Human Resource Management Practices and Organizational Injury Rates

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Abstract

We investigated the extent to which 5 human resource management (HRM) practices—systematic selection, extensive training, performance appraisal, high relative compensation, and empowerment—simultaneously predicted later organizational-level injury rates. Specifically, we modelled the association between these HRM practices (assessed via on-site audits by independent observers) with organizational injury rates collected by a national regulatory agency one and two years later. Results from 49 single-site United Kingdom organizations indicated that, after controlling for industry-level risk, organization size, and the other 4 HRM practices, only empowerment predicted lower subsequent organizational-level injury rates. Findings from the current study have important implications for the design of HRM systems and for organizational-level policies and practices associated with better employee safety.

Keywords: human resource management; injuries; occupational safety

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1. Introduction

The last three decades have seen considerable research interest in the effects of human resource management (HRM) systems on employee outcomes (e.g., Arthur, 1994; Becker & Huselid, 1998; Beijer et al., 2021; Boon et al., 2019; Delery & Doty, 1996; Huselid, 1995; MacDuffie, 1995; Toh et al., 2008; West et al., 2006; Youndt et al., 1996). A range of labels, such as 'high involvement management' (e.g., Forth & Millward, 2004), 'high commitment management' (e.g., Wood & de Menezes, 1998), and 'high performance work systems' (e.g., Huselid, 1995; Liao et al., 2009) have been used to describe various sets of organizational practices that aim to involve employees, generate employee commitment towards their work and the organization, and ultimately improve organizational performance.

Organizational practices that comprise HRM systems are "the specific methods and procedures that the organization adopts to implement the organization's principles and policies" (Posthuma et al., 2013, p. 1189). HRM systems comprise 'bundles' of these organizational practices that have complementary effects (Ogbonnaya et al., 2013), with each bundle of practices preferably "creat[ing] synergistic effects in which certain practices reinforce one another to increase organizational efficiency and effectiveness" (Posthuma et al., 2013, p. 1185). Many studies have focused on how these HRM systems are measured and how they affect performance (for reviews, see Boon et al., 2019; Godard, 2004; Wall & Wood, 2005; Wright et al., 2005). Most of these studies tend to concentrate on conventional financial and labor performance indices, to the neglect of more employee-centered criteria such as occupational health and safety (Delery & Gupta, 2016; Godard, 2004; Shaw & Delery, 2003). Yet, meta-analytic evidence suggests that several mechanisms by which HRM systems are posited to affect outcomes, such as by boosting employee engagement and organizational commitment, might also affect employee-centered criteria such as workplace injuries (Harter et al., 2002). Despite decades of HRM-performance research, we know relatively little about how HRM systems affect workplace injuries at the organizational level (Granger et al., in press; Ogbonnaya et al., 2013; Turner & Dueck, 2015; Zacharatos & Barling, 2004), with greater understanding of the organizational-level determinants of workplace injuries needed more generally.

Drawing from reviews (e.g., Posthuma et al., 2013) of the prevalence of HRM practices in organizations, we identify five key HRM practices warranting investigation with organizational injuries: (1) systematic selection, (2) extensive training, (3) performance appraisal, (4) high relative compensation, and (5) empowerment. The current research examines the relationship among these key HRM practices and workplace injury rates at the organizational level of analysis. In doing so, we extend previous research by simultaneously assessing the association among these five HRM practices and subsequent organizational injury rates, thereby delineating organizational-level determinants of occupational safety. Furthermore, we respond to calls (e.g., Wright & Ulrich, 2017) in the recent literature for more rigorous prospective research designs, such as collecting multi-source data when assessing HRM-outcome linkages.

2. Theoretical Background and Hypotheses

After being virtually ignored within the organizational literature for many years (Campbell et al., 1982; Barling & Frone, 2004; Hofmann & Tetrick, 2003), workplace safety is increasingly the focus of theoretical and empirical attention at multiple levels of analysis (Clarke et al., 2016; Nuñez & Prieto, 2019). Contemporary research draws on earlier studies that have examined the role of antecedents—such as high-quality leadership (e.g., Barling et al., 2002), work design (e.g., Parker et al., 2001), job insecurity (e.g., Probst, 2004), and safety climate (e.g., Zohar, 2002)—of occupational safety-related outcomes such as workplace injuries. Such research is important given the worldwide rates of workplace injuries (Takala, 2019), with recent global estimates of lost-time injury rates as high as 11,096 per 100,000 persons in the workforce (Hämäläinen et al., 2017).

Knowledge of the organizational-level determinants of safety, however, remains limited. Current evidence suggests a potential role for HRM practices designed to “enhance employee competencies, commitment, and productivity” (i.e., high performance work systems; Posthuma et al., 2013, p. 1184), but very little of this research has incorporated an organizational level of analysis. For example, Zacharatos et al. (2005) showed that individuals’ perceptions of high performance work systems were positively related to personal safety orientations and negatively related to occupational injuries, demonstrating how trust in management and perceptions of safety climate served as mechanisms by which HRM systems may exert effects. Additionally, Wallace et al. (2006) examined the foundational climates (i.e., organizational support, management-employee relations) generated by HRM practices, demonstrating a positive relationship with workgroup safety climate and a negative relationship with workplace injuries. At the unit level, Lauver and Trank (2012) showed that organizations with higher levels of organizational decentralization and alignment of HR practices were less likely to suffer workplace injuries (as measured by regulator-collected logs of workplace incidents). Similarly, Newnam et al. (2017) showed in a sample of 83 organizations that high-performance work practices, particularly selection and work design, negatively related to work-related driving behaviors, but this effect was attenuated when upper management demonstrated commitment to safety.

While this evidence suggests that using practices that make up HRM systems is likely to reduce workplace injuries under some conditions, those data were collected at the individual-, workgroup-, and the unit-level (as reported by an upper-level manager in the organization) of analyses, and it cannot be assumed that the findings will apply at the organizational level (Chan, 1998). As scholars have argued, different processes might operate at different levels (Fulmer & Ostroff, 2016). Moreover, from the overall HRM constructs used in these aforementioned studies, it is not always clear which particular sets of practices might be negatively associated with workplace injury rates. It is important to tease out which or how many practices are important, in part to give insight into the mechanisms that might explain HRM-injury linkages, but also to provide practical guidance to organizations.

The aim of the study is to investigate the relationship between HRM systems and organizational injury rates. A further ambition is to examine multiple HRM practices concurrently, since research has often considered practices in isolation. For each of five HRM practice—systematic selection, extensive training, high relative compensation, performance appraisal, and empowerment—we generate hypotheses about their potential association with occupational injuries. We focused on these five practices because they characterize key elements of high performance work organization both historically (e.g., Huselid, 1995; Pfeffer, 1998) and more recently (e.g., Boon et al., 2019).

2.1. A Taxonomy of Human Resource Management Practices

Posthuma et al. (2013) developed a taxonomy of high performance work practices based on a comprehensive review of the HRM-performance literature, examining the frequency with which HRM practices appear among peer-reviewed articles published between 1992 and 2011. They classified 61 specific HRM practices into nine categories and further synthesized them into five categories: recruiting and selection, training and development, compensation and benefits, performance management and appraisal, and job and work design. They then divided the practices within each category into three categories: core practices, practices that are frequent in the literature, and practices either maintaining or steadily growing within the literature. As an example, empowerment is central to the job and work design category, in that the core practice within job and work design includes decentralized and participative decisions. The five practices operationalized in the current study share similarities with Posthuma et al.'s taxonomy categories, reflecting the prevalence of HRM practices studied in the high performance work systems literature.

The current paper focuses on general HRM practices rather than criterion-focused practices (i.e., safety-specific HRM practices such safety training). General HRM practices focus on the specific methods and procedures that organizations adopt (Posthuma et al., 2013), rather than a specific criterion. For example, organizations may use selection practices to screen candidates (Posthuma et al., 2013), and a variety of selection tools to gather more information about a candidate (Youndt & Snell, 2004). Selection practices may include high-quality tools such as structured interviews (Posthuma et al., 2013), but may not necessarily focus on a criterion—for example, selecting for safety-specific competencies—but rather enable the organization to select individuals on a wide range of competencies. These general HRM practices reflect ways of improving employee capabilities, commitment, and productivity, which are also likely to have an impact on safety. In the following sections, we describe the conceptual reasons why each of these general HRM practices—and the set of them—may enhance organizational safety without a particular focus on the safety criterion.

2.1.1. Systematic Selection Practices and Occupational Safety

We propose that organizations with systematic selection practices will have lower levels of occupational injuries. Systematic selection practices involve organizations deciding in advance what the critical skills and attributes for success are in the organization, taking applicants through a systematic selection process, and, in their hiring decisions, focusing on skills, attitudes, and behaviors that are less amenable to change through training. The net effect of systematic selection processes should be organizational members that have a skill set consistent with job requirements and organizational aspirations, and therefore a reduction in on-the-job injuries. In addition, from a symbolic perspective, systematic selection processes signal to both current and future employees that management is committed to selecting the best possible organizational members (Pfeffer, 1998), with members wanting to reciprocate this commitment by doing their best work for the organization.

We propose that systematic selection strategies employed by organizations promote skill matching and facilitate skill development in their workforces, resulting in a link between systematic selection and lower organizational-level injury rates. Specifically, when organizations focus on matching skills with the requirements of the job, the selected workforce have the required competencies and experience to enable them to correctly carry out their work, and are thus more capable of completing tasks safely. Further, we expect that systematic selection systems will be related to lower organizational-level injury rates through other higher-level processes. For example, these systems may be used to create a highly skilled workforce (Takeuchi et al., 2007), which may promote more effective co-ordination within and across units, thereby enhancing safety at the organizational level. From an empirical perspective, there is evidence that organizations that use systematic selection procedures typically experience lower injury rates (e.g., Cohen, 1977; Smith et al., 1978), although these studies do not provide evidence for the reasons why and reflect cross-sectional relationships.

Hypothesis 1: Systematic selection procedures will be negatively associated with injury rates.

2.1.2 Extensive Training and Occupational Safety

Training provides employees with the opportunities to learn the competencies required for a given role (Posthuma et al., 2013). The degree to which extensive training is provided involves the intensity (e.g., duration) and the scope of training (e.g., breadth of training provided) (Youndt & Snell, 2004). Extensive training may involve the amount of time spent training (e.g., Tharenou et al., 2007), frequency and variety of training provided (e.g., Gong et al., 2009), and formalization of training programs (e.g., Delery & Doty, 1996). As such, we suggest that extensive training offered within an organization will influence occupational safety for several reasons. First, general workplace training can increase employees' problem-solving skills (Osterman, 1995) and commitment to the organization (Tannenbaum et al., 1991). Similarly, training for teams increases communication and information sharing (Baker et al., 2006). These skills may be useful for improving occupational safety: problem-solving skills are used to identify and find solutions to safety issues or communication skills may be used to clearly describe safety issues to other organizational members. Indeed, knowledge levels (e.g., Smith-Crowe et al., 2003), commitment (e.g., Parker et al., 2001), and communication (Parker et al., 2001) have all been shown to be positively associated with safety outcomes.

Second, organizations that choose to introduce extensive training, beyond the mandatory training that is required by governments and unions, enhance the likelihood that employees have all the skills and knowledge needed to perform their job safely. By providing training that goes beyond the bare minimum also signals high commitment to employees, which we would expect employees to want to reciprocate through working safely. Kaminski's (2001) finding that, amongst small manufacturing organizations, those offering more training hours were more likely to report lower lost-time injuries, is consistent with this explanation. More recently, Camuffo et al. (2017) conducted a single firm, multi-plant study finding fewer lost-time injuries on average in units where front-line managers focused on developing subordinates' capabilities and skills through teaching and coaching.

Hypothesis 2: Extensive training will be negatively associated with injury rates.

2.1.3 Performance Appraisals and Occupational Safety

Performance appraisal remains an integral part of HRM systems (Daley et al., 2002), and a critical component of performance management (DiNisi & Smith, 2014). One purpose of performance management is to focus on employee development, and the information gathered from such appraisals can be used to document performance and decisions concerning pay and promotion (DiNisi & Smith, 2014). High-quality performance management and performance appraisals generally include appraisals for development, appraisals based on objective results and behaviors as well as frequent performance appraisal meetings (Posthuma et al., 2013). To our knowledge, there is an absence of research assessing the relationship between performance appraisal and occupational safety outcomes. However, the core components of performance appraisal—information sharing and feedback—suggest that an association between high-quality performance appraisal and occupational safety could exist, for several reasons.

First, feedback from performance appraisals can be used to identify employees' training needs (London & Smither, 2002), and as such lead to increases in the skills and behaviors which positively correlate with safety outcomes. Further, more frequent performance appraisal meetings can provide employees with the opportunity to review goals and adjust their training and developmental needs accordingly. Second, feedback from performance appraisals can enable learning from errors and near misses, both of which serve to enable safety improvement in the future (Littlejohn et al., 2014). Third, high-quality performance appraisals might also help to generate norms about the importance of information sharing and feedback, which in turn are likely to enhance organizational-level outcomes (Murphy & Cleveland, 1995). Further, organizations focusing more on seeking information and providing feedback, particularly with respect to safety incidents, can open up opportunities for learning (Dekker & Breakey, 2016), and may encourage important safety behavior such as speaking up. From a safety perspective, Cohen (1977), Smith et al. (1978), and Wallace et al. (2006) present evidence that more feedback between management and employees predicted lower injury rates. As a result, we hypothesize:

Hypothesis 3: Performance appraisals will be negatively associated with injury rates.

2.1.4 High Relative Compensation and Occupational Safety

We propose that high relative compensation in an organization—that is, higher pay relative to market norms—will be associated with lower injury rates. Compensation has consistently been considered an integral part of HRM systems (Pfeffer, 1998), with competitive pay, incentive compensation, and pay for performance as some of the core components of compensation practices generally found in a HRM systems (Posthuma et al., 2013). Research relating pay to safety has focused on performance incentives and intra-organizational pay dispersion. Consistent with the possible negative effects of performance-contingent pay (Dahl & Pierce, 2020; Parker et al., 2019), the existence of performance-based incentives was positively associated with injury rates in a sample of 86 manufacturing companies (Kaminski, 2001). Similarly, pay dispersion is negatively associated with satisfaction (Pfeffer & Langton, 1993), individual and team performance (Bloom, 1999), and positively related to turnover (Bloom &

Michel, 2002) - presumably because it encourages employees to focus more intensively on relative individual worth (Pfeffer, 1998) and heightens perceptions of unfairness. For example, Shaw et al. (2002) found that pay dispersion based on individual incentives for performance was a positive predictor of lost-time injuries in a sample of concrete production plants, over-and-above the effects of either pay dispersion or individual incentives.

In the same way that compensation fairness is an issue among employees within the same organization, we argue that employees in organizations who are paid above-market compensation relative to pay offered by similar organizations will perceive their work situation to be more than fair, and therefore exert more effort towards working safely. Werner et al. (2016) investigated the effect of supplemental retirement plans and safety behavior in the U.S. trucking industry, suggesting that as a part of a high performance work system, supplemental retirement plans act as a form of pay-above-market strategy. Offering supplemental retirement plans was negatively associated with driver insurance costs, indirectly indicating safer driver behavior through reducing accidents, crashes, and driving violations. Pay-above-market strategies may also include additional benefits to employees that may have a positive influence on safety. For example, Weahrer et al. (2016) investigated workplace injury rates across different sized organizations and industries finding that employee assistance programs (EAP) were negatively associated with workplace injury rates, particularly when EAP employees are on-site and when organizations offered telephone EAP services. Taken together, the symbolic advantage of paying employees above market rate implies a commitment-oriented approach to HRM, in which employees are valued and which previous research suggests is positively related to commitment and organizational performance (Tsui et al., 1997) and safety (Barling & Hutchinson, 2000).

Hypothesis 4: High relative compensation will be negatively associated with injury rates.

2.1.5 Empowerment and Occupational Safety

Central aspects of structural empowerment involve autonomy and participation (Seibert et al., 2011). Within HRM systems, structural empowerment practices involve the methods and procedures that enhance employees' opportunity to participate in decision-making, as well as employees' opportunity to exercise their discretion and use their skills (Posthuma et al., 2013). As such, these practices emphasize enhancing employees' opportunity to contribute and perform (Lepak et al., 2006). Organizations implementing empowerment practices may seek to increase autonomous work, that is, work is designed to have employees participate in decision-making (e.g., self-managing teams, quality circles; Wall et al., 2004). Of all HRM practices, research on the relationship between autonomous work and safety has received comparatively more research coverage than other HRM-safety links. Theoretically, enhancing autonomy and participation will reduce injuries for several reasons.

First, from a socio-technical systems perspective, when employees' jobs are designed in a way that maximizes job control and responsibility, they are able to manage the variances (i.e., changes in job demands) more quickly, encouraging a broader role orientation towards safety (Turner et al., 2005) and potentially preventing injuries. Second, autonomy promotes learning (Wall et al., 1992) and the development of greater expertise (Wall et al., 2004), which again likely leads to safer working. Third, autonomy fosters intrinsic motivation and commitment (Parker, 2014), which should increase employees' motivation to work safely. Last, empowerment practices may signal to employees that speaking up and sharing constructive ideas intended to invoke positive organizational change or improvement are encouraged and valued by the organization (i.e., voice; Chamberlin et al., 2018). Extending this to a safety perspective, empowerment practices may also signal to employees that speaking up about safety-related concerns (i.e., safety voice; Tucker & Turner, 2015) is encouraged, which in turn, may promote safer working conditions.

Consistent with these arguments, a number of studies and reviews at the individual- (e.g., Barling et al., 2003; Nahrgang et al., 2011; Parker et al., 2001) and group-level of analyses (e.g., Hechanova-Alamay & Beehr, 2002; Simard & Marchand, 1997; Turner & Parker, 2004) show the benefits of more autonomous work on occupational safety. At the organizational level of analysis, existing research is less abundant and less systematic, although consistent with findings at lower levels of analysis. For example, Shannon et al. (1996) found that managers of companies with lower lost-time injury compensation claim rates were more likely to perceive employee involvement in organizational decision-making, and have a greater expectation that employees use their own initiative. Similarly, Yassi et al. (2004) found that hospital facilities offering staff greater discretion in conducting their work had, on average, lower staff injury rates than those facilities limiting staff discretion; Arocena et al. (2008) showed same-year negative correlations between organizational-level empowerment and lost-time work injury rates in a sample of Spanish organizations; and Camuffo et al. (2017) demonstrated the negative association between empowerment and lost-time injury rates.

Hypothesis 5: Employee empowerment will be negatively associated with injury rates.

3. Present Study

We hypothesize that the presence of each of the HRM practices will uniquely predict organizational injury rates. It is important to note that, while there is evidence for some of the practices when considered in isolation, no organizational-level study has considered the effect of multiple related HRM practices on occupational safety at the same time. Our approach provides a more comprehensive perspective on the association of HRM practices comprising HRM systems and occupational injuries for both conceptual and statistical reasons. Conceptually, HRM practices do not occur in isolation from one another. Statistically, examining these practices in isolation might well exaggerate their apparent effectiveness. We therefore test a model of the simultaneous associations of five HRM practices on organizational injury rates, seeking to understand if each practice makes a unique contribution.

To test this model, we used a prospective, multi-method approach with several advantages over existing research. First, previous research on HRM has been criticized for its sole reliance on singular and often untrained sources providing the data on the use of practices (Wall & Wood, 2005). Our assessment of HRM practices in each organization derives from a team of trained observers who were aware of the possible range of use of the separate practices, but unaware of the study hypotheses. This enabled consistent and informed ratings of the effectiveness of the five separate practices. Second, data on the five practices used in this study derive from multiple sources: interviews with managers and employees, site inspections, and written documentation. Multiple ratings can result in a more reliable composite (Horowitz et al., 1979), and avoids the potential threat of mono-source biases. Third, the dependent variable was collected by the Health and Safety Executive in the United Kingdom, a regulatory body that is involved in inspecting and collecting data on organizational safety performance. Fourth, we used a sample of single-site companies to ensure that data on HRM practices pertain to that site, and the injury data could not be confused with that of another site of a multi-site organization. One of the challenges of conducting research on the relationship between organizational practices and variables such as organizational injury rates is “to have reliable and compatible data” (Askenazy, 2001, p. 493) on both sides of the equation. This study meets that criterion.

Fifth, the relationships tested here are predictive insofar as the HRM practice data precede in time the injury data. Existing research (e.g., Shannon et al., 1996; Kaminski, 2001) on organizational practices and safety conducted at the organizational level of analysis has been based on data collected at the same time. Our prospective design is an improvement over this approach because we collected data on the dependent variable subsequent to the independent variable. Finally, we implement necessary statistical controls to reflect industry differences in risk and organization size. Taken together, these methodological features heighten the extent to which strong inferences can be drawn.

4. Method

4.1. Sample and Data Collection

We collected data from 58 single-site manufacturing companies throughout the United Kingdom, as part of a wider study on organizational practices, employee attitudes, and economic performance[1]. Organizations reflected a number of sectors: mechanical engineering (n = 21), plastics and rubber manufacturing (n = 20), electronics (n = 3), and other miscellaneous sectors (n = 14). These sectors were chosen because they were the most populous in terms of number of firms, and number of employees, in the United Kingdom. Company size ranged from 50 to 900 employees, reflecting small- and medium-sized enterprises.

To assess the use of HRM practices, a team of researchers conducted a three-stage audit of each company, drawing on a range of sources of information. First, detailed structured interviews with senior managers responsible for each practice were conducted on site. The total time spent interviewing in each company was approximately three hours, with an average of three different managers. Second, the audit team toured the facilities and interviewed shop-floor

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[1] Previous papers resulting from these data are not included here at present to protect blind review, but will be inserted if the paper is ultimately accepted for publication.

employees, enabling them to observe the practices-in-use (rather than the espoused practices) and hear opinions from the workforce directly affected by these practices. Third, the research team reviewed written documentation (e.g., training schedules, quality documents) related to the practices. Taking all this information together with the comparative experience of auditing the other companies in the sample, the audit team then made a series of ratings of the sophistication of each of these practices. We provide more detail about the ratings in the Measures section.

A key criterion for selecting these companies was the fact that they were single-site organizations. This has two benefits for the present study. First, the interviews with site managers focused specifically on the HRM practices at that site, rather than the use of these practices across multiple sites. This meant that respondents provided answers about the site they knew best, and the subsequent rating of the site practices by the audit team was based on information provided during the in-depth interviews and documents pertaining to practices in that site only. Second, obtaining injury data on this type of organization from the Health and Safety Executive (HSE) archives minimized the possibility of confusion with another site of the same organization. This way, we ensured that the level of analysis used to measure the practices corresponded directly to the workplace injury data (Askenazy, 2001).

We were able to obtain data on the number of injuries for one and two years following the practice audit for 49 of these 58 single-site organizations. Of these 49 companies, 18 were in the engineering sector, 18 in rubber/plastics, three in electronics, and ten in other miscellaneous manufacturing areas. All 49 were small or medium sized companies, ranging from 63 to 900 employees (*M* employees = 174, *Mdn* employees = 126).

4.2. Measures

Five HRM variables were assessed, namely systematic selection, extensive training, performance appraisal, high relative compensation, and empowerment. Systematic selection, extensive training, and performance appraisal were derived from interviewer ratings, whereas high relative compensation and empowerment were formed directly from responses given by interviewees. In 27 of the 49 organizations, there were two interviewers who rated the HRM practices separately, allowing inter-rater reliability [ICC (2, k); Shrout & Fleiss, 1979] to be established.

4.2.1. Systematic Selection

The interview included detailed questions about what selection methods were used for each staff type (i.e., shopfloor, clerical/administrative staff, professional/technical staff, and management), and which of the ten selection procedures (ranging from application forms to assessment centers) were used for each staff type. After assessing answers to all the previous questions on selection, interviewers then rated the overall approach to selection used by the company for each of the four staff types, on a scale ranging from 1 = “Non- existent” to 5 = “Excellent with careful planning”. These four ratings then formed a scale, with Cronbach’s alpha = .88. The ICC(2, k) was .92.

4.2.2. Extensive Training

A large number of open and closed-ended questions were asked about training in the organization. These included whether: (a) there was an overall training strategy (if there was, the documentation was requested); (b) the average annual hours of formal training for a typical employee of each staff type; (c) a series of questions about Investors in People™ status (a sought-after standard, awarded to UK organizations that meet a series of criteria relating to the management and development of their staff); (d) questions about systems for assessing training needs; and (e) general questions about the type of training that occurred. Interviewers rated the extent of training for shopfloor employees, supervisors and management, on a scale ranging from 1 = “Very limited” to 5 = “Very extensive”. These formed a scale, with Cronbach’s alpha = .91. Inter-rater reliability as measured by ICC(2, k) was .97.

4.2.3. Performance Appraisal

The interview included questions on whether there was a formal appraisal system, and if so, (a) how long it had been in operation for each of the four types of staff; (b) whether and how often these types of staff were appraised; (c) whether the appraisal was linked to remuneration; and (d) whether appraisers received any formal training. Interviewees were also asked a series of open questions about the appraisal scheme, allowing them to describe the details of the scheme more fully. Interviewers then rated the sophistication of the scheme for each of the four types of staff, on a scale ranging from 1 = “Nonexistent” to 5 = “Highly sophisticated”. These formed a scale, with Cronbach’s alpha =.96. Inter-rater reliability measured by ICC (2, k) was unity.

4.2.4. High Relative Compensation

Interviewees were asked how compensation for shopfloor staff, supervisors, and management compared with local companies or competitors’ rates. Responses were given on a scale ranging from 1 = “Well below average” to 5 = “Well above average”. These were added together to form a scale (Cronbach’s alpha = 0.74), but weighted so that shopfloor employees’ pay counted for four times as much as the other groups. This reflected the approximate number of each type of staff in the organizations used in the final sample.

4.2.5. Empowerment

Interviewees were asked to what extent shopfloor operators were responsible for or involved in eight tasks: a significant quality problem, material supply problem, machine repair following minor breakdown, routine maintenance of machines, setting up machines for changeover of product, setting up machines for a new product, when to take breaks, and the order in which they do their work (Wall et al., 1995). Responses were given on a scale from 1 = “Not at all” to 4 = “Very much”. Cronbach’s alpha was .75.

4.2.6. Workplace Injuries

Data on the number of injuries reported at each company was collected from the UK Health and Safety Executive, a government body responsible for overseeing safety in the workplace. Data were collected for both the year following the interviews and the subsequent year. Injuries were classed as fatal, major, or minor. However, there were no fatal and very few major injuries (14% of all injuries). The total number of injuries reported for the two years combined across 49 companies was 252, ranging from 0 (in 22 companies in year 1, and 20 companies in year 2) to 20 (in one company in year 2), and with the majority falling in between. As such, we used the total number of injuries across both years for each company.

4.2.7. Control Variables

In the analyses, we included data on organization size and industry-level average injury rate as calculated by Office of National Statistics for companies in the Standard Industry Code to which each organization in the current sample belonged.

5. Results

5.1. Analytic Strategy and Descriptive Findings

The means (or medians), standard deviations (or interquartile ranges), and Spearman’s Rank (i.e., non-parametric) correlations of all study variables appear in Table 1. Analysis of the dependent variable (number of injuries) reveals that its distribution is severely non-normal, being positively skewed with its peak and lower limit at zero, as is typical for counts of rare events. A goodness-of-fit test showed that the data differed significantly from such a standard Poisson distribution (in which the mean is equal to the variance), being over-dispersed (i.e. with higher variance, and hence a longer tail), and hence more similar to a negative binomial distribution. This concurs with McCullagh and Nelder (1989, p. 199), who suggest that the number of incidents in an organization may be the sum of individual Poisson variables, forming a negative binomial distribution. Consequently, we chose to analyze the injury data by fitting a negative binomial regression model with a logarithmic link function (i.e. transformation of the dependent variable). Given that organizations had differing numbers of employees, it was appropriate to model injuries per employee as opposed to total injuries: as such, we included the logarithm of the number of employees in each organization as an offset term in our model, therefore effectively modelling injury rate per employee. We also controlled for industrial sector by entering the sector-average injury rate. The analysis was conducted in SPSS.

5.2. Hypothesis Testing

The hypotheses address the collective and separate effects of each of five HRM practices on injury rates. The models presented in Table 2 represent the following pattern: Model 1 is a baseline model controlling for the log of organization size and industry sector injury rate, and Model 2 includes the HRM practices as an omnibus test of the hypotheses.

As a block, the HRM practices added significant explanatory power to the baseline model, $\Delta\chi^2$ (5, N = 49) = 73.05, $p < .001$. This suggests that there is an overall effect of the HRM variables on organizational injury rate. However, the only HRM practice to have a significant unique effect on injury rates is empowerment. The coefficient of -.78 (see Table 2) is equivalent to an incidence rate ratio of exp (-.78) = 0.46: an increase of one point on the empowerment scale is associated with a reduction in the injury rate by a factor of 0.46, or a 54% reduction, all else being equal.

In the above analysis, all five practices were entered together as a set. Supplementary analyses, in which the HRM variables were entered individually into separate models, resulted in the same conclusion (i.e., empowerment was the only significant predictor of injury, whether assessed alongside other HRM practices or alone).

6. Discussion

We set out to contribute to human resource management and occupational safety research by investigating the relative effects of particular HRM practices on safety performance. Specifically, we tested simultaneously five practices—systematic selection, extensive training, performance appraisal, high relative compensation, and empowerment—as predictors of organizational injury rate, controlling for company size and industrial sector injury rate. The present data show that, in this sample, higher empowerment is related to lower injury rates. The significant finding for empowerment is consistent with previous findings at the organizational- (e.g., Camuffo et al., 2017; Shannon et al., 1996; Yassi et al., 2004), group- (e.g., Hechanova-Alamay & Beehr, 2002), and individual level of analysis (e.g., Parker et al., 2001) that indicate more autonomous working is related to better safety performance. Our study extends these findings using multiple sources of data and predicting organizational injury rates in the future to show that the relationship between empowerment and safety operates at the organizational-level analysis. Like previous organizational-level analyses, it shows associations between organizational-level constructs and organizational-level outcomes that appear stronger than in individual-level research (Ostroff & Bowen, 2000). Our study also extends prior research because it shows the value of empowerment over-and-above other inter-correlated HRM practices.

From a practical perspective, the current findings suggest that to reduce workplace injury rates, designing work to provide greater opportunity for autonomous work is one way organizations might achieve this. This could also be achieved by enriching jobs (e.g., job enrichment programs) or developing leadership skills among supervisors that value psychological empowerment (Parker & Wall, 1998). This finding is interesting in that it is the same practice (empowerment) that is most strongly associated with organizational productivity (Birdi et al., 2008). Thus, it appears that a key initiative likely to promote safety is consistent with, rather than at odds with, the basic economic need to enhance performance.

Contrary to our hypotheses, however, none of systematic selection, extensive training, performance appraisal, nor high relative compensation were associated with organizational injury rates. One factor that might account for these null effects is the relatively small size of the sample (49 companies with complete HRM practice and organizational injury data) may have insufficient power to find true relationships among the study variables. One specific consequence of this is that any effects are underestimated in the form of non-significant regression coefficients, increasing the likelihood of a Type II error; any results indicating null effects need to be considered as tentative. This possibility especially applies to the practices of performance appraisal and extensive training, which both had negative correlations with injury rates. These effects might have been significant had the power in the study been greater. In contrast, high relative compensation had a positive correlation with injuries, and selection practices had a negligible association, so, irrespective of sample size, these practices may seem less likely to be important. However, it is more likely that a complex relationship among HRM practices and organizational safety exists. Specifically, we cannot reasonably determine, due to the small size of the current sample, whether the interaction of certain practices (e.g., extensive training and systematic selection), or “bundles” of multiple practices, explain additional variance in organizational injury rates over-and-above the main effects of the five practices together. Thus, while there may not be main effects for systematic selection, extensive training, performance appraisal, and high relative compensation, their effects may still interact with other HRM practices.

Finally, despite the fact that measures used in the current study were not safety-specific and instead more general HRM practices, findings suggest the importance of safety-oriented HRM practices and safety outcomes. Similarly, there is a separate stream of literature focused on safety-specific management practices (i.e., occupational health and safety management systems (OHSMS), Fernández-Muñiz et al., 2007; Li & Guldenmund, 2018; Yorio & Wachter, 2014), which emphasize the integration of safety into all organizational capabilities (Fernández-Muñiz et al., 2009). The existing evidence suggests safety-specific practices such as safety-specific selection criteria (e.g., Vredenburgh, 2002), safety-specific training (e.g., Burke et al., 2006), safety-related compensation (e.g., safety incentive programs; Lauver, 2007), and safety-specific empowerment (e.g., employee involvement in safety-related activities; Yorio & Wachter, 2014) might predict organizational injury rates, although there is also evidence on the contrary that some safety-specific management practices may not contribute to the reduction of organizational injury (Lauver, 2007; Vrendenburgh, 2002). Thus, the inconsistent findings from previous literature and the current findings emphasize the need to bridge HRM research and OHSMS research. In doing so, we may enhance our understanding of the relative importance of general

HRM practices and safety-specific management practices in predicting organizational injury rates (cf. Robinson & Smallman, 2006).

6.1. Study Limitations and Future Research

Like all studies, our study has a number of limitations. First, an important methodological concern is the generalizability of the final model. Despite the methodological strengths of our study (i.e., multi-source data and prospective design), we cannot be sure that some unmeasured third factor, such as a climate of trust, does not lead to both empowerment and lower injury rates. Second, although this study tested the hypotheses in a prospective design and found that empowerment was associated with organizational injury rates collected at a later point, this does not rule out the possibility of a reverse causal explanation. As the research design is not a 'true' longitudinal design in that it did not assess both empowerment and injuries at multiple time points (as recommended by Zapf et al., 1996), the possibility exists that lower injury rates in some way led to the implementation of HRM practices such as empowerment.

Third, there might be a degree of error in the injury rates reported, with employees underreporting injuries and underestimation of organizational-level injury rates (Probst et al., 2008). However, this is unlikely to be related systematically to empowerment or the other HRM practices, thus it would attenuate any observed relationship. A fourth possible limitation stems from the measurement of some of the key variables, such as systematic selection and extensive training, which were based on managers' ratings. Obtaining data from several different sources, as was the case in this study, has the advantage of minimizing concerns about common method variance. Nevertheless, it does raise the question of whether managers or other non-incumbents have a more accurate sense of how these HRM practices are implemented. Halo effects or other demand characteristics may bias respondent judgments (e.g., Semmer et al., 1996), and even asking trained raters to make judgments of HRM practices across a range of jobs may bias the relationships depending on the raters' point of view. Again, however, unless such biases are related to the number of injuries recorded, which is unlikely in that raters were unaware of those injury rates, the association would be to attenuate rather than exaggerate relationships.

Another possible limitation is that the current study did not include a measure of efficacy for the HRM practices. Mendelson et al. (2011) suggest that measuring the presence of a practice does not indicate whether the practice is actually efficacious. Inclusion of efficacy measures could help validate the measures used in the current study, and provide an indication of whether these practices were having an impact on intended outcomes. For example, extensive training practices may be validated by whether there are observed behavioral changes in the workplace. Additionally, turnover rates may be used as an indicator of whether systematic selection practices are effectively selecting people with the required knowledge, skills, and abilities (e.g., determining fit of candidate; Seldon & Sowa, 2015). As such, it is important for future research to consider more than the mere presence of HRM practices.

A final limitation is that we have not addressed the mechanisms by which HRM practices may exert their effects. It would be beneficial to examine potential intermediate linkages to better understand the role HRM practices have in shaping workplace safety outcomes (Granger et al., in press). There are several possible ways in which HRM practices might lead to lower injuries. First, at the organizational level of analysis, one potential mechanism is safety climate. Safety climate refers to employees' shared sense of the policies, practices, and procedures that reflect the extent to which safety is valued and rewarded (Zohar, 2014). HRM systems—comprised of practices that are designed to enhance employees' abilities, motivation, and opportunities to perform (Applebaum et al., 2000)—may signal to employees that the organization encourages workplace safety. For example, empowerment practices aimed to enhance employees' autonomy (e.g., employees might proactively address safety issues with having control over their work methods; Turner et al., 2005) and encourage employee participation in organizational issues (e.g., speaking up about safety concerns; Tucker & Turner, 2015) may promote a positive safety climate. Furthermore, context-specific HRM practices may send stronger signals to employees about desirable behaviors and attitudes (Bowen & Ostroff, 2004). As we suggested previously, safety-specific HRM practices may send stronger signals about the relative importance of safety (e.g., safety-specific training) than general HRM practices do.

Second, in addition to an organization's HRM practices exerting effects on organizational-level injury rates, they may also be linked with employee-level injuries, especially if there are systematic differences between employees in different companies; this could be explored by cross-level analysis. A cross-level model consisting of HRM practices might explain between-organization variance in an employee-level mediating variable; this in turn can explain additional employee-level variance in an employee-level outcomes, while controlling for other employee-level factors.

Two possible paths through which this may occur are a mutual gains perspective and the conflicting outcomes perspective (Ogbonnaya et al., 2013; Van de Voorde et al., 2012). A mutual gains pathway suggests that both the organization and employee benefit from implementing HRM practices (Van de Voorde et al., 2012). Specifically, HRM practices may be negatively associated with employee-level injuries by fostering positive employee attitudes such as satisfaction, commitment, and trust (Ogbonnaya et al., 2013). For example, job autonomy might enhance employees' commitment to the organization, strengthening their motivation to meet organizational goals such as safety (Parker et al., 2001). This latter explanation would be consistent with findings that employee engagement might mediate the association between work practices and injury rates (Harter et al., 2002; Nahrgang et al., 2011). A second path suggests a trade-off between organizational outcomes and employee outcomes. In this view, organizations may reap the benefits of HRM practices, but HRM practices may not be beneficial, and may even be detrimental to employee outcomes (Van de Voorde et al., 2012). This critical perspective suggests that employee injuries may be positively associated with HRM practices through work intensification (Ogbonnaya et al., 2013). For example, increased perceived job demands is one way work intensification may manifest itself (Boxall & Macky, 2014), with evidence indicating that extended and overtime hours are related to increased risk of injury (Dembe et al., 2005). In addition, more general job demands within the context of workplace safety (i.e., risks and hazards, physical demands, and complexity) are positively related to worsened safety outcomes through increased burnout (Nahrgang et al., 2011). Taken together, future research should explore the intermediate and cross-level linkages between HRM practices and injuries to enable a greater understanding of the conditions that promote safety.

7. Conclusion

In summary, this study advances our understanding of organizational-level workplace safety. The results support the idea that organizations that promote empowered working also have lower injury rates, and that there is this association in the presence of other HRM practices. Future research should test the robustness of the model in other samples. Meanwhile, a clear policy implication from these findings is that there is merit in going beyond traditional occupational health and safety management systems to understand how more general HRM practices may help to improve workplace safety.

8. References

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Table 1

Means, Standard Deviations, and Correlations among Study Variables

	M/Mdn	*SD/IQR*	1	2	3	4	5	6	7
1. Injury rate (1-year lag) [a]	0.63	0–1.67							
2. Injury rate (2-year lag) [a]	1.04	0–2.22	0.42**						
3. Organizational size [b]	174.24	178.90	0.09	0.23					
4. Performance appraisal	2.31	1.10	-0.21	-0.11	0.27				
5. Systematic selection	3.19	0.59	0.06	0.03	0.24	0.31*			
6. High relative compensation	3.46	0.66	0.18	0.18	0.12	0.02	0.07		
7. Extensive training	2.95	0.92	-0.06	-0.17	0.15	0.58***	0.58***	0.00	
8. Empowerment	2.40	0.68	-0.14	-0.22	0.02	0.23	0.08	0.45**	0.16

Note. Correlations involving injury rate variables are non-parametric (Spearman) correlations. Injury rate measured as number of injuries per 100 employees. * $p < .05$, ** $p < .01$, *** $p < .001$. [a] The median (*Mdn*) and interquartile range (*IQR*) are reported these variables, due to a large skew. [b] The mean and standard deviation reported here are for the raw variable, even though the log of this variable is used in the inferential analysis.

Table 2

Regression of Organizational Injury Rates on HRM Practice Variables

	Model 1	Model 2
Intercept	*B* = 0.504 (0.270)	*B* = 0.159 (0.233)
Organizational size (log)	-0.350 (0.188)	-0.494 (0.145)
Sector-average injury rate	0.450 (0.221)	0.339 (0.190)
Systematic selection	---	0.529 (0.214)
Extensive training	---	-0.232 (0.262)
Performance appraisal	---	-0.167 (0.246)
High relative compensation	---	0.551 (0.192)
Empowerment	---	-0.780* (0.192)
Model χ^2	175.21	102.15
df	46	41
$\Delta\chi^2$, Δdf	---	73.06, 5, $p < 0.005$

Note. Figures in central section of table are regression coefficients (standard errors in brackets). $N = 49$. * $p < .05$.