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Life on the Line: Job Demands, Perceived Co-Worker Support for Safety, and Hazardous Work Events

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The present study of 334 United Kingdom trackside workers tested an interaction hypothesis. We hypothesized, drawing on the job demands-resources framework, that perceived support for safety (from senior managers, supervisors, and coworkers) as job resources would weaken the relationship between higher job demands and more frequent hazardous work events. Consistent with social impact theory, we predicted that perceived coworker support for safety would be particularly influential when trackside workers faced higher job demands. Moderated multiple regression showed that, of all three sources of perceived support for safety, perceived coworker support for safety was most important for keeping employees safe in the face of high job demands.

Keywords: hazardous work events, railway, safety, social impact theory

Existing research has shown that psychological job demands such as excessive workload have the potential to compromise workplace safety outcomes. A narrower role orientation toward promoting safe work (e.g., Turner, Chmiel, & Walls, 2005), higher levels of unsafe work behavior (e.g., Hofmann & Stetzer, 1996), more frequent near-misses (e.g., Elfering, Semmer, & Grebner, 2006; Goldenhar, Williams, & Swanson, 2003) and a higher likelihood of workplace injuries (e.g., Barling, Loughlin, & Kelloway, 2002; Chmiel, 2005; Zohar, 2000) are all associated with higher psychological job demands.

In this paper, we use a job demands-resources framework to model how job resources in the form of perceived support for safety from senior managers, supervisors, and coworkers may weaken the negative relationship between job demands and employee safety. Using social impact theory (Latané, 1981), we consider the effectiveness of perceived support for safety in the face of high job demands and the relative salience of three sources of perceived support for safety under demanding job conditions.

Job Demands, Job Resources, and Hazardous Work Events

The job demands-resources (JD-R) model provides a framework to classify two types of factors, job demands and job resources, in predicting negative work outcomes (Bakker & Demerouti, 2007). Job demands (e.g., work overload) constitute the physical, social, or psychological characteristics of work that require sustained physical or psychological effort and have the potential to induce physical or psychological strain once the employee's routine capacity for effort is exceeded (Bakker, Hakanen, Demerouti, & Xanthopolou, 2007; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Job resources (e.g., perceived support, type of work) are characterized by the physical, social, or psychological characteristics of work that provide employees with support to com-

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plete their work and can lead to positive psychological and physiological outcomes (Demerouti et al., 2001).

The JD-R model posits two different psychological processes (see Bakker & Demerouti, 2007 for a review). First, excessive job demands lead to negative consequences (e.g., absenteeism) due to burnout (e.g., Bakker et al., 2003). Second, job resources lead to positive consequences (e.g., extrarole performance) through job engagement (Bakker & Demerouti, 2007), encompassing the willingness to put extra effort into work tasks and to learn and develop new ways of working. The focus of the present study is on the relative effect of different sources of safety support as job resources for helping to ensure workplace safety.

Perceived support for safety has been conceptualized in different ways, making direct comparisons of results challenging. At an individual level of analysis, perceptions of support have been variously conceptualized as perceived managerial support for safety (e.g., Clarke, 1999; Watson, Scott, Bishop, & Turnbeaugh, 2005) or perceived safety climate (Barling et al., 2002), while other researchers have referred simply to the source of support, such as support from supervisors (Iverson & Erwin, 1997; Parker, Axtell, & Turner, 2001) and coworkers (e.g., Goldberg, Dar-El, & Rubin, 1991; Iverson & Erwin, 1997). Overall, greater support (particularly in the form of interpersonal support for safety) is associated with lower levels of negative safety outcomes such as workplace injuries. In the current study, we modeled job resources as perceived support for safety from coworkers, supervisors, and senior managers, and examined the relative influence that these job resources can have on the relationship between job demands and hazardous work events.

Hazardous Work Events

Hazardous work events are defined as particular working conditions encountered by employees in which occupational injuries (i.e., bodily wounds that result from engaging in work; Baker, O'Neill, Ginsburg, & Li, 1994) have a recognized likelihood of occurring. For example, in a fast-food kitchen, hazardous work events could include having to walk on slippery floors or work unprotected near a deep fryer. As such, hazardous work events focus on *circumstances* that can precede a workplace injury, in contrast to near misses which focus on how close a person was to having an injury often while in the face of hazardous work events.

An understanding of how job demands and resources influence employees' propensity to experience hazardous events can thus help to minimize workplace injuries. Several prior studies have examined hazardous work events and their consequences. For example, Barling et al. (2002) found that hazardous work events predicted occupational injuries among young restaurant workers. These results were replicated in other studies of young workers doing similar work (Kelloway, Mullen, & Francis, 2006), as well as adult production workers outside the service sector (e.g., forestry workers; Michael, Guo, Wiedenbeck, & Ray, 2006).

The Current Study

In this study, we characterize job demands as role overload (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964), which can be a detriment to safe working (e.g., Barling et al., 2002; Hofmann & Stetzer, 1996; Zohar, 2000). Role overload occurs when employees feel they are facing excessive quantitative demands (i.e., there is too much work to do in too little a time), excessive qualitative demands (i.e., they do not have the sufficient skills to do the work at hand), or both (Jex, 1998). We focus specifically on quantitative role overload, and predict that workers who report higher role overload will encounter more hazardous work events. The JD-R model appeals to the idea that employees have limited cognitive-energetical resources to deal with demands over time leading, along with attempts to preserve production-related goals over those connected to safety, to workplace injuries (Hansez & Chmiel, 2010), which are correlated with hazardous work events. Therefore, consistent with prior research, we hypothesize:

> *Hypothesis 1:* Greater job demands (role overload) will be associated with more frequent hazardous work events.

In contrast, we hypothesize that safety-focused support from others, such as coworkers, supervisors, and senior managers will reduce the occurrence of hazardous work events in the face of high job demands. While previous research (e.g., Michael, Evans, Jansen, & Haight, 2005; Thompson, Hilton, & Witt, 1998) has focused on the perceived support for safety from supervisors and senior managers, much of this research has focused exclusively on either one or the other. In contrast, Meliá and colleagues (e.g., Meliá, 1998; Meliá, Mearns, Silva, & Lima, 2007; Tomás, Meliá, & Oliver, 1999) have suggested that

all three sources of support are important in their impact on safety, but the mechanisms and the conditions under which these effects occurs are less clear.

At least two theoretical perspectives suggest that support from other organizational members is likely to be associated with fewer hazardous work events. First, social learning theory (Bandura, 1977) posits that people learn in a number of ways, one of which is through the reinforcement of desired behavior, and another through vicarious learning. Part of supporting safety is reinforcing its importance, and acting in ways that are consistent with the message that safety is important. Therefore, when senior managers, supervisors, and coworkers espouse the importance of safe work practices, they are, in effect, reinforcing safe practices and teaching employees that such practices are valued and expected. By acting in safe ways they are providing opportunities for vicarious learning. Second, social information processing theory (Salancik & Pfeffer, 1978) posits that people use information in their work environment to understand the expectations about their behavior, particularly in uncertain circumstances (Festinger, 1954), for example, in deciding between production or safety priorities. Thus, if employees receive social cues from supervisors, managers, or coworkers that safety is important (i.e., through supportive safety messages), they are more likely to act in accordance with this social information. In sum, when others in their work environment support safety, they reinforce and provide social cues that employees are expected to maintain a safe work environment. In terms of the JD-R model, this would imply a greater willingness to put more effort into safety aspects of a task, and to learn safe ways of working. Therefore, we hypothesize that:

> *Hypothesis 2:* Perceived support for safety from others (coworkers, supervisors, senior managers) will be associated with fewer hazardous work events.

Safety Support in the Face of Job Demands

In the current study, we argue that safety support from others will weaken the relationship between job demands (i.e., role overload) on hazardous work events. As we previously argued, the JD-R model posits that job demands such as role overload will be associated with higher hazardous work events because high demands may mean employees' cognitive-energetical capacity to attend to safety is reduced. However, the JD-R model also suggests that job resources can weaken the effects of job demands on negative outcomes. We argue that safety-related support from members of the work environment is an important resource in this relationship. First, organizational support, especially support for safety, demonstrates to employees that organizational members care for and value them (Tucker, Chmiel, Turner, Hershcovis, & Stride, 2008) influencing the balance of priorities employees draw between production-related goals and safety. Second, when organizational members espouse support for safety, they not only provide reminders that safety is a priority, but also may direct employee attention to hazardous situations and work practices, and even demonstrate new ways of working more safely. Therefore, we expect support for safety to weaken the adverse effects of job demands on hazardous work events.

However, we argue that coworkers in comparison to supervisors and senior managers will have a stronger influence on mitigating the effect of job demands on hazardous work events. First, since job demands occupy employee cognitive-energetical focus, those in the immediate work environment are most able to disrupt employee focus on job demands. Second, coworkers are exposed to similar situations and hazards so have considerable self-interest and experience in ensuring the circumstances within which they operate are safe (Weinstein, 1987). Third, coworkers have greater opportunity through frequency of contact to warn their workmates of potential dangers (Goldberg et al., 1991). Fourth, it is more likely to find friendships among coworkers than among employees of differing organizational ranks, leading to a greater desire among front-line workers to prevent harm befalling one another (Burt, Sepie, & McFadden, 2008).

Consistent with social impact theory (Latané, 1981), the impact of such interpersonal job resources on employee job demands will depend on the *strength*, *immediacy*, and *number of other people*. That is, the stronger (more influential), more immediate, and greater number of people, the more salient the source of support for safety will be. In many contexts, the salience of the support for safety extended by coworkers would be higher than supervisors or senior managers, with whom contact is not as strong, immediate, or proximal. Coworkers are front-line employees who are faced with the same immediate work hazards as the focal employee, and are therefore most affected by such hazards. Given their proximity both to the potentially hazardous situation and to other employees, as well as their greater number, coworkers are likely to have a collectively strong voice in supporting safety. Although a supervisor

may have a formal mandate to support safety, we argue that they are less likely to be on the front-line and not as cognizant of concrete, operational safety concerns (Carroll, 1998). Luria, Zohar, and Erev (2008), in fact, showed the importance of literal visibility on the efficacy of supervisor-based interventions designed to improve employee safety behavior. Further, there are generally fewer supervisors than there are employees, and even fewer senior managers. Therefore, while supervisors and senior managers may have some strength due to their formal organizational status, coworkers are likely to be the most salient source of support for safety for other workers because they are equally affected by safety concerns, are likely to have strong personal connections with those with whom they work, and have a strong stake in reducing safety hazards for both self- and other-protective reasons.

While coworkers have greater numbers, greater proximity, and greater strength (due to their front-line position), and supervisors have some strength (due to their organizational status), senior managers are likely to have the lowest level of social impact despite their high organizational status. In many contexts, senior management is rarely present on the work site, is operationally and cognitively distant from work hazards (Carroll, 1998), and has infrequent contact with employees in comparison to supervisors and especially coworkers. The JD-R model predicts that resources such as support will weaken the effects of job demands on work outcomes, and this effect may be especially applicable when demands are high (Bakker et al., 2007). We expect, however, from social impact theory that coworker support will have the greatest influence in weakening the effect of high job demands on hazardous events.

> *Hypothesis 3:* Coworker support for safety will have the greatest influence in weakening the effect of job demands on hazardous events relative to support for safety from supervisors and senior managers.

Method

Organizational Context

The current research was conducted with railway maintenance employees in the United Kingdom. At the time of this study, the national rail network faced extensive criticism for safety failures (Hutter, 2001; Murray, 2001; Wolmar, 2005), attributed in part to the transition from a government-run rail system to one maintained by private contracting companies. When the rail system privatized, trackside maintenance companies were charged with the upkeep of the vast network (Health & Safety Commission, 2002), with trackside maintenance workers employed by these companies repairing broken rails, fixing signals, and conducting other technical work to ensure that the rail infrastructure remained functional. These companies were under pressure to repair the rail network as quickly as possible, with the workforce facing sustained pressure trackside to keep on schedule. Rail maintenance supervisors would conduct site visits, but were rarely present for the entire duration of trackside work, unless a larger-scale maintenance job was being conducted. Senior management of these companies had even less day-to-day contact with trackside workers, and at the time of the current study senior management often changed frequently as track maintenance contracts were continually reawarded to maintenance companies merging and acquiring one another. Despite these organizational-level changes, there was little change to the day-to-day work of trackside maintenance employees during this period.

Procedure and Sample Characteristics

We conducted a survey of 1,500 trackside maintenance employees. Survey completion was voluntary and permitted on work time. The response rate was 22%[1] ($N = 334$); the average respondent was male (there were only two females in the sample), 41 years old ($SD = 10.17$), and had been with their employing organization for 7.3 years ($SD = 7.49$). In terms of job type, 48% of respondents worked in what is called "permanent way" (i.e., responsible for laying and maintaining track), with the remaining half working in one of four other job categories (22% signaling, 13% renewals, 9% overhead lines, and 8% other). These characteristics are representative of the population of trackside maintenance employees when the data were collected in 2002.

Measures

Role overload. We assessed role overload using the three highest-loading items from Caplan, Cobb,

[1] The dispersed nature of the trackside work, along with demanding work schedules, likely hindered a higher response rate. One of the authors spent significant time trackside and in trackside depots, reminding employees of the opportunity to participate in the survey.

French, Harrison, and Pinneau's (1975) quantitative role overload measure. Participants used a 5-point scale ranging from 1 (*rarely or never*) to 5 (*constantly*) to respond; a sample item was: "To what extent do you find work piles up faster than you can complete it?" Internal consistency was .86.

Perceived managerial support for safety. This scale consisted of the three highest-loading items adapted from Mueller, DaSilva, Townsend, and Tetrick's (1999) Management Attitude Toward Safety scale. A sample item was: "management seem to care about my safety." Respondents answered items on a 5-point scale (strongly disagree to strongly agree), with a higher scale score indicating greater perceived management support for safety. Internal consistency was .88.

Perceived supervisory support for safety. This scale consisted of the three highest-loading items from Mueller et al. (1999). A sample item was: "my supervisor seems to care about safety." Respondents answered items on a 5-point scale (not at all to a very great extent), with a higher scale score indicating greater perceived supervisor safety support. Internal consistency was .92.

Perceived coworker support for safety. This scale consisted of the three highest-loading items from Mueller et al.'s (1999) Effects of Safety Behavior on Social Status scale. A sample item was: "people in my immediate workgroup who work safely try to emphasize it and make sure others do same." Respondents answered items on a 5-point scale (not at all to a very great extent), with a higher scale score indicating greater perceived coworker safety support. Internal consistency was .82.

Hazardous work events. A six-item index was developed using an act frequency approach (e.g., Barling et al., 2002; Withey & Cooper, 1989) to capture hazardous work events appropriate to the study context. Respondents were asked to rate the frequency with which they encountered a list of situations in the last 12 months. We developed the scale for this study by asking eight experienced trackside maintenance workers to develop a list of hazardous work events. We provided the eight employees with the following paragraph, and asked them to develop a list of situations in line with the description:

> We recognize that sometimes you may find yourself trackside in a situation which, through no fault of your own, is not ideal from a safety perspective. It is important to know what these situations are so we can pinpoint problems areas. This exercise is completely confidential, and you won't be getting yourself, your coworkers, your supervisor, or your company in trouble by coming up with these sorts of "hazardous work events."

Based on discussions between these eight representatives and one of the authors, we eliminated several items from the draft list because only a specialized proportion of the trackside maintenance population would find themselves in these situations (e.g., "you have made a safety critical communication without using the phonetic alphabet"). The items included in the final survey were the following six items: "you have been working in a red zone when you feel a green zone would be more appropriate for that area"; "you have had to move pretty quickly to get out of the way of a train"; "you have not felt that a safe system of work was in place when you were working"; "you have felt that there weren't enough people to do the job safely"; "you have been delayed moving out of the way of a train by dropping equipment, tripping, or falling," and "you have been in a position of safety for less than 10 seconds before a train came." Previous research on trackside worker safety (e.g., Baldry & Ellinson, 2006; den Hartog, van Zante-de Fokkert, Sjamaar, & Beusmans,, 2005; Sanne, 2008a, 2008b; Wilson et al., 2009) describes similar events and uses consistent terminology (e.g., "red zone") to describe particular situations.

For survey respondents, these items were prefaced by a variation on the paragraph above, and anchored with "Thinking about the past 12 months, how often have you been in a situation where. . .". The items were rated on a 4-point scale (from 0 = not in the past year to 4 = almost daily). Internal consistency was .82.

Control variables. We controlled for age because younger workers have less experience and may therefore encounter more hazardous events (Breslin & Smith, 2005), and job type because safety conditions differ across different jobs (Rebitzer, 1995).

Measurement model. We tested the adequacy of the measurement model by conducting confirmatory factor analyses in LISREL 8.3 (Jöreskog & Sörbom, 1999) using maximum likelihood estimation and the covariance matrix of study items as input. A comparison of the fit indices (see Appendix A) and chi-square values among plausible alternative models (Kelloway, 1998) suggested that the proposed 5-factor model with correlated factors (i.e., Model 1: Role Overload, Perceived Managerial Support for Safety, Perceived Supervisor Support for Safety, Perceived Coworker Support for Safety, and Hazardous Work Events) provided the best fit to the data. This model is superior to the 5-factor orthogonal model (i.e.,

Model 2; $\Delta\chi^2(15) = 428.11$, $p < .01$), 3-factor oblique model (i.e., Model 3; Role Overload, all three sources of support for safety combined as one factor, and Hazardous Work Events; $\Delta\chi^2(7) = 757.16$, $p < .01$), and a 1-factor model (i.e., Model 4; $\Delta\chi^2(10) = 1579.59$, $p < .01$). As can be seen from Appendix B, all parameters were significant ($p < .01$) across the five factors, with items explaining adequate item variance (average item $R^2 = .63$).

To assess potential overinflation due to common method variance, we also specified an additional factor (unmeasured latent method factor) and allowed all of the items to load on to this additional factor along with their hypothesized latent factor. The fit of the revised model (5 substantive factors + 1 method factor) improved (comparative fit index [CFI] = .98; normed fit index [NFI] = .95; root mean square error of approximation [RMSEA] = .044), although it only explained an additional 6% of the total variance. Williams, Cote, & Buckley (1989) found that the average amount of method variance in similar studies was 25%, and although the present analyses suggest that the model tested does benefit from the addition of a method factor, its benefit is comparatively small, suggesting that the observed relationships are substantive in the main, rather than artifactual.

Analytic Strategy

Consistent with Aiken and West's (1991) caution about multicollinearity, we centered the scale scores and used these transformed data to compute three two-way interaction terms. In the first step of the regression, we entered age and job type (the latter as dummy variables). In the second step, we entered role overload in its centered form. In the third step, we entered the three centered moderator variables. In the fourth step, we entered the interaction terms between role overload and management safety support, role overload and supervisor safety support, and role overload and coworker safety support, respectively. The test of Hypotheses 1 and 2 occur by noting the significance of the main effects of the role overload and support for safety variables in steps 2 and 3, respectively. Tests of the differences between the three interaction terms in step 4 enables a test of Hypothesis 3. To present visually the nature and direction of any significant interactions in the final step, we plotted the simple slope of the relevant safety support variable across high and low levels ($\pm$ 1 *SD*) of role overload (Aiken & West, 1991).

Results

Table 1 presents descriptive statistics and intercorrelations and Table 2 presents the results from the moderated hierarchical regression. In support of Hypothesis 1, role overload was positively related to hazardous work events ($\beta = .22$, $p < .001$). Supporting Hypothesis 2, all safety support variables were related to lower hazardous work events: management support for safety ($\beta = -.24$, $p < .001$), supervisor support for safety ($\beta = -.14$, $p < .05$), and coworker support for safety ($\beta = -.22$, $p < .001$). Step 4 of the regression analysis contains the interaction terms. In total, the interaction terms in this step explained an additional 6% of variance in hazardous work events, with a significant interaction between role overload and perceived coworker support for safety ($\beta = -.24$, $p < .001$). In support of Hypothesis 3, tests of the difference between the three two-way interaction terms shows that the magnitude of the interaction between role overload and coworker support for safety is larger than either the interaction between

Table 1
*Means, Standard Deviations, and Zero-Order Correlations for the Study Variables (*N = *309–329)*

Variables	*M*	*SD*	1	2	3	4	5	6
1. Age	40.96	10.17	—					
2. Role overload	2.75	1.12	.24	—				
3. PMSS	3.08	1.08	.02	−.22	—			
4. PSSS	3.65	1.10	.01	−.12	.56	—		
5. PCSS	3.93	.92	.10	−.09	.40	.52	—	
6. HWE	1.57	.64	−.06	.24	−.45	−.43	−.43	—

Note. PMSS = perceived managerial support for safety; PSSS = perceived supervisor support for safety; PCSS = perceived co-worker support for safety; HWE = hazardous work events. For ease of presentation, the five dummy variables for job type do not appear in this table. Correlations equal or greater than .12, $p < .05$; correlations equal or greater than .15, $p < .01$; correlations equal or greater than .22, $p < .001$.

Table 2
Summary of Moderated Multiple Regression for Variables Predicting Hazardous Work Events (N = Listwise 289)

Variable	Step 1			Step 2			Step 3			Step 4		
	B	*SE* B	β	*B*	*SE* B	β	*B*	*SE* B	β	*B*	*SE* B	β
Age	−.01	.01	−.06	−.01	.01	−.10	−.01	.01	−.07	−.01	.01	−.04
Permanent way	.35	.21	.28	.24	.21	.19	.23	.18	.18	.23	.18	.18
Overhead lines	.23	.23	.11	.19	.23	.09	.16	.20	.08	.07	.19	.03
Signaling	.55	.22	.38*	.46	.21	.32*	.29	.19	.20	.28	.18	.19
Renewals	.24	.23	.13	.21	.23	.11	.09	.20	.05	.08	.19	.04
Other job types	.01	.24	.01	−.04	.24	−.02	−.02	.21	−.01	−.09	.20	−.04
RO				.14	.04	.22***	.09	.03	.14*	.09	.03	.14**
PMSS							−.15	.04	−.24***	−.18	.04	−.28***
PSSS							−.09	.04	−.14*	−.09	.04	−.15*
PCSS							−.14	.04	−.22***	−.11	.04	−.17**
RO × PMSS										.01	.04	.02
PO × PSSS										−.03	.04	−.05
RO × PCSS										−.14	.04	−.24***
R^2		.07			.11			.34			.40	
F for change in R^2		3.38**			13.88***			31.59***			8.92***	

Note. RO = Role overload; PMSS = perceived managerial support for safety; PSSS = perceived supervisor support for safety; PCSS = perceived co-worker support for safety.
* $p < .05$. ** $p < .01$. *** $p < .001$.

role overload and supervisor support for safety [$t(1, 286) = 2.09, p < .05$] or the interaction between role overload and management support for safety [$t(1, 286) = 2.90, p < .01$]. Figure 1 represents the plot of the simple slopes for perceived coworker support for safety across high and low levels of role overload, showing that under demanding job conditions, higher support for safety from coworkers is related to less frequent hazardous work events. Under less demanding job conditions, level of support for safety from coworkers is not related to the frequency of hazardous work events.

Discussion

The present study examined the relationship between job demands (role overload), job resources (perceived coworker, supervisor, and management support for safety), and the extent to which trackside workers encountered hazardous work events. Results showed that role overload was related to more hazardous work events, and management, supervisor, and coworker support for safety were related to fewer hazardous work events. Further, perceived support for safety from coworkers inter-

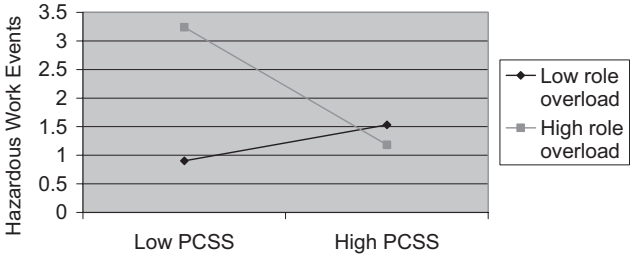

Figure 1. Role Overload and Perceived Coworker Support for Safety as Predictors of Hazardous Work Events. *Note.* PCSS = perceived coworker support for safety.

acted with role overload to predict additional variance in hazardous work events over and above supervisor and senior manager support for safety. Since workers are relationally closer and more directly affected by the work practices of their coworkers, respondents may have been more likely to attend to cues from coworkers than from supervisors or senior managers about the importance of safety under demanding conditions.

These findings help to disentangle how psychosocial factors are related to workplace safety, and extend our knowledge of how the relative support for safety from salient social forces such as coworkers may help protect employees under demanding conditions. The present study is the first to our knowledge to examine the interaction between psychological job demands and a comprehensive set of interpersonal resources for safety. Past research has mainly examined (a) direct effects, rather than the way in which co-occurring psychosocial factors may differentially influence safety hazards, and (b) supervisor and senior manager behaviors often in isolation, rather than as a part of a set of salient social influences in the workplace (supervisors, senior managers, and coworkers). Anchoring the present study in a JD-R framework provides a theoretical lens for interpreting the empirical findings. In addition, social impact theory (Latané, 1981) helps to explain the relative importance of the source of interpersonal support for safety.

In the present study, coworkers were the most salient of the three sources of support under demanding conditions (i.e., high role overload). However, coworkers may not be as influential in all contexts. In other organizations, as previous research has suggested (e.g., Zohar, 2002; Zohar & Luria, 2003b), supervisors may have a strong formal presence and therefore exert different influence over safety under normal operating conditions. The present research suggests that focusing on one source of safety-related support (e.g., supervisors, senior management) may not be capturing the full range of sources of supports available, and that these social influences have the possibility of reinforcing one another under varying job conditions. As a result, the current findings suggest the importance of context (Johns, 2006; Rousseau & Fried, 2000) when considering the salience of sources of support for safe working, the need to explore these relationships with respect to other types of safety performance (e.g., safety compliance and safety participation; Neal & Griffin, 2006), and the integration of support for safety with the growing literature on trust and safety (e.g., Conchie & Burns, 2009; Conchie & Donald, 2009).

Study Limitations and Future Directions

There are several limitations of the current study that are important to note in interpreting the findings and envisioning future research in this area. First, the current research design is cross-sectional, limiting the causal inferences possible from these data. It could be that hazardous work events cause increased job demands: experiencing hazardous work events on a regular basis, for example, may contribute to perceptions of demanding work. Similarly, experiencing fewer hazardous work events may evoke attributions about the extent to which coworkers or supervisors actually need to support safety. Measuring the study variables with longitudinal research designs may help to separate the temporal nature of these relationships.

A second limitation concerns the single source nature of the data, and the potential resulting bias of the focal relationships. In addition to showing the minimal effect of common method variance on the measurement model, the current study hypothesized and found a number of two-way interactions, the presence of which is indicative of substantive relationships among the focal variables rather than exclusively artifacts of method (Wall, Jackson, Mullarkey, & Parker, 1996). Alternative designs using multisource data might help to assuage methodological concerns along these lines.

A third limitation is the generalizability of the model. It is possible, given the nature of the sample and distributed nature of trackside maintenance work, that selective sampling and a low response rate has affected the findings. We put forward three issues in response to this limitation. First, our research design sampled five of the seven rail maintenance contracting companies working on the rail network at the time of the study. Second, the Health and Safety Commission (2002) has acknowledged the difficulty in calculating the number of people working for U.K. rail maintenance contractors, so determining the representativeness of the current sample would be problematic under any conditions. Third, while workplace safety events certainly remain difficult to explore due to potential biases of social desirability (e.g., fear of reprisal if discovered admitting safety violations) and accuracy of recall (e.g., weeks, not months; Landen & Hendricks, 1995), Schalm and Kelloway's (2001) analysis of a range of effect sizes in occupational

health psychology research suggests that the effect of nonresponse bias is likely minimal.

Implications and Conclusions

Notwithstanding the limitations described above, the findings from the present study have implications for theory and practice. First, the findings point to the nature of the relationship between job demands and job resources on workplace safety. In particular, role overload was associated with more frequent hazardous work events and support with less frequent hazardous work events. This suggests the importance of training not only supervisors in managing job demands, but also coworkers in helping to promote safety, particularly when job demands are high. To date, research interest has focused on the role of the supervisor in promoting safety in work groups (e.g., Zohar, 2000, 2002), but largely excludes the role of coworkers. Second, the current research used contingency theories of occupational stress in the safety domain. While previous research has examined job demands and their interaction in the context of safety (e.g., Turner et al., 2005), the weakening potential of interpersonal job resources has not been explicitly examined.

In conclusion, this study examined the potential of coworkers, supervisors, and senior managers in reducing hazardous work events under demanding work conditions by providing support for safety. While organizational conditions may create significant job demands, support from other organizational members, in particular coworkers, seems to help refocus attention to safety and may ultimately help to keep employees out of harm's way.

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Appendix A

Fit Indices for the Measurement Models

Model	χ^2	*df*	RMSEA	NFI	CFI	PNFI
1. 5-factor oblique	357.00	125	.075	.91	.94	.74
2. 5-factor orthogonal	785.11	140	.118	.77	.80	.71
3. 3-factor oblique	1114.16	132	.149	.72	.74	.62
4. 1-factor	1936.59	135	.200	.53	.55	.47

Note. RMSEA = root mean squared error of approximation; NFI = normed fit index; CFI = comparative fit index; PNFI = parsimonious normed fit index.

(*Appendices continue*)

Appendix B

Standardized Parameter Estimates for the Five-Factor Oblique Measurement Model

Item	Role overload	PMSS	PSSS	PCSS	HWE	R^2
1. Do you find work piles up faster than you can complete it?	.79					.62
2. Do you find yourself working faster than you"d like in order to complete your work?	.87					.76
3. Does it seem like you have too much for one person to do?	.79					.62
4. In my company, top management get personally involved in safety activities		.75				.57
5. Management is willing to invest money and effort to improve safety		.88				.78
6. Management seem to care about my safety		.92				.84
7. Worker safety practices are important to my supervisor			.84			.71
8. My supervisor seems to care about safety			.95			.89
9. My supervisor emphasizes safe practices on the job			.85			.72
10. The best workers in my immediate workgroup expect other workers to behave safely.				.61		.37
11. People in my immediate workgroup work who work safely try to emphasize it and make sure others do the same.				.90		.82
12. Employees in my immediate workgroup remind each other of the need to follow safety regulations.				.88		.78
13. Been working in a red zone when feel a green zone would be more appropriate for area.					.69	.47
14. You have had to move pretty quickly to get out of the way of a train.					.69	.48
15. You have not felt that a safe system of work was in place when you were working.					.80	.64
16. You have felt that there weren't enough people to do the job safely.					.70	.49
17. Been delayed moving out of way of train by dropping equipment/tripping/falling.					.49	.24
18. You have been in a position of safety for less than 10 seconds before a train came					.71	.50

Note. PMSS = perceived managerial commitment to safety; PSSS = perceived supervisor commitment to safety; PCSS = perceived co-worker commitment to safety; HWE = hazardous work events.

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