Out of mind, out of sight? Leading distributed workers to ensure health and safety

ABSTRACT

Current frameworks of leadership are based on face-to-face interaction. A growing number of workers work away from their main location of work; this makes it challenging for leaders to ensure the health and safety of distributed workers. In the present study, we explore the relationship between line managers' health and safety leadership and distributed workers' health and safety behaviours. We also explore the organizational procedures and practices that may enhance the impact of health and safety leadership. We included a broad range of distributed workers (in analyses, minimum $N = 626$) from 11 organizations. We found that health-and-safety-specific leadership was positively related to distributed workers' self-rated health, safety compliance and safety proactivity. These relationships were augmented by distributed workers' sense of being included in the workplace. Knowledge sharing among colleagues was associated with safety compliance when health-and-safety-specific leadership was low. Our results indicate that one way of addressing the challenges of distributed working may be through line managers putting health and safety on the agenda.

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Keywords: health leadership, safety leadership, safety compliance, self-rated health, communication, multilevel, distributed workers

Previous research has demonstrated that leaders play a significant role in followers' health and safety (Clarke, 2013; Kuoppala, Lamminpää, Liira, & Vainio, 2008). Current leadership frameworks are based on leaders engaging in face-to-face interaction with their followers (Avolio, Walumbwa, & Weber, 2009). A growing number of workers, however, work away from their main location of work at least part of the time; these workers are known as distributed workers (IDC, 2010). Distributed workers are found across a range of occupations and industries, such as public service (e.g., police, firefighters, community nurses and local authority workers); service sectors (e.g., surveyors, architects and consultants); engineering and construction; utilities (e.g., energy, water and telecoms) and transportation (e.g., rail, bus and delivery). Furthermore, employees in non-traditional distributed working roles may spend some of their time working from home; many distributed workers are also lone workers for part of their work time. Distributed workers share a number of characteristics, including limited opportunities for face-to-face interaction with their line managers. As line managers are responsible for distributed workers' health and safety (Dix & Beale, 1996) it thus becomes an important question to answer how these leaders can ensure their workers' health and safety. In a recent review of safety leadership among distributed workers, Pilbeam, Doherty, Davidson, and Denyer (2016) called for research focusing on the leadership of a wide range of distributed workers and examining safety specific leadership rather than using generic leadership frameworks. In the present study, we address these calls by exploring the links between distributed workers' experiences of their line managers' health and safety leadership and these workers' self-reported health and safety across a wide range of occupations.

Based on Conservation-of-Resource (COR, Hobfoll, 1989) theory, we see health-and-safety-specific leadership as a resource and explore how other resources may interact with leadership to enhance distributed workers' health and safety behaviours. First, we propose that a resource at the organizational level, the extent to which employees feel included in the organization, will

strengthen the relationship between health and safety leadership and distributed workers' health and safety as workers who feel included may be more receptive to stimuli from their line manager. Second, we propose that a resource afforded by the group, knowledge sharing with colleagues, may enhance the link between health and safety leadership and workers' health and safety. Distributed workers whose leaders put health and safety on the agenda may raise awareness of the importance of health and safety and workers who often ask each other for help and advice may also do so when facing risky work situations. We test these propositions in a large multi-organizational study involving distributed workers across a wide range of occupations.

Challenges for Leading the Health and Safety of Distributed Workers

Dix and Beale (1996) introduced the umbrella term 'distributed workers' to describe workers who work autonomously away from their organization's main location for at least part of their time. The term distributed workers thus covers a wide range of workers including teleworkers, mobile maintenance engineers, delivery and transport drivers and surveyors. In 2010, almost half of the Western European workforce could be classified as distributed workers and this number is projected to increase (IDC, 2010). In 2015, a European survey concluded that 30% of this workforce work across multiple locations, with distributed working being most common among blue collar workers such as transport (49%) and construction (57%) (Eurofound, 2015).

The health and safety of distributed workers poses a challenge to line managers because of the nature of this work. A first challenge to distributed workers' health and safety include limited face-to-face interaction between leaders and their followers. Leadership theories implicitly assume frequent face-to-face interaction to allow for the leaders' behaviours to influence followers, e.g., role modelling (Avolio et al., 2009). A second challenge concerns the limited access to organizational sources of information about health and safety policy and procedures, e.g., limited

access to the organization's intranet and physical material, such as safety manuals. This limited access puts an even greater onus on leaders' behaviours to ensure workers' health and safety. A third challenge is that distributed workers work across multiple locations making it difficult for line managers to monitor and anticipate risks and stressors to distributed workers' safety and health.

Health and safety leadership among distributed workers

COR theory (Hobfoll, 1989) suggests that people are motivated to preserve existing resources and to accumulate more resources. Resources can be defined as 'anything perceived by the individual to help attain his or her goals' (Halbesleben, Nevue, Paustian-Underdahl, & Westman, 2014, p. 6). From a COR perspective, people invest resources available to them to deal with the demanding situations they face (Hobfoll, 1989), i.e. conditions that may threaten their health and safety and those who have more resources are less likely to suffer negative outcomes. It has been argued that leadership can be seen as a resource (Tims et al., 2011) and may thus enable distributed workers preserve their health and safety.

Dominant leadership frameworks have been developed with a view to enhancing organizational outcomes including follower performance, innovation and creativity (Gregersen, Vincent-Höper, & Nienhaus, 2014) but it has been argued that these leadership behaviours may not be effective in ensuring employee health and safety (Barling, Loughlin & Kelloway, 2002; Zwingmann, Wolf, & Richter, 2016; Nielsen & Daniels, 2016). The rationale for developing health-and-safety-specific leadership frameworks arises from the fact that leaders play an important role in directing followers' attention to specific aspects of their work (Bass & Riggio, 2006). Leaders may set the agenda for health and safety topics by being open about health and safety objectives, discussing the ways in which health and safety may be improved and involving employee in decision making concerning health and safety (Gurt, Schwennen, & Elke, 2011; Yarker, Lewis, & Donaldson-Feilder, 2009). Gurt et al. (2011) tested the notion of health-specific leadership and

found that such leadership was positively related to workers' job satisfaction and negatively related to workers' irritation. We extended the Gurt et al. (2011) framework by including items related to both health-specific and safety-specific leadership, which refer to generically as health-and-safety-specific leadership.

Both safety compliance and proactivity may be important outcomes for distributed workers. Safety compliance is important because line managers have limited opportunity to monitor the use of safety equipment by distributed workers (Neal & Griffin, 2006). Safety proactivity is important because distributed workers work autonomously away from the location of their line manager and thus have to make independent decisions when they encounter high risk situations. We did not include near-miss incidents and accidents as outcomes as these may be heavily influenced by aspects of unknown environments beyond the individual's control (Greiner, Krause, Ragland, & Fisher, 1998). We propose that the impact of health-and-safety specific leadership may operate at the individual level as line managers primarily interact with their distributed workers on a one-to-one basis rather than with the work group as a whole.

Hypothesis 1: Health-and-safety-specific leadership is positively related to distributed workers' (a) self-rated health. (b) safety compliance, and (c) safety proactivity.

Synergistic Resources Among Distributed Workers

Recently, a classification of resources has been suggested that focus on the source of the resource, thus offering organizations useful insights into where to focus their interventions (Nielsen, Nielsen, Ogbonnaya, Känsälä, Saari, & Isaksson, 2017). Resources within a work context may stem from four sources: individual-level resources comes from within the individual, such as hope, resilience, self-efficacy and optimism; group-level resources concern the resources that are afforded by the group, for example, peer support and a good team climate; leader resources are those afforded by the leader, such as a good relationship between a leader and their employees or the enactment of

positive leadership behaviours; and organizational resources are those afforded by the organization, such as Human Resource Management practices and policies, fair procedures, and positive organizational support (Nielsen et al., 2017). According to COR theory (Hobfoll, 1989) resources do not exist in isolation, but have synergistic effects such that resources at one level, e.g., having colleagues that support their peers in following safety regulations and provide advice and support on how to do so, may strengthen the impact of leaders who promote safe and healthy ways of working (Hobfoll, 1989). We propose that resources at other levels, i.e. resources related to the workplace as a whole and to the interaction with colleagues, may enhance the impact of leadership resources.

Organizational inclusion and the impact of health- and safety specific leadership

An organizational resource that may enhance the impact of health-and-safety-specific leadership is the extent to which workers feel included in the organization. Organizations may employ strategies to minimize the risk of isolation such as organizing social events to ensure employees are included in social networks. Marshall, Michaels, and Mulki (2007) identified workplace isolation, i.e. the extent that workers do not feel part of the organization and feel excluded from social networks, as a potential threat to workers' job satisfaction, commitment, involvement and intentions to remain in the job. Among sales representatives, Mulki and Jaramillo (2011) found that considerate leadership was negatively related to workplace isolation which in turn was negatively related to job satisfaction. Although these results suggest a mediational path, there is good reason to explore the interaction effects between leadership behaviours and the degree of workplace inclusion to understand whether a general sense of being part of a greater whole may make distributed workers more receptive to acting according to the health and safety agenda. In the present study, we suggest that workplace inclusion, i.e. the extent to which workers feel included in

the social networks within the organization may be important to augment the outcomes of health and safety specific leadership. Workplace inclusion may accentuate the positive relationship between leadership and distributed workers' health and safety outcomes. Distributed workers who feel part of the workplace are more likely to feel receptive of leaders' attempts to put health and safety on the agenda and engage in discussions of how health and safety may be improved. The norm of reciprocity (Blau, 1964) suggests that workers who feel they are the recipients of positive attention, e.g., their leader cares about their safety and health, are more likely to reciprocate these positive behaviours. This exchange is more likely to happen if workers feel overall that they belong to the organization and that they form part of a greater whole.

Hypothesis 2: The association between health-and-safety-specific leadership and distributed workers'(a) self-rated health, (b) safety compliance and (c) safety proactivity is moderated by workplace inclusion. Distributed workers who experience their leaders engage in health-and-safety-specific leadership behaviours and who feel part of the organization and engage in organizational networks are more likely to be receptive of the leaders' attempts to put health and safety on the agenda and will as a result report better health and safety outcomes.

Distributed workers' knowledge sharing enhances the impact of health-and-safety-specific leadership

A resource relating to how distributed workers interact with colleagues, i.e. knowledge sharing, may enhance the link between health-and-safety-specific leadership and workers' health and safety. Knowledge sharing concerns the extent to which workers ask and seek advice from their colleagues (Nesheim & Gressgård, 2014). It is possible that leaders who engage in health-and-safety-specific behaviours may benefit from having distributed workers who share knowledge with colleagues at other locations. Nesheim and Gressgård (2014) in their study of offshore workers found that knowledge sharing was related to workers using knowledge concerning safety issues.

This result suggests that when distributed workers ask each other for advice and offer advice, the content of this advice exchange is likely to include health and safety related matters. As leaders promote health and safety among their distributed workers, the moderating effect of knowledge sharing can be interpreted as the extent to which workers will engage actively with the leaders' health and safety agenda. In a context, where distributed workers share information, they may more readily also ask and seek advice on health and safety related matters and thus enhance the impact of the line manager's health and safety leadership behaviours. Related leadership research has suggested that workers who work in groups where there is a good team climate may enhance the effect of leaders' behaviours. Gil, Rico, Alcover, and Barrasa (2005) found that group potency enhanced the impact of change-oriented leadership on worker performance. Distributed workers whose leaders put health and safety on the agenda and who seek and offer advice within their peer group may therefore also be more prone to share information about health and safety related issues and therefore report better health and safety.

Hypothesis 3: The association between health-and-safety-specific leadership and distributed workers' (a) self-rated health, (b) safety compliance, and (c) safety proactivity is moderated by the extent of knowledge sharing between colleagues. Distributed workers who experience their leaders engage in health-and-safety-specific leadership behaviours and who seek and give advice from colleagues, i.e. share knowledge will report better health and safety outcomes.

Methods

Procedure and sample

Data were collected as part of a larger study of occupational safety and health in distributed worker populations (REFERENCE WITHHELD TO PROTECT ANONYMITY). Companies were contacted through contacts of the research team, the project's steering group, through promotion of

the project at conferences, through social media and through a publication in a practitioner magazine.

In most cases, questionnaires were distributed electronically to participants via a weblink. In some cases, participants had no on-line access at work, and so questionnaires were distributed in hard copy. Although there were differences between substantive variables according to distribution methods, analysis of data controlling for distribution method had no impact on findings reported as significant.

In total, 12 companies participated in the research, with 822 workers providing data (36.3% response rate) on 112 line managers. In the present paper, we included participants' data only if at least three members of each work group provided data on their line manager. We define work groups as the group of employees under each line manager. This resulted in a sample of 734 workers providing data on 100 line managers in 11 organizations. Each line manager was responsible for one work group. The majority of the sample was male (95.6%). The average age was 47.2 years (SD=12.6) and workers had been with their current employer for 16.7 years on average (SD=14.6). Participants worked an average of 40.6 hours per week (SD=13.1), of which an average of 33.6 hours (SD=13.0) was spent working remotely. When asked to choose a range of descriptions of their mode of working, the most frequently endorsed were lone working (64%), construction site working (54%), mobile working (53%) and home based working (38%). Some 68% of the sample finished their education at the end of secondary school, and 31% had a University graduate or post-graduate degree. A comparison between those included in the final sample and those excluded revealed no significant differences on the substantive variables.

Measures

Except where noted, items were rated on five-point fully anchored Likert type scale (1 = 'totally disagree', 5 = 'totally agree'). Scale scores for all scales reported in this paper were calculated by summing items and dividing by the number of items in the scale.

Health- and-safety-specific leadership. To assess health-and-safety-specific leadership, we used items from Gurt et al.'s seven-item scale (2011). An example item is "My immediate manager informs me about health at work issues". To assess safety-oriented leadership, we adapted the Gurt et al. scale by substituting the word "safety" for "health" into the seven items and where both health and safety was mentioned in the same item we would split this into two (e.g., "My immediate manager discusses safety related issues with me").

Using data from the entire sample, we analyzed the structure of each leadership scale separately, and then both scales together. We used multi-level confirmatory factor analysis (ML-CFA, using MPlus, Muthén & Muthén, 1998-2017) to assess the items' structure separating within-work group from between-work group differences in a two-level model. The small number of organizations precluded use of three-level ML-CFA, because ML-CFA requires the number of free parameters is less than the number of units at the highest level. We found that a single factor represented the structure of the safety oriented items (χ^2 = 148.12, df = 28, p < .001, Confirmatory Fit Index {CFI} = .97, Root Mean Square Error of Approximation {RMSEA} = .07). However, a single factor did not represent the structure of the health oriented items (χ^2 = 453.37, df = 28, p < .001, CFI = .91, RMSEA = .14). Two health specific items did not load significantly on the single factor at the group level of analysis (p>.20). Exclusion of these two items yielded good model fit (χ^2 = 18.82, df = 10, p < .05, CFI = 1.00, RMSEA = .03).

To examine the structure of the full set of items, we fitted both a single-factor model and a two-factor model representing health-and-safety-specific leadership. We fitted models for all 14

items and for 12 items with two health items excluded. For all 14 items, a single factor model demonstrated marginal fit to the data (χ^2 = 1287.14, *df* = 154, *p* < .001, CFI = .90, RMSEA = .10). The two factor model displayed slightly better fit (χ^2 =1261.39, *df* = 152, *p* < .001, CFI = .90, RMSEA = .09). In models excluding two health specific items, fit was the approximately the same for both single (χ^2 = 916.01, *df* = 106, *p* < .001, CFI = .91, RMSEA = .10) and two factor models (χ^2 = 914.01, *df* = 108, *p* < .001, CFI = .91, RMSEA = .10). Moreover, in the two factor model, latent correlations between factors exceed *r* = .98 for both within-work group and between-work group variation. Therefore, we combined all seven safety items and five health items into a single scale representing health-and-safety-specific leadership (α=.97), because: a) of better fit for a five-item health specific leadership scale when the items were analyzed separately; b) better fit when seven safety and five health items were analyzed together compared to all 14 items analyzed together; and c) the high latent correlation between health-specific and safety-specific leadership. The scale also displayed some inter-rater consistency (ICC1 = .16, ICC2 = .59, median rwg = .96), although the coefficients are not so high as to indicate within-work group variation is trivial.

Workplace inclusion. We assessed workplace inclusion with the three item isolation measure by Mulki and Jaramillo (2011). We rephrased the measure "workplace inclusion" as it measures positive aspects of relatedness rather than isolation. An example is "I am part of the organization/company social network" (α=.88).

Knowledge sharing. We assessed knowledge sharing with three items from Nesheim and Gressgård (2014). An example is "People at other locations often get in touch with me to give me good advice" (α=.76).

Self-rated health. We assessed self-rated health with a single item "How do you rate your health in general?", which was rated on a five-point fully anchored scale (1='very poor', 5='very

good'). Such single item scales have been shown to predict mortality and to give valid information about global health (DeSalvo, Bloser, Raynolds, & Muntner, 2006; Idler & Benyami, 1997).

Safety compliance. Safety compliance was assessed with three items from Neal and Griffin (2006) (e.g., "I use the correct safety procedures for carrying out my job") (α=.90).

Safety proactivity. We assessed safety proactivity with three items adapted from Parker, Williams, and Turner's measure of workplace proactivity (2006). Items were adapted to be specific to safety (e.g., "I suggest ideas for safety improvements to colleagues") (α=.82).

Control variables. We controlled for three variables. First, we included a control variable for leaders' span of control indexed by work group size. These data were collected from company records. Given the distributed nature of the sample, we also controlled for the proportion of time each worker spent working remotely and whether the worker worked at the same time as his/her manager. Proportion of time spent working remotely was calculated from worker reports of the amount of time spent working away from his/her main office or location to the total number of hours worked per week. Working at the same time as the line manager was assessed by a single question "Do you work at different times to your immediate manager, for example night shifts, or working in other countries?" rated on a five-point fully anchored scale (1= 'never', 5 = 'always').

Analysis

Data were analyzed using multilevel regression and the HLM-7 programme (Raudenbush, Bryk, Vheong, Congdon, & Toit, 2011). Three-level models were fitted to the data, with individual observations nested within work groups nested within organizations. Because of missing data, models were estimated with between 626 and 658 participants, with all models reporting on 100 line managers from 11 organizations. Control variables were centered at the grand mean for the

sample, and regression slopes fixed to be invariant across work groups and organizations as appropriate to the level of analysis.

Given that the hypotheses concern the individual level of analysis, the substantive independent variables (i.e., leadership, workplace inclusion and knowledge sharing) were centered at work group means. Centering at the work group enabled us to control for between group variation in these variables (Hofmann & Gavin, 1998). The interaction terms implied in Hypotheses 2a, b and c and 3a, b and c were calculated from the work group centered values of leadership and workplace inclusion or knowledge sharing. In tests of Hypotheses 2a, b and c and 3a, b and c, constituent group mean centered main effects were included in the models as well as interaction effects. All regression slopes involving the individual level variables of leadership, workplace inclusion and knowledge sharing were allowed to vary between work groups. Because of the small number of organizations in the sample, the slopes were fixed to be invariant across organizations.

Distributed workers provided ratings of the same line manager and our data are therefore hierarchical in nature. There was evidence for some level of convergence on perceptions of health and safety leadership within work groups in the current sample, and we therefore also entered work group mean level values of leadership into the regression models to represent shared leadership (Kelloway, Turner, Barling, & Loughlin, 2012). These values were centered at the grand mean for the sample. We made analogous tests for shared experiences in work groups of leadership for Hypotheses 2a, b and c and 3a, b and c. We did so by estimating the cross-level interactions of shared leadership on workplace inclusion and knowledge sharing by regressing shared leadership onto the individual level regression slopes of workplace inclusion and knowledge sharing. We also assessed the interactions between work group means of degree of workplace inclusion and leadership and knowledge sharing and leadership: There was no support for these interactions.

Results

Table 1 shows the means, standard deviations, reliabilities and correlations. Before estimating the multilevel regressions to test the hypotheses, we also estimated null models to provide intraclass correlations (ICCs) for each dependent variable. Between teams, the ICC values were 0.04 for self-rated health, 0.02 for safety compliance and 0.05 for safety proactivity. Between organizations, the ICCs were 0.00 for self-rated health, 0.05 for safety compliance and 0.03 for safety proactivity. The low ICCs mean most of the variation in the dependent variables is between individuals, which could be explained by linear or interacting effects of individual level variables or by cross-level interactions between team level and individual level variables. Tables 2, 3 and 4 show the results of the multilevel regression analyses for each dependent variable.

INSERT TABLES 1, 2, 3 AND 4 HERE

Tables 2, 3 and 4 (model 2) all indicate support for Hypotheses 1a, b, and c, in that individual level health-and-safety-specific leadership was related to self-rated health ($B = 0.18$, $p < .01$; Hypothesis 1a), safety compliance ($B = 0.20$, $p < .01$; Hypothesis 1b), and safety proactivity ($B = 0.28$, $p < .01$; Hypothesis 1c). There was also a relationship between shared health and safety leadership at the work group level and safety compliance ($B = 0.34$, $p < .01$).

Tables 2, 3 and 4 (model 4) also show support for Hypotheses 2a, b and c, in that workplace inclusion moderated the relationship between health-and-safety-specific leadership and self-rated health ($B = 0.12$, $p < .05$; Hypothesis 2a), safety compliance ($B = 0.16$, $p < .01$; Hypothesis 2b), and safety proactivity ($B = 0.09$, $p < .05$; Hypothesis 2c). Figures 1, 2 and 3 show the form of these interactions, with the relationship between workplace inclusion and the dependent variables plotted at ±1 standard deviations of individual health-and-safety-specific leadership (- 1 SD = socially isolated, + 1 SD = socially integrated). The figures also show the statistical significance of the

slopes at ±1 standard deviations of individual health-and-safety-specific leadership. Figures 1, 2 and 3 show that workplace inclusion accentuates the relationship between individual health-and-safety-specific leadership and self-rated health, safety compliance and safety proactivity, as hypothesized.

Tables 2, 3 and 4 (model 5) show no support for Hypotheses 3 a, b, and c, in that the interaction between individual-level health-and-safety-specific leadership and knowledge sharing was not significant for any of the dependent variables. However, there was a main effect of knowledge sharing on safety proactivity (model 3, $B = 0.23$, $p < .01$) and evidence of a cross-level interaction between shared health-and-safety-specific leadership and individual level knowledge sharing on safety compliance ($B = -0.16$, $p < .01$; Hypothesis 3b). Figure 4 shows the form of this interaction. The relationship between shared health and safety leadership compliance is plotted at ±1 standard deviations of individual levels of knowledge sharing, and the statistical significance of the slopes shown. Figure 4 shows that the relationship between shared health-and-safety-specific leadership and safety compliance is stronger for low levels of knowledge sharing, although there is also a positive, but weaker, relationship at high levels of knowledge sharing. Therefore, the form of the relationship in figure 4 suggests that individual level knowledge sharing appears to compensate for low levels of shared health-and-safety-specific leadership.

Discussion

The present study aimed to advance understanding of the role of line managers in distributed workers' self-reported health and safety. We asked two main questions: When workers are distributed is it still possible to establish a link between leaders' health-and-safety-specific leadership behaviours and their followers' health and safety given the challenges of such workers? Are there resources in the social context, feeling part of the workplace and sharing knowledge with colleagues, that enhance the impact of leaders' behaviours? Concerning our first question,

Hypotheses 1a, b and c were supported: a positive relationship was found between distributed workers' perceptions of health-and-safety-specific leadership and self-rated health and safety outcomes. Our results thus suggest that line managers' health-and-safety-specific leadership behaviours may also be effective in a distributed worker context. Despite these leaders having limited opportunities for face-to-face contact with their workers, leaders putting health and safety on the agenda and engaging their workers in health and safety discussions positively related to distributed workers' self-rated health, and safety compliance and proactivity. Distributed workers in groups that shared a perception of their leaders' health-and-safety-specific leadership behaviours were also more likely to comply with safety regulations. A possible explanation may be that leaders who hold meetings emphasizing safety compliance thus create a shared understanding of the importance of safety compliance. In the questionnaire, we had included an item on how often employees engaged in meetings or toolbox talks about health and safety. Correlational analysis revealed a significant relationship with health-and-safety-specific leadership ($r = .26$, $p < .01$) in support of this proposition.

In answer of our second question, our Hypotheses 2a, b, and c concerned how the impact of health and safety leadership may be enhanced where additional resources at the organizational level are present. We proposed that distributed workers who feel part of the larger organization, i.e. do not feel isolated may be more receptive to their leaders' health and safety agenda. We found support for Hypotheses 2a, b and c. Our moderation analyses indicate that when distributed workers reported their leader exhibited health-and-safety-specific leadership behaviours and they felt part of the wider organization, they reported better health, were more safety compliant and were more proactive in assuming responsibility for safety matters. These results suggest resources at different levels may enforce each other and produce positive outcomes.

Also to answer our second question, focusing on the group context, Hypotheses 3a, b and c were not supported. Our analyses indicate that knowledge sharing between individual distributed workers did not accentuate the impact of health-and-safety-specific leadership. Possible explanations for this lack of impact may be that knowledge sharing is only relevant for some occupational groups of distributed workers, for example, those who work on inter-dependent tasks or tasks that are similar in nature. However, we did find that when distributed workers found themselves working in a group where they felt that their leader did not engage in health-and-safety-specific leadership behaviours (group-level leadership), but they experienced a climate where they could offer and give advice to and from colleagues (knowledge sharing), these workers did report adhering to safety regulations. It can thus be argued that in groups where leaders do not push the health and safety agenda good health and safety outcomes can still be achieved if distributed workers share knowledge. This latter finding came from analyses conducted with group-level assessments of leadership rather than individual-level assessments, although our hypotheses were derived in respect of individual-level assessments of leadership.

Implications for research and theory

The findings of the present study offer some support for COR theory (Hobfoll, 1989). We found that health and safety leadership can be viewed as a resource that may protect distributed workers' health and safety. With regards to the synergistic effects of resources we found a more complex picture. Workplace inclusion augmented the positive impact of leadership when examining self-rated health, safety compliance and safety proactivity as outcomes. These results suggest a resource afforded at one level (organizational initiatives to ensure workplace inclusion) can enhance the impact of a resource at another level (leader resource) among workers who do not have regular face-to-face interaction with their line manager. However, knowledge sharing among colleagues

may replace a leader level resource where it is missing and help ensure positive health and safety outcomes among distributed workers.

Our results have implications for research. First, we found that among distributed workers who do not have regular face-to-face interaction with their line manager, these line managers may still be able to promote workers' health and safety behaviours, especially in context where workers feel part of the wider organization. Second, our study supports the importance of considering different levels of analysis in leadership research. Nielsen and Daniels (2016) found that among one sample of distributed workers, namely mail delivery service workers, group-level transformational leadership was over time related to higher levels of sickness absence. This link was accentuated by workers showing up for work while ill. However, a limitation of this study is that only group-level leadership was tested. Kelloway et al. (2012) found that transformational leadership worked at the individual level predicting employee well-being, but not at the group level. In support of this, Nielsen and Daniels (2012) found that individual-level transformational leadership was linked to more well-being outcomes. Our results extend previous research to suggest that when leadership behaviours interact with other resources, the level of leadership plays an important role in this interaction. We found that individual-level health-and-safety-specific leadership interacted with workplace inclusion to ensure health and safety proactivity, while group-level health and safety leadership interacted with knowledge sharing such that knowledge sharing buffered low levels of leadership when safety compliance was tested as an outcome.

Our study calls for the study of multiple safety outcomes. We found leadership and the organizational resource of workplace inclusion interacted differently when considering safety compliance and proactivity as outcomes. We found a positive interaction between leadership and workplace inclusion when testing safety proactivity as an outcome such that high levels of health and safety leadership and workplace inclusion together resulted in higher levels of safety

proactivity. When testing safety compliance as an outcome we found low levels of leadership among distributed workers who felt included at work resulted in lower levels of safety compliance. Our results are in line with previous research showing antecedents impact these two types of safety outcomes differently (Clarke, 2006). Our results suggest that resources at multiple levels interact differently to influence in- and out-role safety performance. Knowledge sharing compensates for poor health-and safety-specific leadership at the group level, but workplace inclusion enhances the impact of health-and-safety-specific leadership at the individual level. These results confirm the importance of studying the complex interactions between individual-level and group-level leadership and resources at other levels.

Although not part of our Hypotheses, we also tested whether health-and-safety-specific leadership behaviours should be tested separately. Our factor analyses showed that they form one dimension of "good" leadership. This result is in line with other research findings that leadership behaviours are highly correlated (Gregersen et al., 2014; Zwingmann et al., 2016). We therefore conclude that health-and-safety-specific leadership is unidimensional.

Practical implications

The practical implications of our study revolve around how organizations may best ensure the health and safety of their distributed workers. Our results indicate that despite the challenges of lack of face-to-face contact with superiors and colleagues, lack of access to organizational health and safety material and the unknown risks faced by distributed workers when away from their main location, the health-and-safety-specific leadership behaviours of line managers may be related to good health and safety outcomes. The results suggest that organizations may stress the importance of putting health and safety on the agenda to line managers responsible for distributed workers and provide training to line managers as to how they can do this. Line managers themselves may

organize get-togethers of distributed workers in order to drive the message about managing health and safety across the collective.

Organizations may also consider activating resources at other levels to augment or replace health-and-safety-specific leadership behaviours. Initiating activities at the organizational level to prevent distributed workers feeling isolated may help ensure they engage in safe behaviours and have better health. These activities may include organizing social events that bring together distributed workers and making sure that communication about such events reach distributed workers, for example through letters to the home address rather than being dropped in pigeon holes or advertised on the organization's intranet.

Activities and procedures to ensure knowledge sharing may also help ensure the health and safety of distributed workers. Social activities and networking events may help distributed workers get to know each other, so that they feel comfortable asking each other for help and they know whom to ask for help with regards to specific problems. An overview of which colleagues have which competencies and skills, e.g., training, may be made available to distributed workers and could be placed in the glove compartment of cars and trucks, for example. Distributed workers could also be provided with mobile phones with pre-entered phone numbers to colleagues, or in places with poor reception, satellite telephones. Hand-held devices, such as tablets, could be utilized to store and share information regarding health and safety and useful details such as colleagues work locations and work schedules.

Strengths and limitations

The main strengths of this paper are its multi-level design including a wide range of distributed workers which strengthens generalizability. There are, however, also limitations that need to be considered when drawing conclusions about the results of the present study. Due to the large number of self-reported measures in the present study, common-method bias may pose a threat to

our results. We took a number of steps to minimize common method bias as recommended by Podsakoff, MacKenzie, Lee and Podsakoff (2003). First, we designed our survey to minimize such bias. We mixed the order of presentation of the leadership factors and safety compliance and proactivity in the questionnaires to avoid response patterns.

Second, ratings were made of different targets; the leader's behaviours and employees' perceptions of the context and their own health and safety. In relation to the interactions, research suggests common method variance is unlikely to artefactually produce significant single-level or cross-level interaction effects (Lai, Li & Leung, K., 2013; Siemsen, Roth, & Oliviera, 2010). Indeed, where there were significant linear effects of leadership in main effects models, the results indicated that these effects were conditional on workplace inclusion (all dependent variables at the individual level) and knowledge sharing (safety compliance at the group level). It is therefore unlikely that common method bias has influenced the substantive conclusions.

That we asked about health in both the leadership measure and self-rated health may have inflated correlations, however, this risk is minimized by including both health and safety items in the leadership measure. Furthermore, correlations were not worryingly high. For safety, we also used two different outcomes of safety performance which were differentially impacted by our antecedents.

Finally, our population was predominantly male, which may have impacted the results of the study, however, a recent systematic review of the leadership related to distributed workers' health and safety (Nayani, Nielsen, Daniels, Donaldson-Feilder, & Lewis, 2017) found that most of these distributed worker populations were male and thus our sample is likely to reflect the over-representation of males in distributed working.

Conclusion

Our study has two important implications. First, our research confirms that health-and-safety-specific leadership of first line managers is positively related to distributed workers' health and safety. Our study thus offers important insights into how organizations can ensure the health and safety of workers whose health and safety may be difficult to manage for organizations due to the nature of their job, i.e. the limited face-to-face interaction with line managers, the lack of easy access to organizational health and safety material and the lack of organizational control over health and safety risks faced by distributed workers when they are away from their main location. Second, our study offers valuable insights as to how resources at different level may interact to replace lacking resources or to create resource caravans. Group-, leader-, and organizational-level resources interact differentially to influence in-role and extra-role safety performance.

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Table 1. Means, standard deviations, reliabilities and correlations.

	Mean	*SD*	1	2	3	4	5	6	7	8	9
1. Health and safety leadership	3.54	.87	.97	.57**	.30**	-.13	.07	-.30**	.14	.51**	.46**
2. Lack of isolation	3.42	.80	.56**	.88	.53**	-.01	.10	-.33*	.07	.46**	.33**
3. Knowledge sharing	3.45	.92	.27**	.46**	.76	.06	-.18	-.06	.09	.42**	.45**
4. Proportion of time working remotely	.83	.29	-.04	-.03	.01	--	-.13	.16	.20*	.08	.20*
5. Working at same time as manager	2.26	1.14	.01	-.02	.02	-.08*	--	-.19	-.17	-.16	-.04
6. Work group size	7.20	4.98	--	--	--	--	--	--	-.06	-.01	-.09
7. Self-rated health	3.92	.84	.14**	.18**	.12**	.07	-.13**	--	--	.31**	.32**
8. Safety compliance	4.53	.63	.31**	.20**	.21**	.01	-.08*	--	.14**	.90	.42**
9. Safety proactivity	3.49	.72	.32**	.28**	.37**	.02	.09*	--	.13**	.23**	.82

N = 662 to 729 from 100 work groups in 11 organizations.

* $p < .05$, ** $p < .01$

Reliabilities (Cronbach's alpha) shown on primary diagonal. Correlations between the primary diagonal are individual level correlations, correlated above the primary diagonal are correlations between team means.

Table 2. Multilevel regressions on self-rated health.

Step	*B* (Model 1)	*B* (Model 2)	*B* (Model 3)	*B* (Model 4)	*B* (Model 5)
Work group variables					
Work group size	0.00	0.00	0.00	0.00	0.00
Shared health and safety leadership		0.10	0.06	0.11	0.01
Individual variables					
Proportion of time working remotely	0.14	0.15	0.12	0.13	0.14
Working at same time as manager	-0.06*	-0.06*	-0.05	-0.06*	-0.06*
Health and safety leadership		0.18**	0.09	0.10*	0.09
Lack of isolation			0.17**	0.20**	0.19**
Knowledge sharing			0.03	0.03	0.00
Individual health and safety leadership * lack of isolation				0.12*	
Individual health and safety leadership * knowledge exchange					0.12
Cross-level interactions					
Shared health and safety leadership * lack of isolation				0.19	
Shared health and safety leadership * knowledge exchange					-0.16

Table 3. Multilevel regressions on safety compliance.

Step	*B* (Model 1)	*B* (Model 2)	*B* (Model 3)	*B* (Model 4)	*B* (Model 5)
Work group variables					
Work group size	0.00	0.01	0.01	0.01	0.01
Shared health and safety leadership		0.34**	0.32**	0.36**	0.35**
Individual variables					
Proportion of time working remotely	-0.01	0.03	0.01	0.04	0.04
Working at same time as manager	-0.03	-0.03	-0.03	-0.04*	-0.04
Health and safety leadership		0.20**	0.20**	0.20**	0.20**
Lack of isolation			-0.07	-0.07	-0.06
Knowledge sharing			0.10**	0.10**	0.06
Individual health and safety leadership * lack of isolation				0.16**	
Individual health and safety leadership * knowledge exchange					0.07
Cross-level interactions					
Shared health and safety leadership * lack of isolation				-0.08	
Shared health and safety leadership * knowledge exchange					-0.16**

* $p < .05$, ** $p < .01$

Table 4. Multilevel regressions on safety proactivity.

Step	*B* (Model 1)	*B* (Model 2)	*B* (Model 3)	*B* (Model 4)	*B* (Model 5)
Work group variables					
Work group size	0.00	0.01	0.00	0.00	0.00
Shared health and safety leadership		-0.01	0.02	0.00	0.03
Individual variables					
Proportion of time working remotely	0.06	0.06	0.07	0.07	0.07
Working at same time as manager	0.07**	0.07**	0.06**	0.05*	0.07**
Health and safety leadership		0.28**	0.20**	0.21**	0.21**
Lack of isolation			0.02	0.03	0.02
Knowledge sharing			0.23**	0.23**	0.24**
Individual health and safety leadership * lack of isolation				0.09*	
Individual health and safety leadership * knowledge exchange					0.00
Cross-level interactions					
Shared health and safety leadership * lack of isolation				0.05	
Shared health and safety leadership * knowledge exchange					0.03

Figure 1. Interaction between individual level leadership and lack of social isolation on self-reported health.

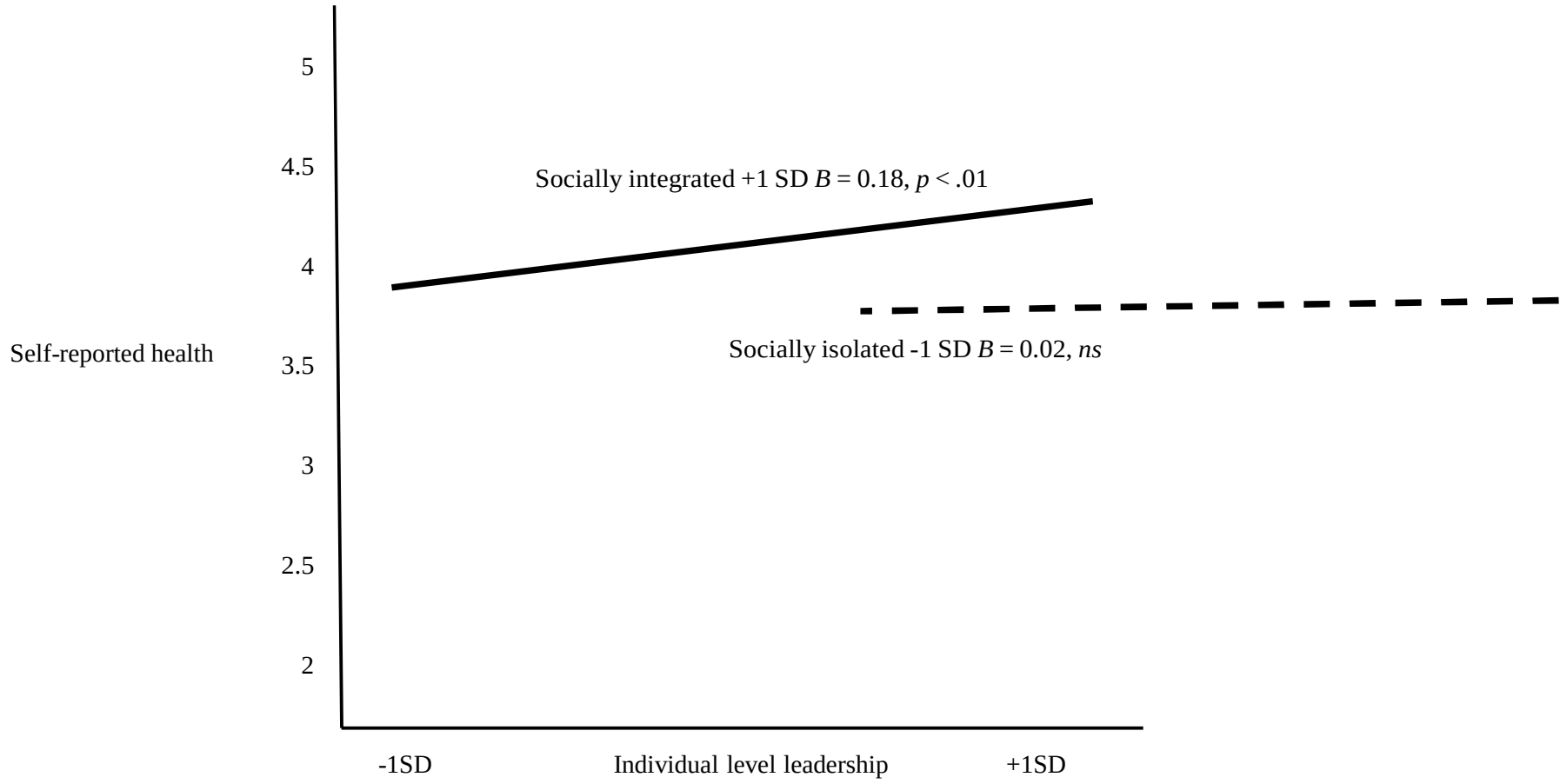


Figure 2. Interaction between individual level leadership and lack of social isolation on safety compliance.

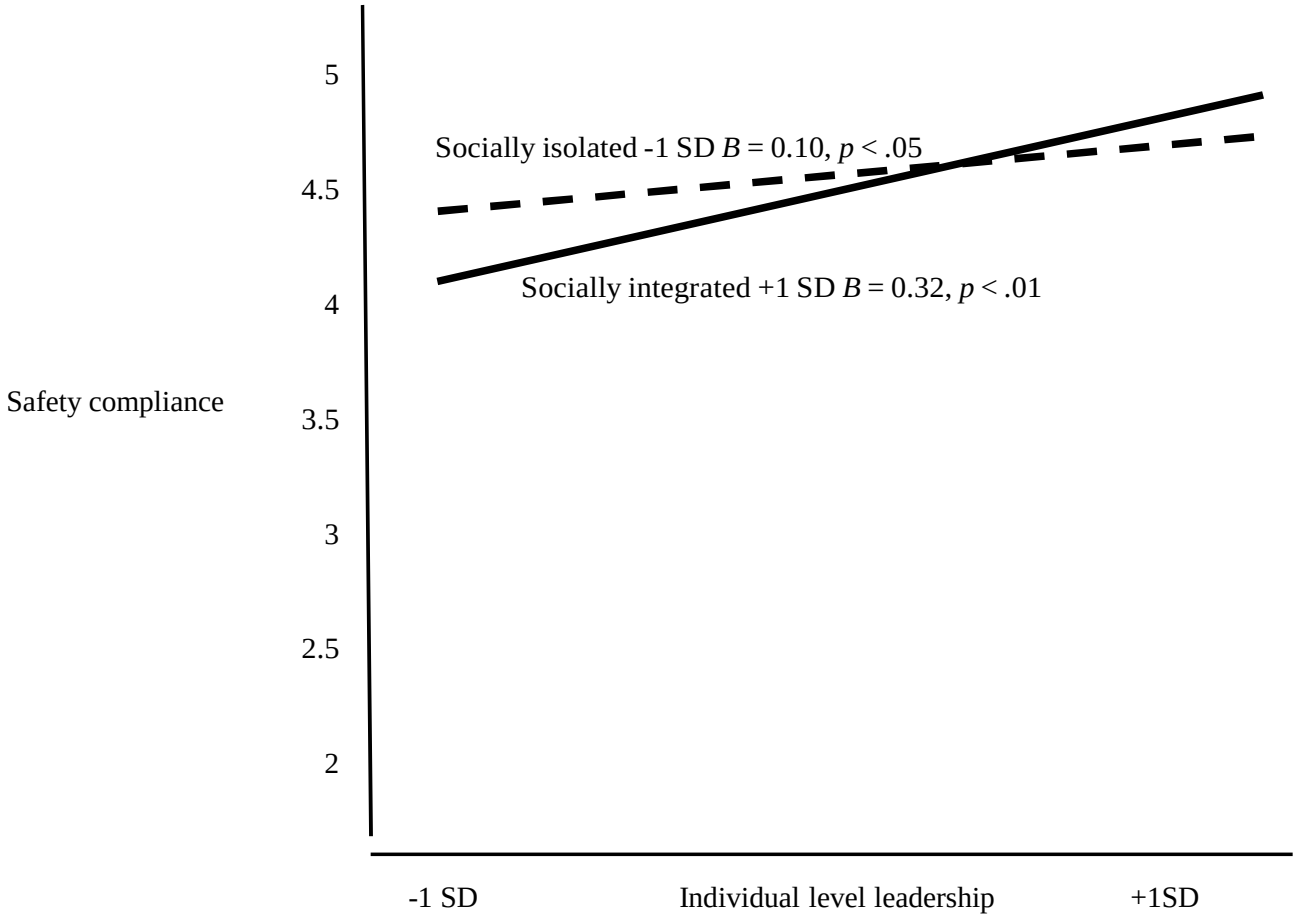


Figure 3. Interaction between individual level leadership and lack of social isolation on safety proactivity.

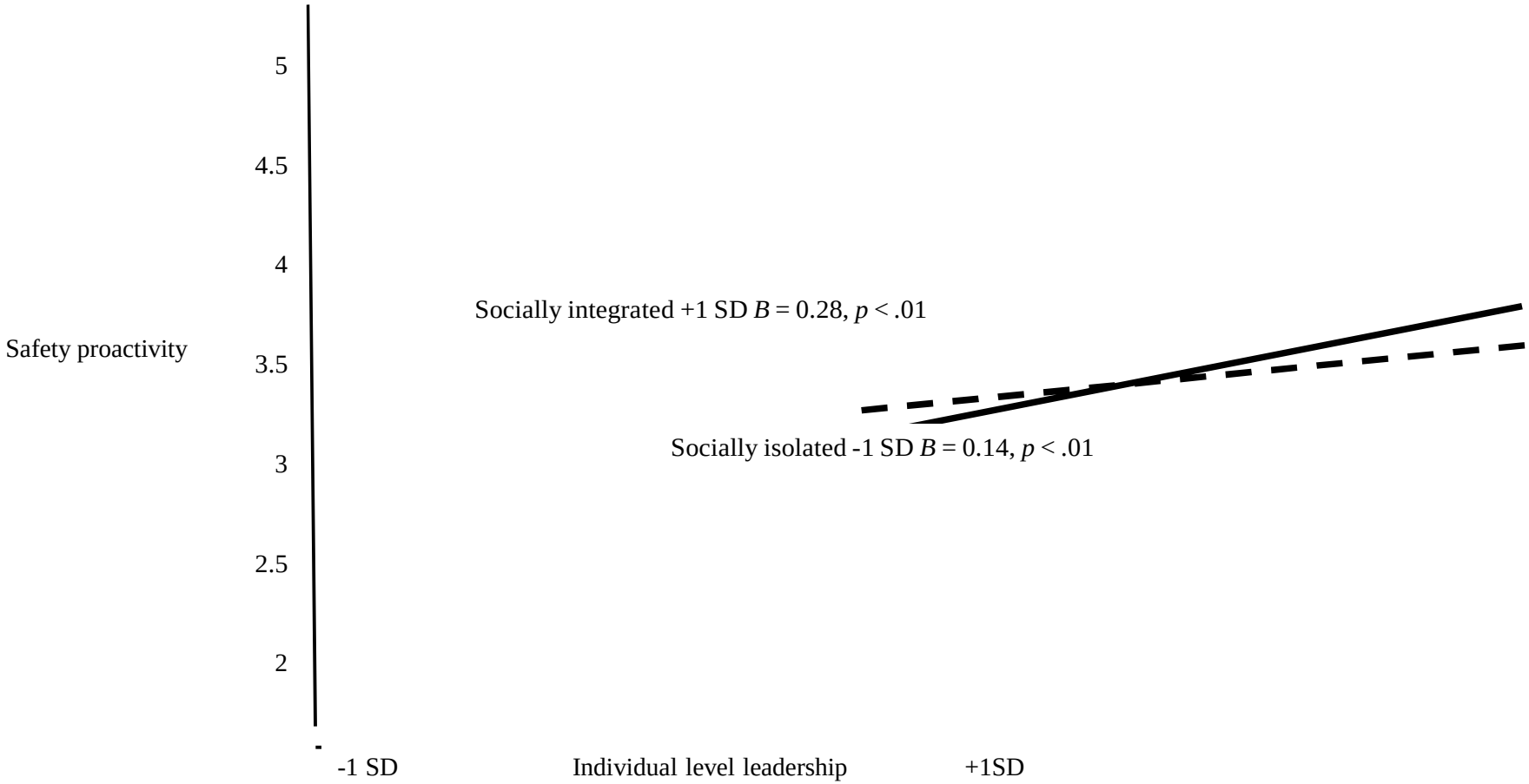
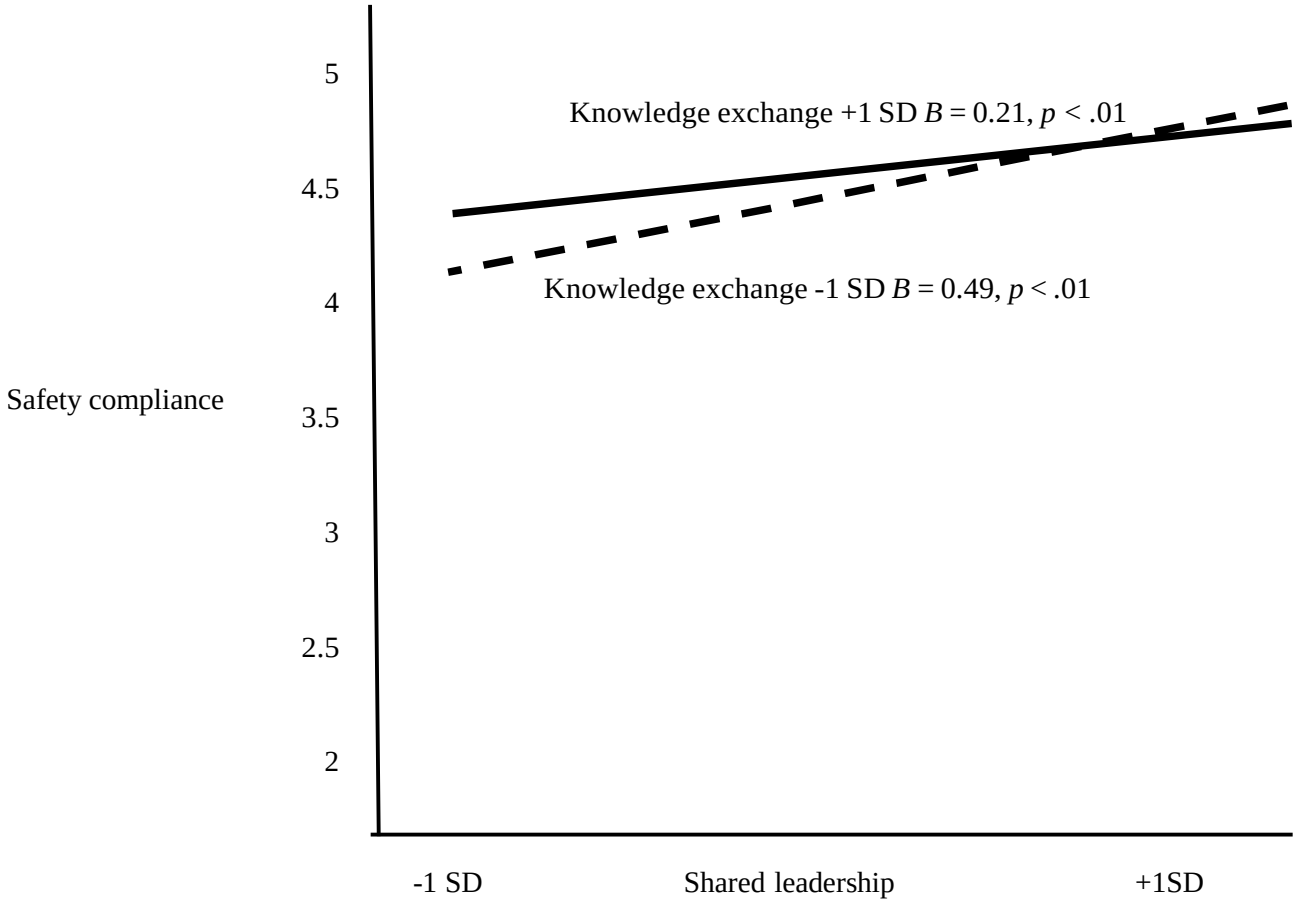


Figure 4. Cross-level interaction between shared leadership and knowledge exchange on safety compliance.



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3. Knowledge sharing	3.45	.92	.27**	.46**	.76	.06	-.18	-.06	.09	.42**	.45**
4. Proportion of time working remotely	.83	.29	-.04	-.03	.01	--	-.13	.16	.20*	.08	.20*
5. Working at same time as manager	2.26	1.14	.01	-.02	.02	-.08*	--	-.19	-.17	-.16	-.04
6. Work group size	7.20	4.98	--	--	--	--	--	--	-.06	-.01	-.09
7. Self-rated health	3.92	.84	.14**	.18**	.12**	.07	-.13**	--	--	.31**	.32**
8. Safety compliance	4.53	.63	.31**	.20**	.21**	.01	-.08*	--	.14**	.90	.42**
9. Safety proactivity	3.49	.72	.32**	.28**	.37**	.02	.09*	--	.13**	.23**	.82

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Individual variables					
Proportion of time working remotely	0.14	0.15	0.12	0.13	0.14
Working at same time as manager	-0.06*	-0.06*	-0.05	-0.06*	-0.06*
Health and safety leadership		0.18**	0.09	0.10*	0.09
Lack of isolation			0.17**	0.20**	0.19**
Knowledge sharing			0.03	0.03	0.00
Individual health and safety leadership * lack of isolation				0.12*	
Individual health and safety leadership * knowledge exchange					0.12
Cross-level interactions					
Shared health and safety leadership * lack of isolation				0.19	
Shared health and safety leadership * knowledge exchange					-0.16

Table 3. Multilevel regressions on safety compliance.

Step	*B* (Model 1)	*B* (Model 2)	*B* (Model 3)	*B* (Model 4)	*B* (Model 5)
Work group variables					
Work group size	0.00	0.01	0.01	0.01	0.01
Shared health and safety leadership		0.34**	0.32**	0.36**	0.35**
Individual variables					
Proportion of time working remotely	-0.01	0.03	0.01	0.04	0.04
Working at same time as manager	-0.03	-0.03	-0.03	-0.04*	-0.04
Health and safety leadership		0.20**	0.20**	0.20**	0.20**
Lack of isolation			-0.07	-0.07	-0.06
Knowledge sharing			0.10**	0.10**	0.06
Individual health and safety leadership * lack of isolation				0.16**	
Individual health and safety leadership * knowledge exchange					0.07
Cross-level interactions					
Shared health and safety leadership * lack of isolation				-0.08	
Shared health and safety leadership * knowledge exchange					-0.16**

* $p < .05$, ** $p < .01$

Table 4. Multilevel regressions on safety proactivity.

Step	*B* (Model 1)	*B* (Model 2)	*B* (Model 3)	*B* (Model 4)	*B* (Model 5)
Work group variables					
Work group size	0.00	0.01	0.00	0.00	0.00
Shared health and safety leadership		-0.01	0.02	0.00	0.03
Individual variables					
Proportion of time working remotely	0.06	0.06	0.07	0.07	0.07
Working at same time as manager	0.07**	0.07**	0.06**	0.05*	0.07**
Health and safety leadership		0.28**	0.20**	0.21**	0.21**
Lack of isolation			0.02	0.03	0.02
Knowledge sharing			0.23**	0.23**	0.24**
Individual health and safety leadership * lack of isolation				0.09*	
Individual health and safety leadership * knowledge exchange					0.00
Cross-level interactions					
Shared health and safety leadership * lack of isolation				0.05	
Shared health and safety leadership * knowledge exchange					0.03

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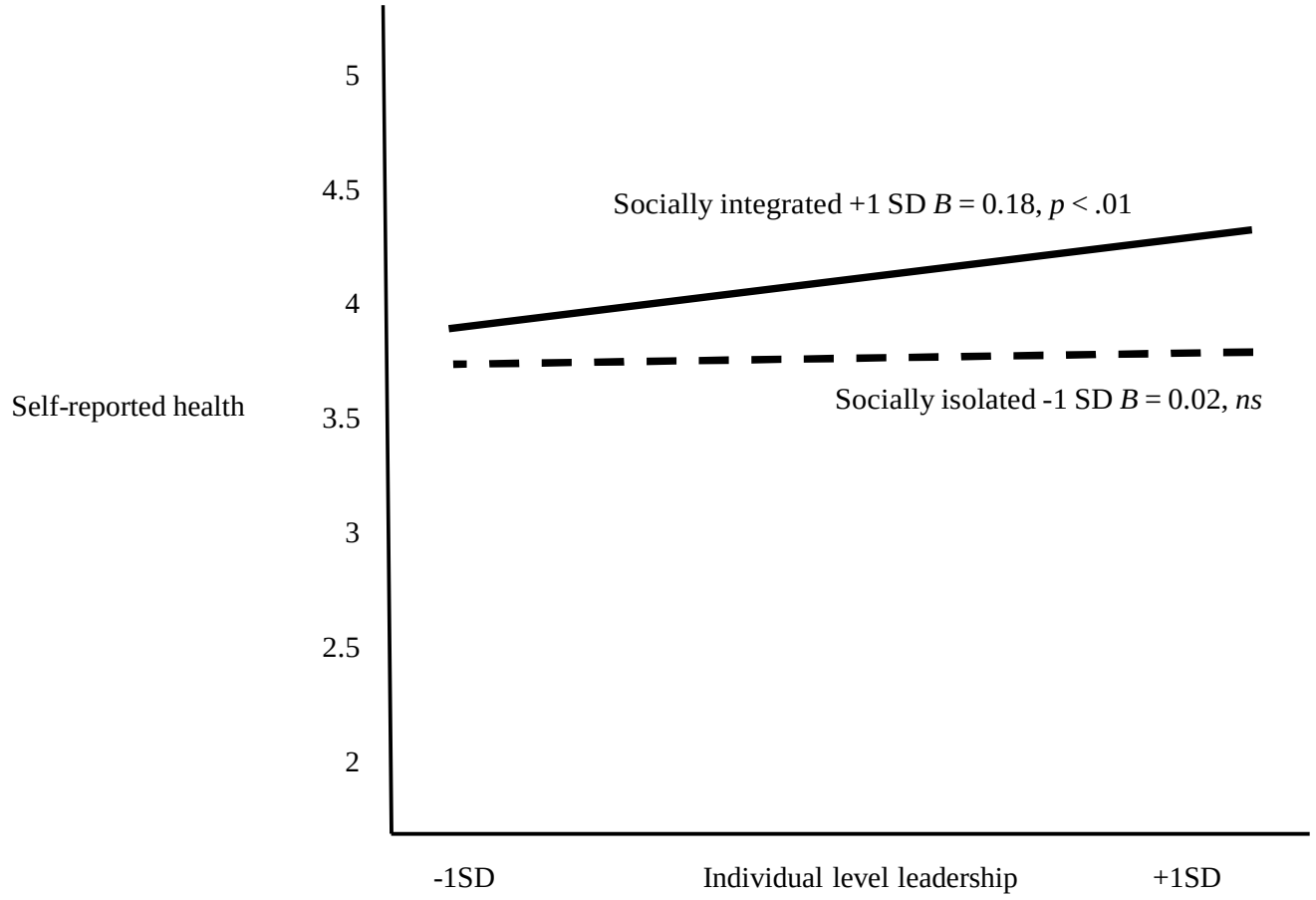


Figure 2. Interaction between individual level leadership and lack of social isolation on safety compliance.

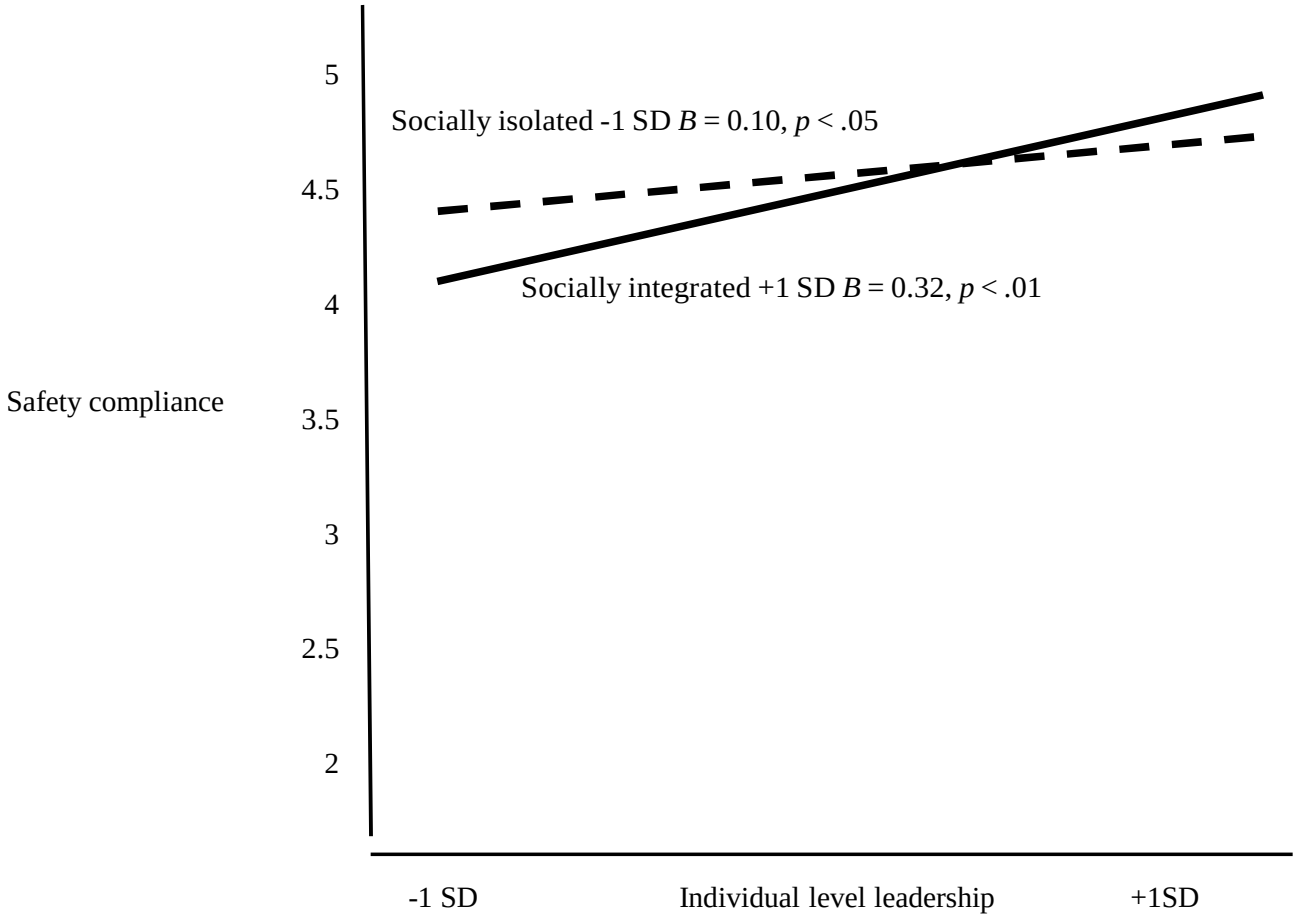


Figure 3. Interaction between individual level leadership and lack of social isolation on safety proactivity.

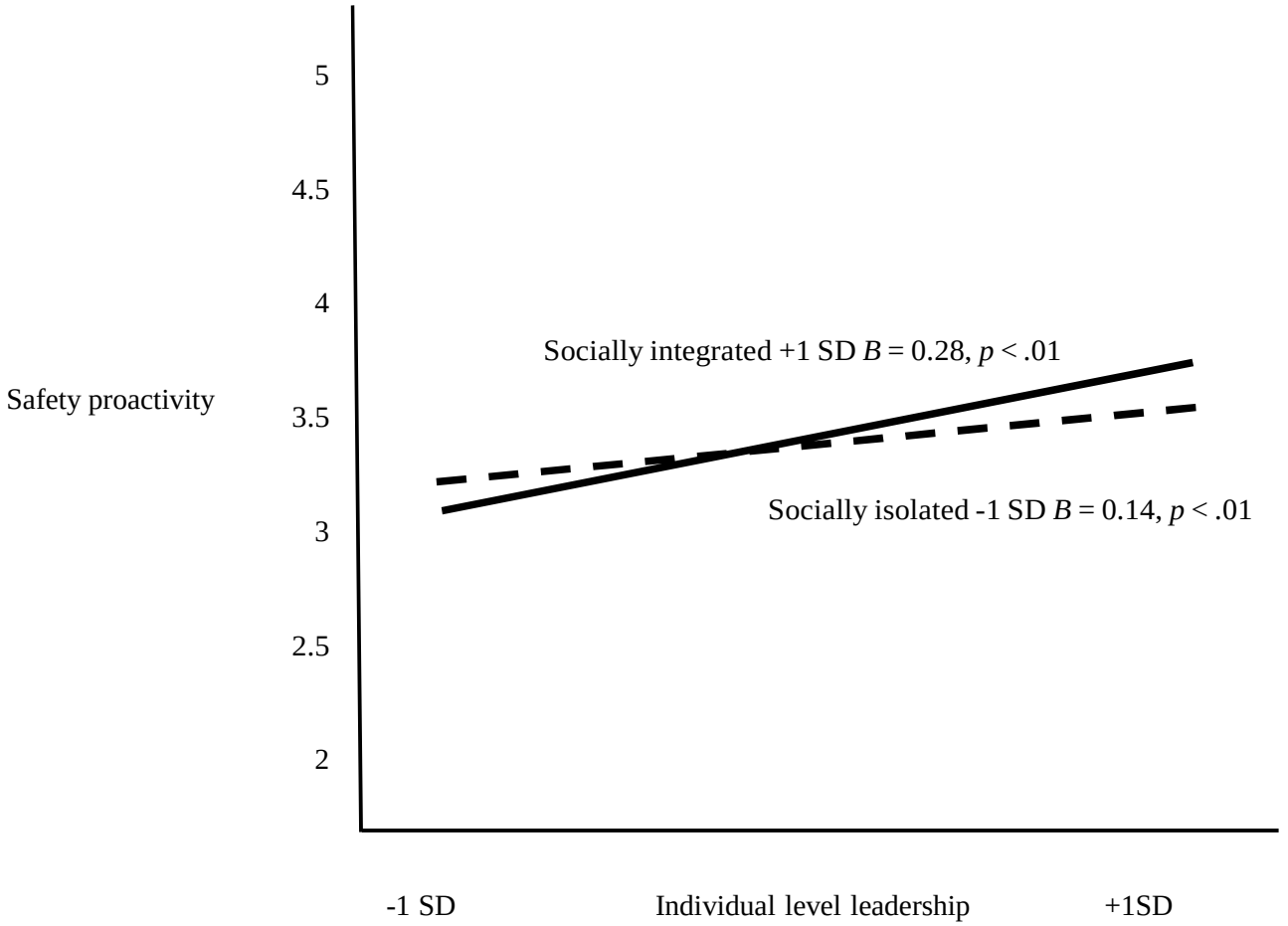
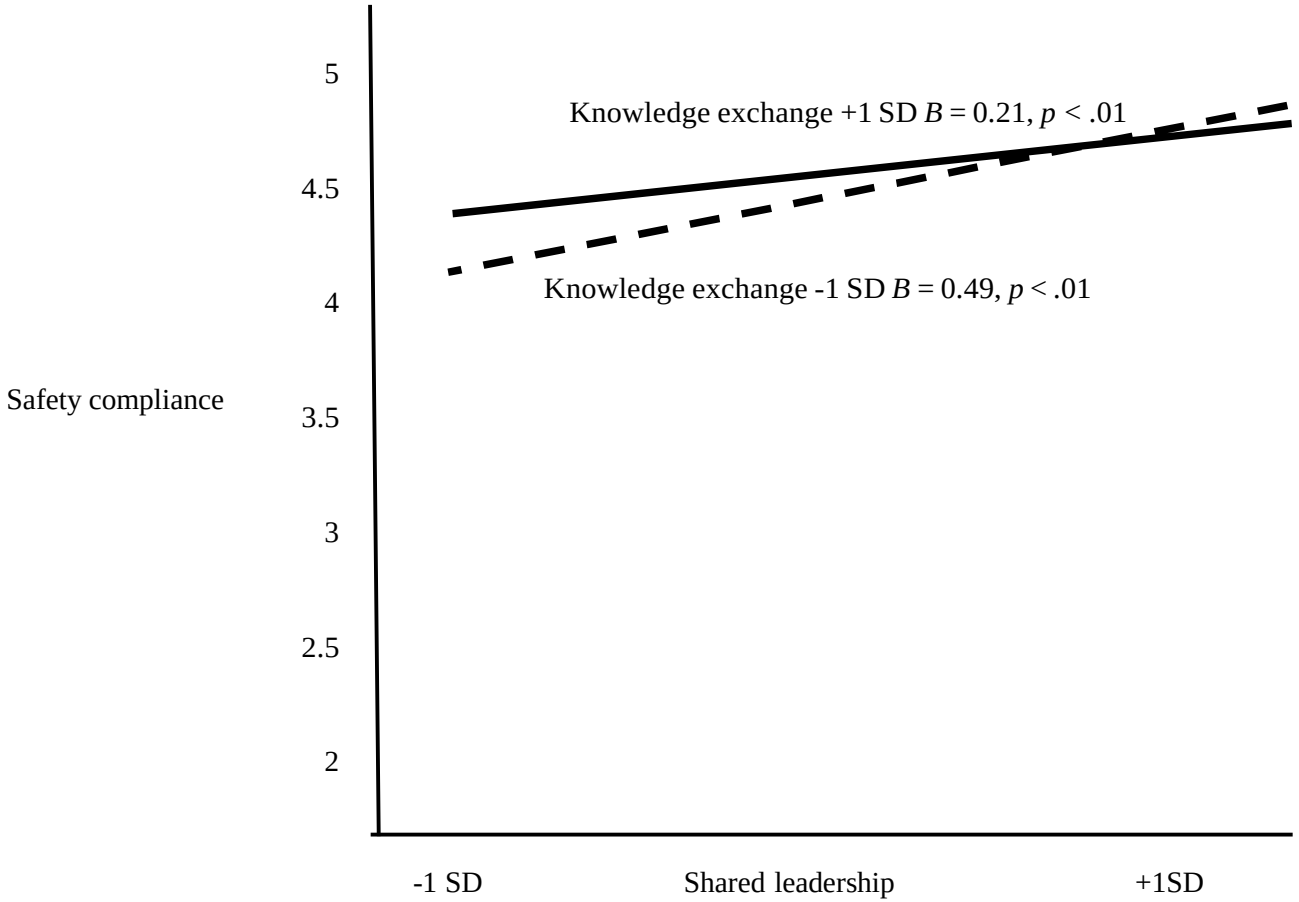


Figure 4. Cross-level interaction between shared leadership and knowledge exchange on safety compliance.



Out of mind, out of sight?

Leading distributed workers to ensure health and safety

ABSTRACT

Current frameworks of leadership are based on face-to-face interaction. A growing number of workers work away from their main location of work; this makes it challenging for leaders to ensure the health and safety of distributed workers. In the present study, we explore the relationship between line managers' health and safety leadership and distributed workers' health and safety behaviours. We also explore the organizational procedures and practices that may enhance the impact of health and safety leadership. We included a broad range of distributed workers (in analyses, minimum $N = 626$) from 11 organizations. We found that health-and-safety-specific leadership was positively related to distributed workers' self-rated health, safety compliance and safety proactivity. These relationships were augmented by distributed workers' sense of being included in the workplace. Knowledge sharing among colleagues was associated with safety compliance when health-and-safety-specific leadership was low. Our results indicate that one way of addressing the challenges of distributed working may be through line managers putting health and safety on the agenda.

Keywords: health leadership, safety leadership, safety compliance, self-rated health, communication, multilevel, distributed workers

Introduction

Previous research has demonstrated that leaders play a significant role in followers' health and safety (Clarke, 2013; Kuoppala, Lamminpää, Liira, & Vainio, 2008). Current leadership frameworks are based on leaders engaging in face-to-face interaction with their followers (Avolio, Walumbwa, & Weber, 2009). A growing number of workers, however, work away from their main location of work at least part of the time; these workers are known as distributed workers (IDC, 2010). Distributed workers are found across a range of occupations and industries, such as public service (e.g., police, firefighters, community nurses and local authority workers); service sectors (e.g., surveyors, architects and consultants); engineering and construction; utilities (e.g., energy, water and telecoms) and transportation (e.g., rail, bus and delivery). Furthermore, employees in non-traditional distributed working roles may spend some of their time working from home; many distributed workers are also lone workers for part of their work time. Distributed workers share a number of characteristics, including limited opportunities for face-to-face interaction with their line managers. As line managers are responsible for distributed workers' health and safety (Dix & Beale, 1996) it thus becomes an important question to answer how these leaders can ensure their workers' health and safety. In a recent review of safety leadership among distributed workers, Pilbeam, Doherty, Davidson, and Denyer (2016) called for research focusing on the leadership of a wide range of distributed workers and examining safety specific leadership rather than using generic leadership frameworks. In the present study, we address these calls by exploring the links between distributed workers' experiences of their line managers' health and safety leadership and these workers' self-reported health and safety across a wide range of occupations.

Based on Conservation-of-Resource (COR, Hobfoll, 1989) theory, we see health-and-safety-specific leadership as a resource and explore how other resources may interact with

leadership to enhance distributed workers' health and safety behaviours. First, we propose that a resource at the organizational level, the extent to which employees feel included in the organization, will strengthen the relationship between health and safety leadership and distributed workers' health and safety as workers who feel included may be more receptive to stimuli from their line manager. Second, we propose that a resource afforded by the group, knowledge sharing with colleagues, may enhance the link between health and safety leadership and workers' health and safety. Distributed workers whose leaders put health and safety on the agenda may raise awareness of the importance of health and safety and workers who often ask each other for help and advice may also do so when facing risky work situations. We test these propositions in a large multi-organizational study involving distributed workers across a wide range of occupations.

Challenges for Leading the Health and Safety of Distributed Workers

Dix and Beale (1996) introduced the umbrella term 'distributed workers' to describe workers who work autonomously away from their organization's main location for at least part of their time. The term distributed workers thus covers a wide range of workers including teleworkers, mobile maintenance engineers, delivery and transport drivers and surveyors. In 2010, almost half of the Western European workforce could be classified as distributed workers and this number is projected to increase (IDC, 2010). In 2015, a European survey concluded that 30% of this workforce work across multiple locations, with distributed working being most common among blue collar workers such as transport (49%) and construction (57%) (Eurofound, 2015).

The health and safety of distributed workers poses a challenge to line managers because of the nature of this work. A first challenge to distributed workers' health and safety include limited face-to-face interaction between leaders and their followers. Leadership theories

implicitly assume frequent face-to-face interaction to allow for the leaders' behaviours to influence followers, e.g., role modelling (Avolio et al., 2009). A second challenge concerns the limited access to organizational sources of information about health and safety policy and procedures, e.g., limited access to the organization's intranet and physical material, such as safety manuals. This limited access puts an even greater onus on leaders' behaviours to ensure workers' health and safety. A third challenge is that distributed workers work across multiple locations making it difficult for line managers to monitor and anticipate risks and stressors to distributed workers' safety and health.

Health and safety leadership among distributed workers

COR theory (Hobfoll, 1989) suggests that people are motivated to preserve existing resources and to accumulate more resources. Resources can be defined as 'anything perceived by the individual to help attain his or her goals' (Halbesleben, Nevue, Paustian-Underdahl, & Westman, 2014, p. 6). From a COR perspective, people invest resources available to them to deal with the demanding situations they face (Hobfoll, 1989), i.e. conditions that may threaten their health and safety and those who have more resources are less likely to suffer negative outcomes. It has been argued that leadership can be seen as a resource (Tims et al., 2011) and may thus enable distributed workers preserve their health and safety.

Dominant leadership frameworks have been developed with a view to enhancing organizational outcomes including follower performance, innovation and creativity (Gregersen, Vincent-Höper, & Nienhaus, 2014) but it has been argued that these leadership behaviours may not be effective in ensuring employee health and safety (Barling, Loughlin & Kelloway, 2002; Zwingmann, Wolf, & Richter, 2016; Nielsen & Daniels, 2016). The rationale for developing health-and-safety-specific leadership frameworks arises from the fact that leaders play an important role in directing followers' attention to specific aspects of their work (Bass & Riggio,

2006). Leaders may set the agenda for health and safety topics by being open about health and safety objectives, discussing the ways in which health and safety may be improved and involving employee in decision making concerning health and safety (Gurt, Schwennen, & Elke, 2011; Yarker, Lewis, & Donaldson-Feilder, 2009). Gurt et al. (2011) tested the notion of health-specific leadership and found that such leadership was positively related to workers' job satisfaction and negatively related to workers' irritation. We extended the Gurt et al. (2011) framework by including items related to both health-specific and safety-specific leadership, which refer to generically as health-and-safety-specific leadership.

Both safety compliance and proactivity may be important outcomes for distributed workers. Safety compliance is important because line managers have limited opportunity to monitor the use of safety equipment by distributed workers (Neal & Griffin, 2006). Safety proactivity is important because distributed workers work autonomously away from the location of their line manager and thus have to make independent decisions when they encounter high risk situations. We did not include near-miss incidents and accidents as outcomes as these may be heavily influenced by aspects of unknown environments beyond the individual's control (Greiner, Krause, Ragland, & Fisher, 1998). We propose that the impact of health-and-safety specific leadership may operate at the individual level as line managers primarily interact with their distributed workers on a one-to-one basis rather than with the work group as a whole.

Hypothesis 1: Health-and-safety-specific leadership is positively related to distributed workers' (a) self-rated health. (b) safety compliance, and (c) safety proactivity.

Synergistic Resources Among Distributed Workers

Recently, a classification of resources has been suggested that focus on the source of the resource, thus offering organizations useful insights into where to focus their interventions

(Nielsen, Nielsen, Ogbonnaya, Känsälä, Saari, & Isaksson, 2017). Resources within a work context may stem from four sources: individual-level resources comes from within the individual, such as hope, resilience, self-efficacy and optimism; group-level resources concern the resources that are afforded by the group, for example, peer support and a good team climate; leader resources are those afforded by the leader, such as a good relationship between a leader and their employees or the enactment of positive leadership behaviours; and organizational resources are those afforded by the organization, such as Human Resource Management practices and policies, fair procedures, and positive organizational support (Nielsen et al., 2017). According to COR theory (Hobfoll, 1989) resources do not exist in isolation, but have synergistic effects such that resources at one level, e.g., having colleagues that support their peers in following safety regulations and provide advice and support on how to do so, may strengthen the impact of leaders who promote safe and healthy ways of working (Hobfoll, 1989). We propose that resources at other levels, i.e. resources related to the workplace as a whole and to the interaction with colleagues, may enhance the impact of leadership resources.

Organizational inclusion and the impact of health- and safety specific leadership

An organizational resource that may enhance the impact of health-and-safety-specific leadership is the extent to which workers feel included in the organization. Organizations may employ strategies to minimize the risk of isolation such as organizing social events to ensure employees are included in social networks. Marshall, Michaels, and Mulki (2007) identified workplace isolation, i.e. the extent that workers do not feel part of the organization and feel excluded from social networks, as a potential threat to workers' job satisfaction, commitment, involvement and intentions to remain in the job. Among sales representatives, Mulki and Jaramillo (2011) found that considerate leadership was negatively related to workplace

isolation which in turn was negatively related to job satisfaction. Although these results suggest a mediational path, there is good reason to explore the interaction effects between leadership behaviours and the degree of workplace inclusion to understand whether a general sense of being part of a greater whole may make distributed workers more receptive to acting according to the health and safety agenda. In the present study, we suggest that workplace inclusion, i.e. the extent to which workers feel included in the social networks within the organization may be important to augment the outcomes of health and safety specific leadership. Workplace inclusion may accentuate the positive relationship between leadership and distributed workers' health and safety outcomes. Distributed workers who feel part of the workplace are more likely to feel receptive of leaders' attempts to put health and safety on the agenda and engage in discussions of how health and safety may be improved. The norm of reciprocity (Blau, 1964) suggests that workers who feel they are the recipients of positive attention, e.g., their leader cares about their safety and health, are more likely to reciprocate these positive behaviours. This exchange is more likely to happen if workers feel overall that they belong to the organization and that they form part of a greater whole.

Hypothesis 2: The association between health-and-safety-specific leadership and distributed workers'(a) self-rated health, (b) safety compliance and (c) safety proactivity is moderated by workplace inclusion. Distributed workers who experience their leaders engage in health-and-safety-specific leadership behaviours and who feel part of the organization and engage in organizational networks are more likely to be receptive of the leaders' attempts to put health and safety on the agenda and will as a result report better health and safety outcomes.

Distributed workers' knowledge sharing enhances the impact of health-and-safety-specific leadership

A resource relating to how distributed workers interact with colleagues, i.e. knowledge

sharing, may enhance the link between health-and-safety-specific leadership and workers' health and safety. Knowledge sharing concerns the extent to which workers ask and seek advice from their colleagues (Nesheim & Gressgård, 2014). It is possible that leaders who engage in health-and-safety-specific behaviours may benefit from having distributed workers who share knowledge with colleagues at other locations. Nesheim and Gressgård (2014) in their study of offshore workers found that knowledge sharing was related to workers using knowledge concerning safety issues. This result suggests that when distributed workers ask each other for advice and offer advice, the content of this advice exchange is likely to include health and safety related matters. As leaders promote health and safety among their distributed workers, the moderating effect of knowledge sharing can be interpreted as the extent to which workers will engage actively with the leaders' health and safety agenda. In a context, where distributed workers share information, they may more readily also ask and seek advice on health and safety related matters and thus enhance the impact of the line manager's health and safety leadership behaviours. Related leadership research has suggested that workers who work in groups where there is a good team climate may enhance the effect of leaders' behaviours. Gil, Rico, Alcover, and Barrasa (2005) found that group potency enhanced the impact of change-oriented leadership on worker performance. Distributed workers whose leaders put health and safety on the agenda and who seek and offer advice within their peer group may therefore also be more prone to share information about health and safety related issues and therefore report better health and safety.

Hypothesis 3: The association between health-and-safety-specific leadership and distributed workers' (a) self-rated health, (b) safety compliance, and (c) safety proactivity is moderated by the extent of knowledge sharing between colleagues. Distributed workers who experience their leaders engage in health-and-safety-specific leadership behaviours and who

seek and give advice from colleagues, i.e. share knowledge will report better health and safety outcomes.

Methods

Procedure and sample

Data were collected as part of a larger study of occupational safety and health in distributed worker populations (REFERENCE WITHHELD TO PROTECT ANONYMITY). Companies were contacted through contacts of the research team, the project's steering group, through promotion of the project at conferences, through social media and through a publication in a practitioner magazine.

In most cases, questionnaires were distributed electronically to participants via a weblink. In some cases, participants had no on-line access at work, and so questionnaires were distributed in hard copy. Although there were differences between substantive variables according to distribution methods, analysis of data controlling for distribution method had no impact on findings reported as significant.

In total, 12 companies participated in the research, with 822 workers providing data (36.3% response rate) on 112 line managers. In the present paper, we included participants' data only if at least three members of each work group provided data on their line manager. We define work groups as the group of employees under each line manager. This resulted in a sample of 734 workers providing data on 100 line managers in 11 organizations. Each line manager was responsible for one work group. The majority of the sample was male (95.6%). The average age was 47.2 years (*SD*=12.6) and workers had been with their current employer for 16.7 years on average (*SD*=14.6). Participants worked an average of 40.6 hours per week (*SD*=13.1), of which an average of 33.6 hours (*SD*=13.0) was spent working remotely. When asked to choose a range of descriptions of their mode of working, the most frequently endorsed

were lone working (64%), construction site working (54%), mobile working (53%) and home based working (38%). Some 68% of the sample finished their education at the end of secondary school, and 31% had a University graduate or post-graduate degree. A comparison between those included in the final sample and those excluded revealed no significant differences on the substantive variables.

Measures

Except where noted, items were rated on five-point fully anchored Likert type scale (1 = 'totally disagree', 5 = 'totally agree'). Scale scores for all scales reported in this paper were calculated by summing items and dividing by the number of items in the scale.

Health- and-safety-specific leadership. To assess health-and-safety-specific leadership, we used items from Gurt et al.'s seven-item scale (2011). An example item is "My immediate manager informs me about health at work issues". To assess safety-oriented leadership, we adapted the Gurt et al. scale by substituting the word "safety" for "health" into the seven items and where both health and safety was mentioned in the same item we would split this into two (e.g., "My immediate manager discusses safety related issues with me").

Using data from the entire sample, we analyzed the structure of each leadership scale separately, and then both scales together. We used multi-level confirmatory factor analysis (ML-CFA, using MPlus, Muthén & Muthén, 1998-2017) to assess the items' structure separating within-work group from between-work group differences in a two-level model. The small number of organizations precluded use of three-level ML-CFA, because ML-CFA requires the number of free parameters is less than the number of units at the highest level. We found that a single factor represented the structure of the safety oriented items ($\chi^2 = 148.12$, $df = 28$, $p < .001$, Confirmatory Fit Index {CFI} = .97, Root Mean Square Error of Approximation {RMSEA} = .07). However, a single factor did not represent the structure of the health oriented

items (χ^2 = 453.37, *df* = 28, *p* < .001, CFI = .91, RMSEA = .14). Two health specific items did not load significantly on the single factor at the group level of analysis (*p*>.20). Exclusion of these two items yielded good model fit (χ^2 = 18.82, *df* = 10, *p* < .05, CFI = 1.00, RMSEA = .03).

To examine the structure of the full set of items, we fitted both a single-factor model and a two-factor model representing health-and-safety-specific leadership. We fitted models for all 14 items and for 12 items with two health items excluded. For all 14 items, a single factor model demonstrated marginal fit to the data (χ^2 = 1287.14, *df* = 154, *p* < .001, CFI = .90, RMSEA = .10). The two factor model displayed slightly better fit (χ^2 =1261.39, *df* = 152, *p* < .001, CFI = .90, RMSEA = .09). In models excluding two health specific items, fit was the approximately the same for both single (χ^2 = 916.01, *df* = 106, *p* < .001, CFI = .91, RMSEA = .10) and two factor models (χ^2 = 914.01, *df* = 108, *p* < .001, CFI = .91, RMSEA = .10). Moreover, in the two factor model, latent correlations between factors exceed *r* = .98 for both within-work group and between-work group variation. Therefore, we combined all seven safety items and five health items into a single scale representing health-and-safety-specific leadership (α=.97), because: a) of better fit for a five-item health specific leadership scale when the items were analyzed separately; b) better fit when seven safety and five health items were analyzed together compared to all 14 items analyzed together; and c) the high latent correlation between health-specific and safety-specific leadership. The scale also displayed some inter-rater consistency (ICC1 = .16, ICC2 = .59, median rwg = .96), although the coefficients are not so high as to indicate within-work group variation is trivial.

Workplace inclusion. We assessed workplace inclusion with the three item isolation measure by Mulki and Jaramillo (2011). We rephrased the measure "workplace inclusion" as it measures positive aspects of relatedness rather than isolation. An example is "I am part of the

organization/company social network" (α=.88).

Knowledge sharing. We assessed knowledge sharing with three items from Nesheim and Gressgård (2014). An example is "People at other locations often get in touch with me to give me good advice" (α=.76).

Self-rated health. We assessed self-rated health with a single item "How do you rate your health in general?", which was rated on a five-point fully anchored scale (1='very poor', 5='very good'). Such single item scales have been shown to predict mortality and to give valid information about global health (DeSalvo, Bloser, Raynolds, & Muntner, 2006; Idler & Benyami, 1997).

Safety compliance. Safety compliance was assessed with three items from Neal and Griffin (2006) (e.g., "I use the correct safety procedures for carrying out my job") (α=.90).

Safety proactivity. We assessed safety proactivity with three items adapted from Parker, Williams, and Turner's measure of workplace proactivity (2006). Items were adapted to be specific to safety (e.g., "I suggest ideas for safety improvements to colleagues") (α=.82).

Control variables. We controlled for three variables. First, we included a control variable for leaders' span of control indexed by work group size. These data were collected from company records. Given the distributed nature of the sample, we also controlled for the proportion of time each worker spent working remotely and whether the worker worked at the same time as his/her manager. Proportion of time spent working remotely was calculated from worker reports of the amount of time spent working away from his/her main office or location to the total number of hours worked per week. Working at the same time as the line manager was assessed by a single question "Do you work at different times to your immediate manager, for example night shifts, or working in other countries?" rated on a five-point fully anchored scale (1= 'never', 5 = 'always').

Analysis

Data were analyzed using multilevel regression and the HLM-7 programme (Raudenbush, Bryk, Vheong, Congdon, & Toit, 2011). Three-level models were fitted to the data, with individual observations nested within work groups nested within organizations. Because of missing data, models were estimated with between 626 and 658 participants, with all models reporting on 100 line managers from 11 organizations. Control variables were centered at the grand mean for the sample, and regression slopes fixed to be invariant across work groups and organizations as appropriate to the level of analysis.

Given that the hypotheses concern the individual level of analysis, the substantive independent variables (i.e., leadership, workplace inclusion and knowledge sharing) were centered at work group means. Centering at the work group enabled us to control for between group variation in these variables (Hofmann & Gavin, 1998). The interaction terms implied in Hypotheses 2a, b and c and 3a, b and c were calculated from the work group centered values of leadership and workplace inclusion or knowledge sharing. In tests of Hypotheses 2a, b and c and 3a, b and c, constituent group mean centered main effects were included in the models as well as interaction effects. All regression slopes involving the individual level variables of leadership, workplace inclusion and knowledge sharing were allowed to vary between work groups. Because of the small number of organizations in the sample, the slopes were fixed to be invariant across organizations.

Distributed workers provided ratings of the same line manager and our data are therefore hierarchical in nature. There was evidence for some level of convergence on perceptions of health and safety leadership within work groups in the current sample, and we therefore also entered work group mean level values of leadership into the regression models to represent shared leadership (Kelloway, Turner, Barling, & Loughlin, 2012). These values were

centered at the grand mean for the sample. We made analogous tests for shared experiences in work groups of leadership for Hypotheses 2a, b and c and 3a, b and c. We did so by estimating the cross-level interactions of shared leadership on workplace inclusion and knowledge sharing by regressing shared leadership onto the individual level regression slopes of workplace inclusion and knowledge sharing. We also assessed the interactions between work group means of degree of workplace inclusion and leadership and knowledge sharing and leadership: There was no support for these interactions.

Results

Table 1 shows the means, standard deviations, reliabilities and correlations. Before estimating the multilevel regressions to test the hypotheses, we also estimated null models to provide intraclass correlations (ICCs) for each dependent variable. Between teams, the ICC values were 0.04 for self-rated health, 0.02 for safety compliance and 0.05 for safety proactivity. Between organizations, the ICCs were 0.00 for self-rated health, 0.05 for safety compliance and 0.03 for safety proactivity. The low ICCs mean most of the variation in the dependent variables is between individuals, which could be explained by linear or interacting effects of individual level variables or by cross-level interactions between team level and individual level variables. Tables 2, 3 and 4 show the results of the multilevel regression analyses for each dependent variable.

INSERT TABLES 1, 2, 3 AND 4 HERE

Tables 2, 3 and 4 (model 2) all indicate support for Hypotheses 1a, b, and c, in that individual level health-and-safety-specific leadership was related to self-rated health ($B = 0.18$, $p < .01$; Hypothesis 1a), safety compliance ($B = 0.20$, $p < .01$; Hypothesis 1b), and safety proactivity ($B = 0.28$, $p < .01$; Hypothesis 1c). There was also a relationship between shared health and safety leadership at the work group level and safety compliance ($B = 0.34$, $p < .01$).

Tables 2, 3 and 4 (model 4) also show support for Hypotheses 2a, b and c, in that workplace inclusion moderated the relationship between health-and-safety-specific leadership and self-rated health ($B = 0.12$, $p < .05$; Hypothesis 2a), safety compliance ($B = 0.16$, $p < .01$; Hypothesis 2b), and safety proactivity ($B = 0.09$, $p < .05$; Hypothesis 2c). Figures 1, 2 and 3 show the form of these interactions, with the relationship between workplace inclusion and the dependent variables plotted at ±1 standard deviations of individual health-and-safety-specific leadership (- 1 *SD* = socially isolated, + 1 *SD* = socially integrated). The figures also show the statistical significance of the slopes at ±1 standard deviations of individual health-and-safety-specific leadership. Figures 1, 2 and 3 show that workplace inclusion accentuates the relationship between individual health-and-safety-specific leadership and self-rated health, safety compliance and safety proactivity, as hypothesized.

Tables 2, 3 and 4 (model 5) show no support for Hypotheses 3 a, b, and c, in that the interaction between individual-level health-and-safety-specific leadership and knowledge sharing was not significant for any of the dependent variables. However, there was a main effect of knowledge sharing on safety proactivity (model 3, $B = 0.23$, $p < .01$) and evidence of a cross-level interaction between shared health-and-safety-specific leadership and individual level knowledge sharing on safety compliance ($B = -0.16$, $p < .01$; Hypothesis 3b). Figure 4 shows the form of this interaction. The relationship between shared health and safety leadership compliance is plotted at ±1 standard deviations of individual levels of knowledge sharing, and the statistical significance of the slopes shown. Figure 4 shows that the relationship between shared health-and-safety-specific leadership and safety compliance is stronger for low levels of knowledge sharing, although there is also a positive, but weaker, relationship at high levels of knowledge sharing. Therefore, the form of the relationship in figure 4 suggests that individual level knowledge sharing appears to compensate for low levels of shared health-and-safety-

specific leadership.

Discussion

The present study aimed to advance understanding of the role of line managers in distributed workers' self-reported health and safety. We asked two main questions: When workers are distributed is it still possible to establish a link between leaders' health-and-safety-specific leadership behaviours and their followers' health and safety given the challenges of such workers? Are there resources in the social context, feeling part of the workplace and sharing knowledge with colleagues, that enhance the impact of leaders' behaviours? Concerning our first question, Hypotheses 1a, b and c were supported: a positive relationship was found between distributed workers' perceptions of health-and-safety-specific leadership and self-rated health and safety outcomes. Our results thus suggest that line managers' health-and-safety-specific leadership behaviours may also be effective in a distributed worker context. Despite these leaders having limited opportunities for face-to-face contact with their workers, leaders putting health and safety on the agenda and engaging their workers in health and safety discussions positively related to distributed workers' self-rated health, and safety compliance and proactivity. Distributed workers in groups that shared a perception of their leaders' health-and-safety-specific leadership behaviours were also more likely to comply with safety regulations. A possible explanation may be that leaders who hold meetings emphasizing safety compliance thus create a shared understanding of the importance of safety compliance. In the questionnaire, we had included an item on how often employees engaged in meetings or toolbox talks about health and safety. Correlational analysis revealed a significant relationship with health-and-safety-specific leadership ($r = .26$, $p < .01$) in support of this proposition.

In answer of our second question, our Hypotheses 2a, b, and c concerned how the impact of health and safety leadership may be enhanced where additional resources at the

organizational level are present. We proposed that distributed workers who feel part of the larger organization, i.e. do not feel isolated may be more receptive to their leaders' health and safety agenda. We found support for Hypotheses 2a, b and c. Our moderation analyses indicate that when distributed workers reported their leader exhibited health-and-safety-specific leadership behaviours and they felt part of the wider organization, they reported better health, were more safety compliant and were more proactive in assuming responsibility for safety matters. These results suggest resources at different levels may enforce each other and produce positive outcomes.

Also to answer our second question, focusing on the group context, Hypotheses 3a, b and c were not supported. Our analyses indicate that knowledge sharing between individual distributed workers did not accentuate the impact of health-and-safety-specific leadership. Possible explanations for this lack of impact may be that knowledge sharing is only relevant for some occupational groups of distributed workers, for example, those who work on inter-dependent tasks or tasks that are similar in nature. However, we did find that when distributed workers found themselves working in a group where they felt that their leader did not engage in health-and-safety-specific leadership behaviours (group-level leadership), but they experienced a climate where they could offer and give advice to and from colleagues (knowledge sharing), these workers did report adhering to safety regulations. It can thus be argued that in groups where leaders do not push the health and safety agenda good health and safety outcomes can still be achieved if distributed workers share knowledge. This latter finding came from analyses conducted with group-level assessments of leadership rather than individual-level assessments, although our hypotheses were derived in respect of individual-level assessments of leadership.

Implications for research and theory

The findings of the present study offer some support for COR theory (Hobfoll, 1989).

We found that health and safety leadership can be viewed as a resource that may protect distributed workers' health and safety. With regards to the synergistic effects of resources we found a more complex picture. Workplace inclusion augmented the positive impact of leadership when examining self-rated health, safety compliance and safety proactivity as outcomes. These results suggest a resource afforded at one level (organizational initiatives to ensure workplace inclusion) can enhance the impact of a resource at another level (leader resource) among workers who do not have regular face-to-face interaction with their line manager. However, knowledge sharing among colleagues may replace a leader level resource where it is missing and help ensure positive health and safety outcomes among distributed workers.

Our results have implications for research. First, we found that among distributed workers who do not have regular face-to-face interaction with their line manager, these line managers may still be able to promote workers' health and safety behaviours, especially in context where workers feel part of the wider organization. Second, our study supports the importance of considering different levels of analysis in leadership research. Nielsen and Daniels (2016) found that among one sample of distributed workers, namely mail delivery service workers, group-level transformational leadership was over time related to higher levels of sickness absence. This link was accentuated by workers showing up for work while ill. However, a limitation of this study is that only group-level leadership was tested. Kelloway et al. (2012) found that transformational leadership worked at the individual level predicting employee well-being, but not at the group level. In support of this, Nielsen and Daniels (2012) found that individual-level transformational leadership was linked to more well-being outcomes. Our results extend previous research to suggest that when leadership behaviours interact with other resources, the level of leadership plays an important role in this interaction.

We found that individual-level health-and-safety-specific leadership interacted with workplace inclusion to ensure health and safety proactivity, while group-level health and safety leadership interacted with knowledge sharing such that knowledge sharing buffered low levels of leadership when safety compliance was tested as an outcome.

Our study calls for the study of multiple safety outcomes. We found leadership and the organizational resource of workplace inclusion interacted differently when considering safety compliance and proactivity as outcomes. We found a positive interaction between leadership and workplace inclusion when testing safety proactivity as an outcome such that high levels of health and safety leadership and workplace inclusion together resulted in higher levels of safety proactivity. When testing safety compliance as an outcome we found low levels of leadership among distributed workers who felt included at work resulted in lower levels of safety compliance. Our results are in line with previous research showing antecedents impact these two types of safety outcomes differently (Clarke, 2006). Our results suggest that resources at multiple levels interact differently to influence in- and out-role safety performance. Knowledge sharing compensates for poor health-and safety-specific leadership at the group level, but workplace inclusion enhances the impact of health-and-safety-specific leadership at the individual level. These results confirm the importance of studying the complex interactions between individual-level and group-level leadership and resources at other levels.

Although not part of our Hypotheses, we also tested whether health-and-safety-specific leadership behaviours should be tested separately. Our factor analyses showed that they form one dimension of "good" leadership. This result is in line with other research findings that leadership behaviours are highly correlated (Gregersen et al., 2014; Zwingmann et al., 2016). We therefore conclude that health-and-safety-specific leadership is unidimensional.

Practical implications. The practical implications of our study revolve around how

organizations may best ensure the health and safety of their distributed workers. Our results indicate that despite the challenges of lack of face-to-face contact with superiors and colleagues, lack of access to organizational health and safety material and the unknown risks faced by distributed workers when away from their main location, the health-and-safety-specific leadership behaviours of line managers may be related to good health and safety outcomes. The results suggest that organizations may stress the importance of putting health and safety on the agenda to line managers responsible for distributed workers and provide training to line managers as to how they can do this. Line managers themselves may organize get-togethers of distributed workers in order to drive the message about managing health and safety across the collective.

Organizations may also consider activating resources at other levels to augment or replace health-and-safety-specific leadership behaviours. Initiating activities at the organizational level to prevent distributed workers feeling isolated may help ensure they engage in safe behaviours and have better health. These activities may include organizing social events that bring together distributed workers and making sure that communication about such events reach distributed workers, for example through letters to the home address rather than being dropped in pigeon holes or advertised on the organization's intranet.

Activities and procedures to ensure knowledge sharing may also help ensure the health and safety of distributed workers. Social activities and networking events may help distributed workers get to know each other, so that they feel comfortable asking each other for help and they know whom to ask for help with regards to specific problems. An overview of which colleagues have which competencies and skills, e.g., training, may be made available to distributed workers and could be placed in the glove compartment of cars and trucks, for example. Distributed workers could also be provided with mobile phones with pre-entered

phone numbers to colleagues, or in places with poor reception, satellite telephones. Hand-held devices, such as tablets, could be utilized to store and share information regarding health and safety and useful details such as colleagues work locations and work schedules.

Strengths and limitations. The main strengths of this paper are its multi-level design including a wide range of distributed workers which strengthens generalizability. There are, however, also limitations that need to be considered when drawing conclusions about the results of the present study. Due to the large number of self-reported measures in the present study, common-method bias may pose a threat to our results. We took a number of steps to minimize common method bias as recommended by Podsakoff, MacKenzie, Lee and Podsakoff (2003). First, we designed our survey to minimize such bias. We mixed the order of presentation of the leadership factors and safety compliance and proactivity in the questionnaires to avoid response patterns.

Second, ratings were made of different targets; the leader's behaviours and employees' perceptions of the context and their own health and safety. In relation to the interactions, research suggests common method variance is unlikely to artefactually produce significant single-level or cross-level interaction effects (Lai, Li & Leung, K., 2013; Siemsen, Roth, & Oliviera, 2010). Indeed, where there were significant linear effects of leadership in main effects models, the results indicated that these effects were conditional on workplace inclusion (all dependent variables at the individual level) and knowledge sharing (safety compliance at the group level). It is therefore unlikely that common method bias has influenced the substantive conclusions.

That we asked about health in both the leadership measure and self-rated health may have inflated correlations, however, this risk is minimized by including both health and safety items in the leadership measure. Furthermore, correlations were not worryingly high. For

safety, we also used two different outcomes of safety performance which were differentially impacted by our antecedents.

Finally, our population was predominantly male, which may have impacted the results of the study, however, a recent systematic review of the leadership related to distributed workers' health and safety (Nayani, Nielsen, Daniels, Donaldson-Feilder, & Lewis, 2017) found that most of these distributed worker populations were male and thus our sample is likely to reflect the over-representation of males in distributed working.

Conclusion

Our study has two important implications. First, our research confirms that health-and-safety-specific leadership of first line managers is positively related to distributed workers' health and safety. Our study thus offers important insights into how organizations can ensure the health and safety of workers whose health and safety may be difficult to manage for organizations due to the nature of their job, i.e. the limited face-to-face interaction with line managers, the lack of easy access to organizational health and safety material and the lack of organizational control over health and safety risks faced by distributed workers when they are away from their main location. Second, our study offers valuable insights as to how resources at different level may interact to replace lacking resources or to create resource caravans. Group-, leader-, and organizational-level resources interact differentially to influence in-role and extra-role safety performance.

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