, and risk is any factor that increases the possibility of an accident's occurrence (Elvik, 2016). Risk is the potential state and preparatory process of accident occurrence. With the evolution of accident causation theory, the identification of risk evolved from single to multiple factors. Risk analysis gradually evolved into a systematic process, with an accident involving the interaction of four major elements: man, machines, media, and management (the 4Ms) (Leveson, 2004, 2011). . Deviation from any system element can leave employees exposed to risk (Leveson, 2011; Lower, Magott, & Skorupski, 2018). The 4M-risk-induced framework of accident causation theory has been widely applied in different fields of research, such as coal mining (Song & Xie, 2014), marine transportation (Chen, 2014), and engineering management (Mao & Xu, 2011). In tourism, Bentley et al. (2001) applied the 4Ms to investigate the nature and extent of New Zealand's adventure tourism injury problems, and identified a range of client, equipment, environmental, and organizational risk factors. However, the 4M-risk-induced framework has not received much attention in hospitality.

Extant hospitality research is limited to specific categories of risks, such as occupational injuries, public safety, and natural disasters (Krause et al., 2005; Buchanan et al., 2010;

Henderson, 2005; Hua & Yang, 2017), which has led to a lack of systematic understanding of the concept of HEPJR. The 4M-risk-induced framework provides such a systemic approach to understanding the risk factors that employees encounter from varying sources (Leveson, 2011; Lower, Magott, & Skorupski, 2018). This research draws upon the 4M-risk-induced framework to address the research questions, and the conceptualization and operationalization of the HEPJR construct.

2.2. Job risk

Appendix 1 presents the definitions of job risk and related concepts. Currently, job risk research mainly focuses on high-risk industries such as construction, engineering, and chemicals, aiming to identify the risk perceptions, safety behaviors, and occupational injuries of employees in high-risk job situations (Basha & Maiti, 2013; Rundmo & Sjoberg, 2010). The goal of job risk research is to improve employee occupational health and corporate safety performance. Job risk is commonly considered as a negative working condition (Karatepe & Sokmen, 2006). Perceived job risk is employees' evaluations of the risks they are exposed to at work (Basha & Maiti, 2013).

2.3. HEPJR

Hotel employee job risks are the risk factors that cause staff to suffer unfortunate events such as threats, danger, injuries, and losses during or related to their work. HEPJR represents the overall judgments by employees of risk factors and the risk status of a hotel. Hotel job risk has

received considerable attention in hospitality research. For example, Buchanan et al. (2010) argued that hotel employees have a higher incidence of occupational health issues and suffer more serious injuries than most other service workers. Hotel job risks may include work-family conflicts, job stress, customer misconduct, and emotional exhaustion (Babin & Boles, 1998; Harris & Reynolds, 2004; Zohar, 1994). The concept of employee perceived job risk is proposed in prior studies and this research extended the concept into hospitality and developed a scale for HEPJR.

Following the 4M-risk-induced framework, this research conceptualizes HEPJR as a construct consisting of five dimensions: human, equipment, environment (internal and external), and management. Appendix 2 summarizes the previous studies relevant to HEPJR based on these risk source dimensions.

2.3.1. *Perceived human risk*

According to the 4M-risk-induced framework, the human factor refers to an individual's behavior in a work setting (Leveson, 2004, 2011). In the context of hotel services, this is reflected in the behaviors of customers, colleagues, and the employees themselves. Misconducts such as negligence, inappropriate interactions, and emotional responses may cause behavioral conflicts among employees and customers, leading to negative circumstances on both sides (Harris & Reynolds, 2004; Li, Qiu, & Liu, 2016). Differences in religion, gender, race, age, and educational background among employees in various hotel departments may generate conflicts at work (Harris & Ogbonna, 2002, 2006; Sanon, 2014; Krause et al., 2005). The lack of employee

safety awareness, attitudes, and skills constitute significant causes of injuries and accidents

(Baser et al., 2016; Corchado, Han, & Fyfe, 2010; Buchanan et al., 2010). Additionally,

excessive workloads and long working hours are common sources of HEPJR (Krause et al., 2005;

Lee & Krause, 2002).

2.3.2. Perceived equipment risk

Equipment risk refers to the possibility of threats, injuries, and other adverse consequences

that hotel employees suffer due to a lack of equipment, poor equipment performance, equipment

failure, or mismatches between people and machines. Hotel workplaces contain large amounts of

equipment and facilities, such as high-tech security systems (Chan & Lam, 2013), information

security systems (Kim, Lee, & Ham, 2013), professional firefighting equipment (Sierra et al.,

2012) and others. A lack of adequate safety equipment can be an important injury factor in

workplaces. Besides, equipment that has design defects or is difficult to operate may cause

employee injuries (Baser et al., 2016; Krause et al., 2005). Equipment in hotels must be regularly

tested, repaired, and updated to avoid unsafe conditions and to reduce equipment malfunction

(Jones, 2001; Lai & Yik, 2012).

2.3.3. Perceived environmental risk

Environmental risk is the possibility of threats, injuries, and other adverse situations that

hotel staff may experience due to environmental factors. The hotel environment is composed of

two sub-environments: the controllable internal environment and the uncontrollable external

environment. Risk factors in the external and internal environments are likely to harm the work status of hotel employees, but their nature and sources differ.

The external environment is the natural environment (physical environment) and social environment (physicochemical environment) surrounding a hotel. The specific risk factors are more diverse. For example, hotel employees in areas prone to natural disasters are often exposed to more risk than others (Méheux & Parker, 2006). Employees may also be at risk of disease and infection if there is a lack of hygiene or an epidemic near the hotel (Chien & Law, 2003). A social or refugee crisis in the region where a hotel is located (Ivanov & Stavrinoudis, 2018; Pappas, 2018; Šegota & Mihalič, 2018), employees may suffer from income reduction, unemployment, and other specific job risks. Also, hotel employees may be at risk of specific organized criminal activities in the local area, such as terrorist attacks, theft, and fraud (Enz & Taylor, 2002; Hua & Yang, 2017; Gill et al., 2002).

The internal environment refers to hotel employees' working environments, which includes the physical environment, such as air quality and workplace conditions, and the physicochemical environment, such as the organizational climate and teamwork environment. The internal environment is an important production space for customer service, information sharing, teamwork, and career development. A positive working environment promotes employee job satisfaction and performance (Zoghbi-Manrique-De-Lara & Ting-Ding, 2017). In contrast, a negative working environment may result in role ambiguity, performance pressure, team conflict, and other adverse behavioral consequences (Karatepe & Sokmen, 2006; Karatepe & Uludag,

2008). Since the external and internal environments of hotels have different risk sources and consequences, it is appropriate to measure them separately.

2.3.4. *Perceived management risk*

Management risk is the possibility of threats, injuries, and other negative impacts that hotel staff encounter as a result of the negligence or lack of professional risk systems at the organizational or managerial levels. Hotel management risk includes institutional factors, such as a lack of a security risk management department, loss of job security functions, lack of contingency plans, and inadequate emergency response capabilities (Enz & Taylor, 2002; Seaman & Eves, 2006; Gill et al., 2002), and managerial factors, such as a lack of warnings, neglect of safety, insufficient safety training, poor daily management, and inadequate accident handling (Chen et al., 2012; Graham & Roberts, 2000; Baser et al., 2016). Management risk factors do not include routine management behavior in non-secure situations and when equipment malfunctions (Leveson, 2004. 2011). The perceived management risk in this research describes the safety expectations and safety confidence of hotel employees in the institution, maintenance, emergency plans, and other organizational behavior of hotel safety management.

3. Methodology and scale development

This research employed a mixed-method approach following Churchill's (1979) guidance. Four studies were conducted (Figure 1). Study 1 generated the dimensions and initial items through a literature review, semi-structured qualitative interviews with hotel employees, an expert panel and a pilot test survey; Study 2 collected data from a survey of hotel employees for scale refinement; Study 3 further refined the scale through another survey with a different sample of hotel employees; and Study 4 validated the scale based on a nationwide online survey of hotel employees.

[Insert Figure 1 about here]

3.1 Study 1: Dimensions and measurement of HEPJR

Since neither an adequate conceptual model nor a measurement scale for HEPJR existed, a literature review and semi-structured interviews with a panel of experts were used to identify the dimensions and generate initial items for HEPJR.

3.1.1 Dimension identification

This research conceptualized risk as a multidimensional concept with four risk dimensions: human, equipment, environmental, and management. Previous research in manufacturing settings mainly focused on internal environments when analyzing risks (Basha & Maiti, 2013; Hayes et al., 1998; Zohar, 1980; Cox et al., 2004), and treated the environment as a unified physical space. However, the spatial structure and elements within the external and internal

environments of a hotel are very different, suggesting that the two environments should be treated separately. Additionally, the academic attention paid to the external and internal environmental risks of a hotel is balanced (Appendix 2). Twenty-seven themes were identified and grouped into five dimensions for measuring HEPJR from the risk-source perspective.

3.1.2 Item generation

A local hotel agreed to participate in the study. Five senior managers and eight frontline employees were interviewed. The total length of the interviews was more than 200 minutes (Table 1), and the average length of each interview was 15 minutes. After the semi-structured interview with the 13th respondent, no new insights were found compared with the previous 12, indicating saturation of the information provided by these13 respondents.

[Insert Table 1 about here]

The interview outline consisted of five dimensions and 27 themes summarized from the literature (Appendix 2). During the interviews, each respondent was asked these questions to elicit their thoughts and experiences regarding each dimension and to describe risk situations to which they were exposed at work. The respondents were asked to describe the risk factors causing potential adverse consequences in the: (1) hotel workplace; (2) hotel external environment; (3) hotel internal environment; (4) hotel facilities and equipment; (5) interactions of employees, customers, and colleagues; and (6) hotel management. The respondents were also asked to share their ideas and experiences about HEPJR, particularly with information not

included in the six dimensions.

Content analysis was used to organize and classify responses. Three researchers coded the transcripts into 107 statements and generated 29 items after reading, classifying, and combining respondent expressions. It was found that employee perceived job risks were not the same as the 27 themes derived from the literature. Four new themes were added, five themes were not mentioned, and three themes were expanded; 29 initial items were finally generated. Appendix 3 presents the results of the content analysis. For each dimension, the number of coded statements varied from 17 to 28. The research team assessed the content accuracy of the 29 items with the assistance of five Ph.D. students and two professors. Two items that did not belong to HEPJR were eliminated (IER-02 and IER-03); eight items that had the same connotation, but different expressions were combined (HR-03, HR-04, EER-01, EER-04, MR-03, MR-05); three items with inappropriate expressions were modified (EER-02, HR-01, IER-01), and two new items were added. Twenty-six items were identified and retained for further analysis.

3.1.3 Content validity

An expert review panel assessed the content validity of the HEPJR scale. The panel consisted of six professors and four doctoral candidates who had experience of conducting academic research on hospitality management and tourism safety (Appendix 4). A self-administered questionnaire was used in Round 1, where items were rated (1= strongly disagree and 5= strongly agree) by identifying redundancy, content ambiguity, and absence of inter-correlation. In Round 2, items with mean values of two or lower were revised through

expert group discussion. As a result, seven items were revised, and two new items were added. All experts agreed that the 28 items accurately defined the concept of HEPJR. These 28 items were categorized into five dimensions, with six items for perceived human risk, five items for perceived equipment risk, six items for perceived external environmental risk, five items for perceived internal environmental risk, and six items for perceived management risk.

3.1.4 Pilot test

A pilot test was conducted to reevaluate the effectiveness of the initial dimensions and items in three star-rated hotels in Xiamen and Quanzhou in Fujian Province. A total of 236 valid responses were obtained from employees, yielding a response rate of 78.7%. The subject to items ratio exceeded 5:1, the threshold suggested by Gorsuch (1974).

Item-to-total correlations and explanatory factor analysis (EFA) were conducted for 28 items. "Poor items" were revised according to the following criteria: a) the items were poorly correlated ($r < 0.3$) with the total score (Bagozzi, 1981; Churchill, 1979); b) the community of items was below 0.5 (Straub, 1989); and c) both the factor loading ($r < 0.5$) and cross-loading of each item were examined. As a result, three items were eliminated, and five items were revised, forming a 25-item scale.

3.2 Study 2: Scale refinement

The purpose of the second study was to refine the items generated in Study 1. Data were collected from employees working in five star-rated hotels in Quanzhou, Xiamen, and Shanghai

in December 2017. Undergraduate students on internships at the hotels were employed to deliver questionnaires after work through convenience sampling. The questionnaires were delivered and collected on-site and in a one-to-one format (one researcher and one respondent). This procedure ensured the validity of the data by informing respondents about the research purpose and ensuring anonymity. Respondents were asked to rate each item on a seven-point scale anchored by "strongly disagree (1)" and "strongly agree (7)." A total of 281 questionnaires were delivered, and 226 valid forms were returned, yielding a response rate of 80.4%.

3.3 Study 3: Scale re-refinement

The purpose of Study 3 was to re-refine the factor structure and items produced in Study 2 and to confirm the convergent and discriminant validity of HEPJR through confirmatory factor analysis (CFA). Study 3 employed undergraduate students, who were interns at the hotels, to deliver questionnaires, starting from March 2018 for a period of three months. The east and southeast areas of China have developed economies and vibrant hospitality markets. Data were collected from 19 star-rated hotels in five cities: Hong Kong (two hotels), Macau (one hotel), Quanzhou (three hotels), Xiamen (12 hotels), and Shanghai (one hotel). The data were collected from medium- and high-star-rated hotels, including thirteen 5-star, four 4-star, and two 3-star hotels. Nine of the participating hotels were international chain brands (e.g., Hilton, Hyatt, and Sheraton) and 10 hotels were local hotel brands (e.g., Yeohwa and Fliport). Hilton, Hyatt, and Sheraton are among the most recognized hotel chains in the world, Yeohwa and Fliport are local hotel brands with distinctive features in southeast China. A total of 496 questionnaires were

distributed and 407 valid forms were returned, representing an overall response rate of 82.1%.

3.4 Study 4: Scale validation

The results of Study 3 confirmed the convergent and discriminant validity of the HEPJR scale. However, the correlation between perceived equipment and the human risk was of some concern, and the correlations between perceived external environment risk, perceived human risk, and perceived equipment risk were lower than expected. Therefore another expert review was conducted to reconsider the items. It was found that some human risk items were worded in a manner that may have led to respondents thinking more about equipment or environmental factors (PHR-01 and PHR-02). Moreover, some equipment items were worded in a manner that might lead respondents to think they were the result of improper staff behavior (e.g., PER-01, PER-02, PER-03, PER-04, PER-05). The wording of these items was adjusted without significantly modifying the meanings.

The purpose of Study 4 was to re-examine the factor structure produced in Study 3 and to confirm the cross-validity and criterion validity of the HEPJR scale. Study 4 began with the launching of a fourth round of surveys in May 2019. Medium- and high-star-rated hotels were selected in the northeast (Jilin), east (Fujian), north (Beijing and Shanxi), south (Guangdong), southwest (Guizhou), and northwest China (Ningxia). Data were collected in 14 cities with 28 star-rated hotels, including ten 5-star, sixteen 4-star, and two 3-star hotels. This survey was conducted online through a leading market research website (www.wjx.cn). Hyperlinks to the questionnaire were posted on the WeChat groups of employees of the hotels surveyed with the

assistance of each hotel's human resources department. The survey lasted for seven days and

1,015 responses were received with 711 of them being considered valid, yielding a response rate

of 70.1%.

4. Results

4.1 Results of Study 2

The sample consisted of 60.6% female and 39.4% male respondents. The largest age group was 20-29 (70.8%), and the most frequently chosen range of monthly income was $372-743. Seventy-three percent had graduated from a junior college or higher. Some 81.0% were from frontline departments (front office, food and beverage, housekeeping) and junior staff (43.4%) was the largest position group.

The internal consistency of the scale was examined and the measurements were as follows: 1) Cronbach's alpha for each construct ranged from 0.789 to 0.953, which was an acceptable level of reliability; and 2) the item-to-total correlations were computed to determine the reliability of each item, which should exceed 0.30 (Bagozzi, 1981; Churchill, 1979), and the results showed that the item-to-total correlation coefficients for each item were greater than this suggested level.

An EFA with principal component analysis (PCA) and varimax rotation was performed. Five factors with eigenvalues greater than one were extracted, and the cumulative contribution of variance was 72.1%. The Kaiser-Meyer-Olkin index was 0.907 (> 0.7), and the Bartlett spherical test was significant at the level of 0.001, which justified the use of EFA. Both the factor loadings (r > 0.5) (Straub, 1989) and the community (r > 0.5) of each item were examined to eliminate "poor items." Two items were eliminated and the EFA was conducted again with principal

component analysis and varimax rotation. Finally, five factors were extracted, with the remaining 23 items accounting for 75.1% of the total variance (Table 2).

[Insert Table 2 about here]

4.2 Results of Study 3

Among the 407 respondents, 56.5% were female and 43.5% were male. The age group of 20-29 comprised the highest proportion (74.0%), and 81.3% had less than three years of work experience in hospitality. The most frequently chosen range of monthly income was $372-743, and 72.5% had graduated from junior college or higher. Some 79.5% were from frontline departments and junior staff (47.1%) was the largest position group.

4.2.1 Common method variance (CMV)

To avoid CMV, the order of questionnaire items was randomized, answers to some items were arranged in opposite directions, and participants were informed that their answers would be anonymous. Harman's single-factor test was conducted to test CMV by entering all items for PCA without rotation (Podsakoff et al., 2003). The results showed that the KMO index was 0.914, five factors with eigenvalues greater than one were extracted, and the largest percentage of variance was 40.6%. Also, the potential error variable was controlled to avoid negative effects on results. The original five-factor model was turned into a six-factor model by introducing a latent variable, common method factor, into the structural model (Liang et al., 2007). The results indicated that the Chi-square value had changed significantly ($\Delta\chi^2 = 121.598$, $\Delta df = 19$, $p < 0.05$).

Moreover, the values of GFI, IFI, CFI, TLI, RMSEA, and RMR changed slightly. Thus, CMV was not a concern in this research.

4.2.2 Reliability and validity assessment

CFA was conducted using AMOS 22.0, and maximum-likelihood analysis was performed. The Cronbach alphas for each dimension ranged from 0.819 to 0.945, indicating the reliability of the HEPJR scale (Table 3). Construct, convergent, discriminant, and nomological validity were taken into consideration. Convergent validity determines whether each factor is a single-dimensional construct. In accordance with Bagozzi (1981) and Hair et al. (2010), items that met the following criteria were eliminated: 1) the standardized factor loading was below the recommended 0.5 threshold, 2) the composite reliability (CR) was lower than 0.70, and 3) the average variance extracted (AVE) was below the cut-off value of 0.50. As a result, combined with model modification indices, four items (FR_01, FR_02, PR_01, and IER_05) were deleted to obtain better model-fit indices (χ^2 = 322.457, *df* = 139, p = 0.000, χ^2/*df* = 2.230, GFI =0.927, RMR = 0.081, RMSEA= 0.057, NFI = 0.945, CFI = 0.968, and AGFI = 0.900).

[Insert Table 3 about here]

To achieve discriminant validity, the correlation coefficients between constructs should be less than 0.85 and should be lower than the square root of the AVE of each construct. The results (Table 4) showed that each construct satisfied this requirement, indicating good discriminant validity (Bagozzi, 1987; Kam & Petrick, 2010). To assess nomological validity, correlations

between each construct were examined (Hair et al., 2010). As indicated by the correlation matrix, the five constructs of HEPJR were all correlated at the significance level of 0.001, which demonstrated nomological validity.

[Insert Table 4 about here]

4.3 Results of Study 4

The sample was composed of 63.6% females and 36.4% males. Some 32.6% were 20-29 years old and 32.3% were 30-39. Almost 40% had less than three years of work experience in hospitality. The most frequently chosen range of monthly income was $372-743, and high school (37.1%) was the largest education group. Some 68.8% were from frontline departments and junior staff (50.2%) was the largest position group.

4.3.1 Reliability and validity assessment

A meta-analytic approach was adopted to determinate the external validity of HEPJR (Wanous & Reichers, 1999). Using the nonparametric Spearman's rank correlation test, the correlations between the ordinal global HEPJR item and other ordinal items were examined. Cross-checking with the extant literature, the research team developed a global item, "I feel that working at this hotel is very unsafe." After the item was designed, the experts were asked for their opinions on it. Additionally, the advice was sought from scholars with experience in scale development and employees who had worked in hotels for more than one year. All agreed that this item summarized HEPJR. The results showed that there were significant and positive

correlations between the global item and other indicators, confirming good external validity for

HEPJR.

For each dimension, the Cronbach alphas ranged from 0.781 to 0.860, indicating the

reliability of the HEPJR scale. The standard factor loadings ranged from 0.631 to 0.917; CR was

from 0.783 to 0.870, and AVE ranged from 0.522 to 0.694, indicating the acceptable convergent

validity of the HEPJR scale. Discriminant validity was confirmed because the correlation

coefficients between constructs were lower than 0.85 and lower than the square root of the AVE

of each construct.

4.3.2 Model comparison of HEPJR

Four competitive models were constructed to determine the optimal factor structure of

HEPJR. Model 1 estimated the one first-order factor model with 19 observed variables (Figure

2-1); Model 2 estimated the five first-order factor models without correlation (Figure 2-2),

Model 3 estimated the five first-order factor models with correlation (Figure 2-3), and Model 4

estimated the one second-order factor model with five first-order factors (Figure 2-4).

Models 1 and 2 had the same degrees of freedom, but Model 1 showed inferior goodness of

fit and a higher Chi-square value, implying that Model 2 was superior to Model 1. Additionally,

Models 3 and 4 demonstrated better goodness of fit than Models 1 and 2, and the two models in

CFA showed high fit indices. However, Model 3 had a lower Chi-square value and RMSEA, and

it had a better goodness-of-fit index and adjusted goodness-of-fit index ($\chi^2 = 441.969$, $df = 140$, p

= 0.000, χ^2/df = 3.157, GFI = 0.939, SRMR = 0.052, RMSEA= 0.061, NFI = 0.934, CFI = 0.954,

and AGFI=0.917). In Model 4, the loadings of the initial five factors (PHR, PER, PIER, PEER,

and PMR) on the second-order HEPJR were 0.572, 0.569, 0.714, 0.863, and 0.739, which

surpassed the cutoff value of 0.5 and were statistically significant at the 0.001 level. This

dimensionality test indicated that Model 3 was the best measurement structure of HEPJR (Figure

2-3) and supported the use of a second-order factor for HEPJR as well (Figure 2-4).

[Insert Figure 2 about here]

4.3.3 Cross-validity

To assess the cross-validity of the HEPJR scale, an invariance test was performed. The

sample was randomly split into two sub-samples (50% vs. 50%) through SPSS routine random

case selection. One sample was a calibration sample (n = 355) and the other was a validation

sample (n = 356). The baseline model for the unconstrained model (χ^2 = 615.493, df = 280; CFI =

0.949; NFI = 0.911; RMSEA = 0.041; SRMR = 0.059) and the factor loading constrained model

(χ^2 = 635.866, df = 294; CFI = 0.948; NFI = 0.908; RMSEA = 0.040; SRMR = 0.058) showed a

good fit and that the same construct was measured across the specified groups. The result of the

Chi-square difference test between the calibration and validation samples was invariant ($\Delta\chi^2$ (Δdf

= 14) = 20.373; p = 0.119). These results demonstrated that the measurement model was

invariant for different groups, and it showed the cross-validity of the five-dimensional structure

of HEPJR.

4.3.4 Criterion-related validity

In previous works, job risk was identified as an important antecedent of safety consequences and job satisfaction (Basha & Maiti, 2013; Sunal, Sunal, & Yasin; 2011). It was hypothesized that the higher the job risk employees perceived, the lower their job satisfaction and the more serious the negative safety consequences. Three items measuring negative safety consequences were adapted from Huang et al. (2006), and three items measuring job satisfaction were adapted from Pugh, Groth, & Hennig-Thurau (2011). Question items were anchored on a 7-point Likert-scale (1 = strongly disagree, 7 = strongly agree) based on work experience in respective hotels. The criterion-related validity was assessed by examining the relationships between HEPJR, job satisfaction, and safety consequences. According to the results, HEPJR and its dimensions were significantly and positively correlated with negative safety consequences and negatively correlated with job satisfaction. Therefore, the criterion-related validity of the scale was confirmed.

5. Discussion and conclusions

5.1. Conclusions

The primary purpose of this research was to provide a clear conceptualization and a reliable and valid measurement scale for HEPJR from the risk-source perspective. With this goal in mind, the research closely followed the scale development procedure proposed by Churchill (1979). Four studies were conducted including the generation of dimensions and initial items (Study 1), scale refinement (Study 2), scale re-refinement (Study 3), and scale validation (Study 4). The results confirmed that the measurement model proposed for HEPJR was applicable to a first-order factor model with correlation as well as a second-order factor model. Additionally, the invariance test of cross-validity confirmed that the HEPJR scale is invariant for different samples, and the test of criterion-related validity confirmed that HEPJR and its dimensions significantly predict negative safety consequences and job satisfaction.

The results indicate that there were dimensional differences in the perceived levels of job risk among hotel employees. According to the data (Study 4), perceived human (mean = 3.99) and equipment risks (mean = 4.15) were relatively high, and the levels of these two dimensions were significantly higher than external environmental (mean = 2.29), internal environmental (mean = 2.51), and management risks (mean = 2.15), indicating the category difference in HEPJR. Combined with the interview results, hotel employees were greatly worried about human and equipment risks, while the concerns about environmental and management risks were relatively weak.

5.2. Theoretical implications

The current research enriches the knowledge of HEPJR by conceptualizing and verifying HEPJR as a multidimensional construct from a risk-source perspective based on the 4M-risk-induced framework of accident causation theory. Previous studies measured perceived workplace risk as a sub-dimension of organizational safety climate (Zohar, 1980). According to Basha & Maiti (2013), the job risk perceived by employees can be measured at four levels, including deadly risk, general risk, health risk, and safety perceptions. The risk source (because of humans) is different from risk consequence (employee injury). Unlike previous studies (e.g., Zohar, 1980; Basha & Maiti, 2013), a risk-source perspective adopted in this study provides more clearly-structured and inclusive dimensions of the perceived job risk in the hotel industry.

The newly developed HEPJR scale covers hotel employees' specific work environments and behavioral settings, considering various types of risk information that may affect employee perceived job risk assessment. Although discussion of some of the dimensions of job risk, for example, that of the risk at a staff level, such as occupational disease, customer-employee conflict, work-family conflict, has featured in previous studies (Harris & Reynolds, 2004; Karatepe & Sokmen, 2006; Buchanan et al., 2010), risk from an environmental level, such as social crises, public safety issues, and natural disasters (Henderson, 2005; Gill et al., 2002; Pappas, 2018), has rarely been discussed in hospitality research. The study thus compensates for this gap in the existing literature.

Consistent with the previous literature, this research confirms that the information affecting

HEPJR comes from multiple subjects (Harris & Reynolds, 2004; Gill et al., 2002) and from various factors (Henderson, 2005; Ivanov & Stavrinoudis, 2018; Pappas, 2018), which include human, equipment, environmental, and management risks. The research further shows that the environmental risks perceived by hotel employees can be subdivided into internal and external environmental dimensions (Zohar, 1994; Chien & Law, 2003; Karatepe & Sokmen, 2006; Méheux & Parker, 2006), which expands the concept of environmental risk in the 4M-risk-induced framework.

The HEPJR scale advances contemporary hospitality research by providing a measurement tool for follow-up empirical studies. Emerging theoretical implications include that HEPJR is potentially an important predictor of job satisfaction and turnover intention (Chen, Chang, & Wang, 2018; Zhao et al., 2016) and how health, safety and security management practices can help reduce HEPJR.

5.3. Practical implications

This research has several practical implications. First, hotel managers can use the scale for a better classification of job risks, and subsequently, develop tailored strategies for managing safety based on each dimension. For human risk, hotels should incorporate the misconduct of customers, colleagues, and even the employees themselves into the scope of management. For equipment risk, hotels should strengthen the comprehensive management of facilities and equipment in terms of allocation, failure, aging, and use. For environmental risk, hotels should divide it into two sub-components, namely internal and external environmental risks, which

should not only strengthen risk management in the workplace but also improve risk avoidance in the community. For management risk, hotels should pay attention to the development of professional safety work and strengthen the construction of safety cultures and mechanisms at the organizational level.

Second, the scale can be used to assess the perceived risk levels of hotel employees, and thus help hotel managers develop and improve risk management strategies. The scale can be used as a diagnostic tool to continuously monitor changes in employees' perceived job risk levels and provide decision support for optimizing hotel risk management practices. The finding that HEPJR is a significant predictor of negative safety consequences and job satisfaction suggests that effective risk management strategies can help enhance employee job performance and job satisfaction. And job performance and satisfaction are antecedents for improving hotel operating performance and recruitment attractiveness.

Third, the findings indicate that employees had higher levels of perceived human and equipment risk, and they were less concerned about environmental and management risk. This situation is related to the current low level of understanding of occupational safety among hotels in China. Hotel managers in China should invest more in staff, equipment, environments, management, and other resources, thereby reducing the risk factors more effectively. Also, job stability and security are important factors affecting employee recruitment and occupational choices. Hotels with low perceived job risk will have a favorable performance for employee satisfaction and retention. There is a close relationship between job risk and negative

occupational images as well. Hotels must strengthen HEPJR management to enhance the occupational safety images held by hotel employees, which will have a positive influence on the employment success rate of the hotel industry.

5.4. Limitations and future research

There are several limitations to this research. First, the present research identified characteristics of HEPJR only in Chinese hotels because of sample limitations. Previous hospitality studies have shown that HEPJR varies by region, race, gender, and position (Buchanan at al., 2010). Due to the rapid growth of the Chinese hotel industry, most of the respondents were between the ages of 20-29 and 30-39, and their work experience was less than three years. Future research should expand sample sizes and investigate HEPJR in contexts with different cultural backgrounds and risk orientations. Second, only employees of mid- and high-star-rated hotels were surveyed. Employees may perceive job risks differently depending on the star level, size, and type of hotel. Future research should test the HEPJR scale with other types of hotels (e.g., budget hotels, homestays, or cruise ships). Finally, future research should explore the antecedents (e.g., organizational culture, leadership, safety programs, employee welfare programs) and consequences of HEPJR (e.g., employee loyalty, customer service quality, hotel brand equity).

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Appendix 1. The definitions of job risk and relevant concepts

Concept	Target group	Definition	Dimension	Reference
Job-risk perception	Steel plant	Job-risk perception refers to employees' perception about the amount of risk at job	Four-dimensional concept	Basha & Maiti (2013)
Perception of workplace safety	Patients who experienced industrial accidents	Employees' perception of workplace safety, including global perception of job safety, co-worker safety, supervisor safety, management safety practices, and satisfaction with the safety program.	Five-dimensional concept	Hayes, Perander, Smecko, & Trask (1998)
Perceived risk level at workplace	Production worker in industrial organization	Employees' negative perceptions of the workplace environment	One-dimensional concept	Zohar (1980)
Employee risk perception	Offshore oil personnel	Employee risk perception consists of a rational component, which is probability judgments, as well as an affective component, such as worry and concern.	Two-dimensional concept	Rundmo & Sjoberg (2010)
Job risk	Industrial organization	The risk of a job is constructed from the risks associated with the hazards a worker has to face when he or she performs his job	One-dimensional concept	Ale et al. (2008)
Employee risk perception	Chemical company	Assessed the probability of accidents and injuries as well as worry and concern about potential hazards	One-dimensional concept	Rundmo & Iversen (2007)
Job insecurity		Perceived powerlessness to maintain desired continuity in a threatened job situation	Multiple-dimensional concept	Greenhalgh & Rosenblatt (1984)
Risks at work		Those aspects of the design and management of work and its social and organizational contexts that have the potential to cause psychological or physical harm		Cox, Griffths, & Randall (2004)
Occupational risk	Building construction	The hazards that a worker is exposed to, the duration of the exposure and the integration of the risk to all hazards and workers		Aneziris, Topple, & Papazoglou (2012)

Appendix 2. Themes of HEPJR

Dimensions	Themes	References
Perceived human risk (PHR)	Excessive workload	Heavy workload and work intensification (Krause et al., 2005; Lee & Krause, 2002)
	Occupational disease	Prevalence of back and neck pain (Krause et al., 2005); occupational hazards (Hsieh, Apostolopoulos, & Sönmez, 2015; Lee & Krause, 2002; Sönmez et al., 2018) ; acute trauma and musculoskeletal injuries (Buchanan et al., 2010)
	Customers' improper behaviour	Customer behaviourur (Harris & Reynolds, 2004) ; customer crime (Gill et al., 2002)
	Colleagues' improper behaviour	Employee theft (Gill et al., 2002); service sabotage (Harris & Ogbonna, 2002; Harris & Ogbonna, 2006)
	Work-family conflict	Work-family conflict for female employee (Babin & Boles, 1998); work-family conflict for frontline employee (Karatepe & Sokmen, 2006; Karatepe & Uludag, 2008)
	Lack of safety skills	Fire escape capability (Corchado et al., 2010; Kobes, Helsloot, Vries, Oberijé, & Rosmuller, 2007); engineering and maintenance course (Borsenik, 1977); food safety knowledge (Baser et al., 2016)
Perceived equipment risk (PER)	Difficult usage of hotel equipment	Cleaning equipment (Krause et al., 2005); firefighting equipment (Sierra et al., 2012)
	Aged hotel facilities	Facility management (Jones, 2001); computerized maintenance management systems (Lai & Yik, 2012)
	Failure of hotel facilities	Ventilation system (Stansbury, Yeager, Chen, Mueller, Dunn, Almaguer, & Gong, 2009)
	Lack of professional safety equipment	Safety and security index (Enz & Taylor, 2002); professional firefighting equipment (Sierra et al., 2012); information security system (Kim et al., 2013); high-

		tech security system (Chan & Lam, 2013)
Perceived external environmental risk (PEER)	Industry competition	Seasonal demand (Šegota & Mihalič, 2018); turbulent industry environment (Skokic, Lynch, & Morrison, 2016)
	Industry discrimination	"Social stigma" (Powell & Watson, 2006); low social status and "dirty work" (Ellis, 1981; Shamir, 1975)
	Social crisis	Technology crisis (Law & Lau, 2000); refugee crisis (Ivanov & Stavrinoudis, 2018); multiple crises (Pappas, 2018)
	Public safety	Terrorism (Enz & Taylor, 2002); theft, crime, violence and prostitution (Hua & Yang, 2017; Gill et al., 2002)
	Sanitation	Severe acute respiratory syndrome (Chen, 2011; Chien & Law, 2003); hand, foot and mouth disease (Ritchie, Dorrell, Miller, & Miller, 2004)
	Natural disasters	Island natural disaster (Méheux & Parker, 2006); earthquake (Chen, 2011); tsunami (Henderson, 2005)
Perceived internal environmental risk (PIER)	Air condition	Toxic chemicals (Lloyd, 1999); smoke (Teeters, Jones, & Boatman, 1995)
	Working condition	Low pay, low job security and long working hours (Krause et al., 2005; Hsieh et al., 2013; Deery & Shaw, 2016)
	Workplace risk	Workplace hazards (Hsieh et al., 2015); cleaning environment (Hsieh et al., 2013); sanitary environment of the kitchen (Baser et al., 2016)
	Working atmosphere	Role stress and role ambiguity (Karatepe & Sokmen, 2006; Zohar, 1994); procedural corruption (Gillard, 2018) ; emotional exhaustion (Chen et al., 2018)
	Organization atmosphere	Turnover culture (Deery & Shaw, 2016)

	Lack of emergency plans	Safety plan (Enz & Taylor, 2002); contingency plans for epidemic crisis (Chien & Law, 2003); emergency planning and disaster recovery (Albattat & Matsom, 2014)
	Inadequate emergency response capabilities	Fire evacuation ability (Corchado et al., 2010; Graham & Roberts, 2000); gas emergency rescue reserve plan system (Tan, Li, & Hu, 2014)
Perceived management risk (PMR)	Lack of safety protection	Chemical exposure (Suleiman & Svendsen, 2017)
	Lack of safety training	Food hygiene training (Baser et al., 2016; Seaman & Eves, 2006); Emergency fire training (Chen et al., 2012)
	Poor daily management	Fire safety management (Chen et al., 2012); security department (Groenenboom & Jones, 2003; Gill et al., 2002))
	Lack of warning	Fire warning (Sierra et al., 2012) ; risk assessment of gas accidents (Graham & Roberts, 2000)

Appendix 3. Result of content analysis

Themes	Items	Sample coded statements	N
PHR	PHR	PHR	28
Work-family conflict	Not mentioned	Not mentioned	0
Lack of safety skills	PHR01: Physical injury may be caused by a lack of safety skills at work.	"Our new colleague fell when lifting heavy luggage." (11-1-01)	2
New additions	PHR02: Physical injury may be incurred because of carelessness at work.	"Many of our cooks have scars on their hands, which are caused by oil splashing during cooking." (02-1-02)	5
Excessive workload	PHR03: Physical injury may be caused by excessive workload.	"My friend in the cafeteria and often works overtime. In the peak season, he felt tired because he served nearly 50 customers a day." (07-1-03)	4
Occupational disease	PHR04: Physical injury may be caused by irregular and inflexible work schedules.	"I work three shifts at the reception desk, with irregular hours." (08-1-04)	5
New additions	PHR05: Physical injury may be caused by violations of regulations at work.	"Some colleagues often use the detergent without protective gloves, and the skin on their hands is rough." (11-1-05)	6
Customers' improper behaviour	PHR06: Conflict with the customer may be caused by inappropriate conversations during work.	"During conversation, guests will be rude to you because of a small mistake you made, and their attitude is very bad." (10-1-06)	4
Colleagues' improper behaviour	PHR07: Conflicts with colleagues during work may be caused by competition.	"Because of career development, there will be inappropriate competition behaviour among colleagues, such as rumours." (03-1-07)	2
PER	PER	PER	24
Aged hotel facilities	PER01: Ageing hotel facilities may cause injuries.	"Some tables in the hotel are ageing, I was pinched when I moved tables." (10-2-01)	2
Failure of hotel facilities	PER02: Failure of hotel facilities may cause injuries.	"Even though our hotel has just opened, some facilities often fail." (13-2-02)	4

Difficult usage of hotel equipment	PER03: Improper design of facilities and equipment may cause injuries.	"The magnetic furnace (heating equipment) is very inconvenient to use, sometimes the fire is very large, and sometimes it can't be opened." (07-2-03)	4
Lack of professional safety equipment	PER04: A lack of facilities and equipment may cause injuries.	"The toilet is often wet and there is no anti-skid equipment, which makes it easy for employees to fall." (03-2-04)	6
Aged hotel facilities	PER05: Disrepair of facilities and equipment may cause injuries.	"There is a gap in the glass, and I cut my hand cleaning it." (07-2-05)	5
New additions	PER06: A lack of hotel facility upgrades may cause injuries.	"The replacement period for some large, professional equipment in the hotel is too long, and the old equipment is not easy to use." (01-02-06)	3
PEER	PEER	PEER	17
Industry competition	Not mentioned	Not mentioned	0
Social crisis	Not mentioned	Not mentioned	0
Sanitation	PEER01: The community environment around the hotel is poorly managed.	"There is a garbage dump around our hotel, which is very stinky in the summer." (04-3-01)	2
Industry discrimination	PEER02: Others have obvious discrimination against the hospitality industry.	"My parents and friends are not very supportive of me in this industry." (09-3-02)	5
Public safety	PEER03: The public security situation around the hotel is poor.	"There is a bar around our hotel, and often drunken guests become harassing." (12-3-03)	5
New additions	PEER04: The water quality around the hotel is poor.	"The water around the hotel has a strange smell." (09-3-04)	2
Natural disasters	PEER05: The hotel is located in an area prone to natural disasters (e.g., earthquakes, typhoons).	"When Typhoon Morandi came, the main building with 55-floors of our hotel was shaking." (12-3-05)	3
PIER	PIER	PIER	21
Organization atmosphere	Not mentioned	Not mentioned	0
Workplace risk	PIER01: Hotel security issues are prominent (e.g., fire, electricity).	"The hotel's electric board short circuit easily, and sometimes it will catch fire."	2

Workplace risk	PIER02: The main building structure of the hotel is unsafe.	"When Typhoon Morandi came, the main building of our hotel-with 55floors-was shaking." (12-4-02)	2
Workplace risk	PIER03: The layout of the hotel space is inappropriate.	"The office is too small; four staff members must squeeze into a small room with lots of supplies." (05-4-03)	4
Air condition	PIER04: Hotel decorations are improper.	"As the hotel has just opened, the new decoration materials emit a lot of harmful gases, such as formaldehyde." (04-4-04)	3
Working condition	PIER05: Hotel employees' dormitory conditions are bad.	"The food of our hotel canteen is poor, and the dormitory does not have a private bathroom." (13-4-05)	5
Working atmosphere	PIER06: Hotel work characteristics cause physical injury.	"As a luggage man, I need to stand up all day, causing me to have severe backache." (09-4-06)	6
PMR	PMR	PMR	19
Lack of safety protection	Not mentioned	Not mentioned	0
Lack of safety training	PMR01: The hotel does not pay enough attention to safety training and publicity.	"Our hotel has carried out fire drills, but some employees still do not know where the escape route is." (02-5-01)	3
Lack of warning	PMR02: The hotel fails to provide a timely release of risk warning information.	"The hotel issued a warning message long after the earthquake and did not alert employees what needs to be done, and there was no follow-up action." (11-5-02)	4
Poor daily management	PMR03: The hotel emergency rescue team is insufficient.	"The last hotel I worked in put a lot of effort into emergency rescue, but the new one does not." (06-5-03)	2
Lack of emergency plans	PMR04: The hotel lacks action plans for emergencies.	"An older housekeeper died suddenly, and the hotel did not deal with it well; his family had to come to the hotel for three days, and it affected the normal operation of the hotel." (03-5-04)	4

(04-4-01)

Inadequate emergency response capabilities	PMR05: The hotel lacks sufficient manpower, material resources and financial resources to recover and rebuild following the adverse effects of emergencies.	"There is no infirmary in the hotel, and emergency medicine is not adequate." (06-5-05)	6

Notes: 11-1-03 represents the 11th interviewee's statement, which is sorted into the third item of the first dimension.

Appendix 4. The panel of experts for item review

No.	Position	Final educational degree	Field	Age	Years of experience in the field
1	Full professor	Ph.D.	Tourist safety	60	30-plus years
2	Full professor	Ph.D.	Hospitality	45	20-plus years
3	Assistant professor	Ph.D.	Hospitality	38	10-plus years
4	Assistant professor	Ph.D.	Business	42	15-plus years
5	Assistant professor	Ph.D.	Tourist safety	37	10-plus years
6	Assistant professor	Ph.D.	Hospitality	39	10-plus years
7	Ph.D. candidate	Ph.D.	Smart tourism	29	10-plus years
8	Ph.D. candidate	Ph.D.	Foodservice	28	3-plus years
9	Ph.D. candidate	Master	Tourist safety	27	3-plus years
10	Ph.D. candidate	Master	Hospitality	28	5-plus years

Table 1. Interviewee' profile

No.	Position	Department	Star level	Age	Experience	Length
01	General manager	/	5-star	45	23	15 minutes
02	Director	HR	5-star	42	9	10 minutes
03	Director	HR	5-star	43	18	11 minutes
04	Director	HR	5-star	39	12	14 minutes
05	Director	HR	5-star	40	8	13 minutes
06	Supervisor	Security	5-star	32	8	20 minutes
07	Supervisor	F & B	4-star	28	6	22 minutes
08	Supervisor	Front office	4-star	25	5	19 minutes
09	Junior employee	Concierge	5-star	25	3	15 minutes
10	Junior employee	Concierge	5-star	23	1	16 minutes
11	Junior employee	Housekeeping	4-star	32	8	15 minutes
12	Junior employee	Security	3-star	28	4	16 minutes
13	Junior employee	Security	3-star	23	1	15 minutes

Table 2. Results of EFA

Dimension and Item Description	Study 2		
	Mean	Factor loading	Variance (%)
PHR (Cronbach'α=0.850)			
PHR_05. Customers' improper behaviour may hurt me.	4.68	0.731	
PHR_01. Excessive workload may hurt my body.	4.40	0.725	
PHR_02. I will be accidentally injured if I disobey the rules.	4.65	0.719	14.393
PHR_03. Long-term hotel work may cause severe back pain.	5.09	0.704	
PHR_04. My colleagues' improper behaviour may hurt me.	4.47	0.688	
PER (Cronbach'α=0.942)			
PER_03. Ageing hotel facilities may cause accidental injuries to me.	4.61	0.854	
PER_04. Failure of hotel facilities may cause accidental injuries to me.	4.73	0.850	
PER_02. Difficult usage of hotel equipment may cause accidental injuries to me.	4.40	0.822	17.310
PER_05. The lack of professional safety equipment may cause accidental injuries to me.	4.41	0.788	
PER_01. Bad hotel equipment may cause accidental injuries to me.	4.49	0.711	
PEER (Cronbach'α=0.800)			
PEER_02. Public safety around the hotel is not good.	2.62	0.89	
PEER_01. The people around the hotel are not very friendly to me.	2.58	0.76	10.148
PEER_03. The sanitation environment around the hotel is not clean.	2.86	0.743	

PIER (Cronbach'α=0.879)

PIER_03. There are many hidden risks in the hotel.	3.28	0.832	
PIER_04. The working atmosphere is very depressed in the hotel.	3.23	0.761	
PIER_02. The working conditions are not good in the hotel.	3.19	0.745	14.028
PIER_01. The air quality is not good in the hotel.	3.18	0.669	
PIER_05. My supervisor and colleagues put me on the spot at work.	2.86	0.612	

PMR (Cronbach'α=0.953)

PMR_03. The hotel rarely warns about job risks.	3.12	0.883	
PMR_02. The hotel lacks practical contingency plans.	2.98	0.870	
PMR_04. I am worried about the hotel's emergency response capabilities.	3.10	0.848	19.209
PMR_01. The hotel does not attach importance to emergency drills.	2.94	0.848	
PMR_05. I am worried about the hotel's ability to prevent work-related injuries.	3.18	0.847	

Table 3. Results of CFA

Dimension	Study 4				
	Mean	SD	Factor Loadings	CR	AVE
PHR (Cronbach'α=0.808)					
PHR_02: Physical injury may occur if I disobey the rules.	4.11	2.28	0.681		
PHR_03: Long-term hotel work may cause severe back pain.	4.22	1.95	0.654	0.8129	0.5224
PHR_04: My colleagues' improper behaviour may hurt me.	3.69	1.97	0.812		
PHR_05: Customers' improper behaviour may hurt me.	3.93	1.89	0.734		
PER（Cronbach'α=0.860)					
PER_03: Ageing hotel facilities may cause accidental injuries.	4.35	1.99	0.883		
PER_04: Failure of hotel facilities may cause accidental injuries.	4.31	1.99	0.917	0.8702	0.6943
PER_05: The lack of professional safety equipment may cause accidental injuries.	3.79	2.14	0.680		
PEER (Cronbach'α=0.781)					
PEER_01: The people around the hotel are not very friendly to me.	2.31	1.57	0.667		
PEER_02: Public safety around the hotel is not good.	2.17	1.51	0.778	0.7830	0.5472
PEER_03: The sanitation environment around the hotel is not clean.	2.39	1.55	0.769		
PIER (Cronbach'α=0.821)					
PIER_01: The air quality is not good in the hotel.	2.41	1.60	0.680		
PIER_02: The working conditions are not good in the hotel.	2.50	1.59	0.787		
PIER_03: There are many hidden risks in the hotel.	2.38	1.48	0.749	0.8238	0.5396
PIER_04: The working atmosphere is very depressed in the hotel.	2.74	1.69	0.718		
PMR (Cronbach'α=0.859)					
PMR_01: The hotel does not attach importance to emergency drills.	1.79	1.28	0.694	0.8549	0.5429
PMR_02: The hotel lacks practical contingency plans.	2.08	1.40	0.750		

PMR_03: The hotel rarely warns about job risks.	2.13	1.46	0.809
PMR_04: I am worried about the hotel's emergency response capabilities.	2.20	1.47	0.786
PMR_05: I am worried about the hotel's ability to prevent work-related injuries.	2.55	1.65	0.631

Table 4. Correlations and Squared Roots of AVE (n = 711)

Dimensions	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1: Perceived personnel risk	(0.723)				
Factor 2: Perceived equipment risk	0.676	(0.833)			
Factor 3: Perceived external environmental risk	0.279	0.331	(0.740)		
Factor 4: Perceived internal environmental risk	0.459	0.448	0.645	(0.735)	
Factor 5: Perceived management risk	0.356	0.339	0.594	0.655	(0.737)

Notes: 1. The diagonal element is the square root of the extracted mean variance.   2. The off-diagonal elements are the correlations between dimensions (p < 0.05).
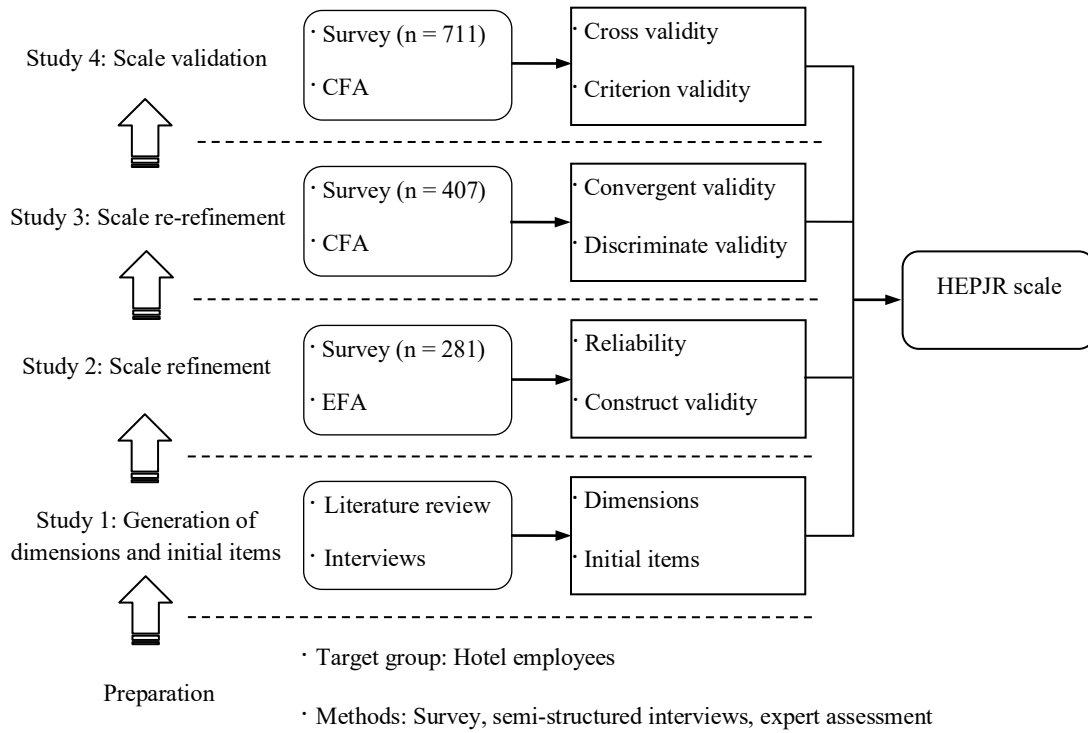
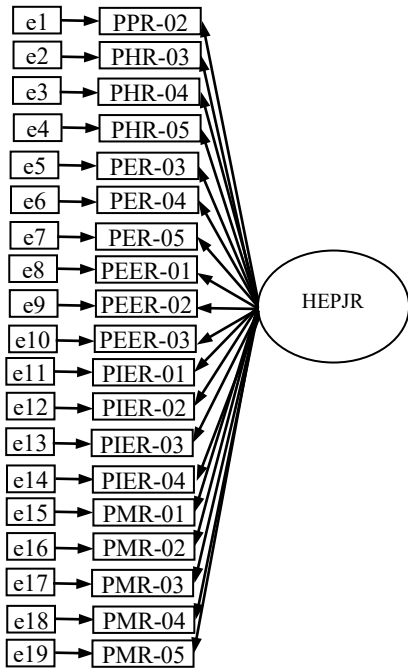Figure 1. Methodological procedures of scale development.
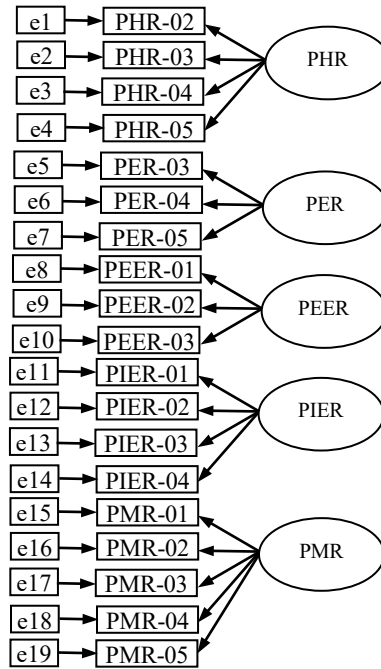
Figure 2-1 One first-order factor model

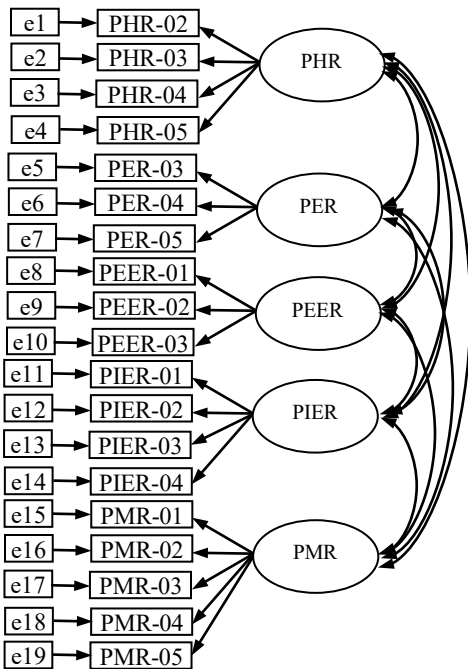Figure 2-2 Five first-order factors model without correlation

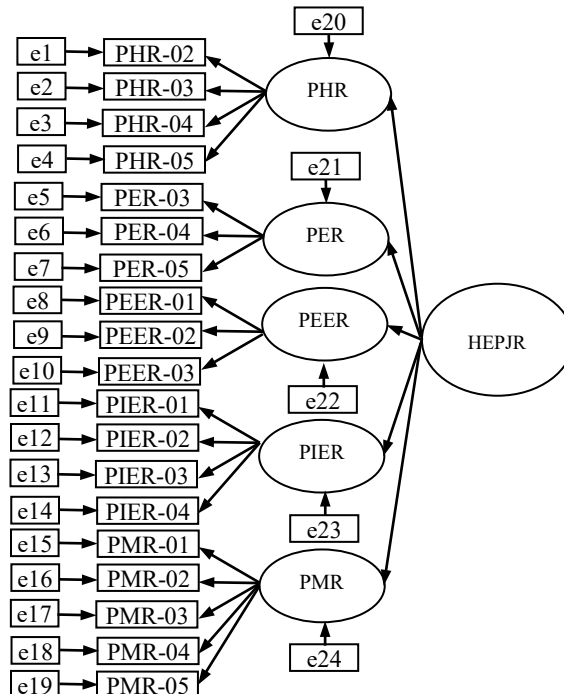Figure 2-3 Five first-order factors model with correlation

Figure 2-4 One second-factor model with five first-order factors

Figure 2. Comparison of HEPJR models