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Supervisor and organizational factors associated with supervisor support of job accommodations for low back injured workers

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Abstract

PURPOSE—Temporary job accommodations contribute to the prevention of chronic work disability due to low back pain (LBP) through the facilitation of early return to work; yet, workplace dimensions of job accommodation are poorly understood. The objective of this study was to determine supervisor and organizational factors associated with supervisors' support for temporary job accommodations for LBP injured workers.

METHODS—Supervisors were recruited from 19 workplaces in the USA and Canada and completed an online survey regarding job accommodation practices and potential associated factors with respect to a case vignette of a worker with LBP. Multivariable linear regression was used to identify the most parsimonious set of factors associated with supervisors' support for accommodations.

RESULTS—A total of 804 supervisors participated with 796 eligible for inclusion in the analysis. The final set of factors explained 21% of the variance in supervisors' support for temporary job accommodations. Considerate leadership style (β = .261; 95 % CI: .212, .310), workplace disability management policies and practices (β = .243; 95 % CI: .188, .298), and supervisor

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autonomy for designing and providing workplace accommodations (β = .156; 95 % CI: .071, .241) had the largest effect on supervisor support for accommodations.

CONCLUSION—Factors predicting supervisors' likelihood to accommodate LBP injured workers include use of considerate leadership style, workplace disability management policies and practices, and supervisor autonomy. Workplace interventions targeting these factors should be developed and evaluated for their ability to improve work disability prevention outcomes.

Keywords

job accommodation; supervisor; predictors; return to work; disability management

INTRODUCTION

Low back pain (LBP) is a prominent health problem for working-age adults and a challenge for workers and employers across many occupational settings. For example, in nursing the prevalence rates of LBP have been shown to range from 33% to 86% [1]. Most working-age adults with acute LBP fully recover or manage their condition with only a brief work absence, while others experience chronic back pain with significant periods of recurring work disability [2]. Epidemiologic evidence suggests personal circumstances, pain beliefs, and non-medical systemic factors are important in the perpetuation of chronic pain and disability [3–4]. Among these factors are a number of workplace variables [5], whose influence may be abated with the offer of temporary workplace accommodation.

The offer of temporary workplace accommodations improves return to work and reduces disability duration for workers with LBP [3, 6–8]. Workplace accommodations are efforts to modify any aspect of a job or work environment to enable people with disabilities to work effectively at their current workplace [9, 10]. These are beneficial and effective for both disabled workers and their employers [6, 7]. Unfortunately, many workers disabled with LBP who may benefit from an offer of workplace accommodation, do not receive one [11].

Supervisors play a key role in the job accommodation process [12]. Supervisors may be asked by their employer to interpret medical restrictions, document job demands, create modified duty positions, or temper production demands. Injured workers report that supervisors are "usually responsible for applying the policies and procedures of absence management, including return to work interviews, health and safety management and referral to occupational health" [11]. The assistance a worker receives is often dependent on their individual supervisor [11]. Supervisors may alter workstations, adjust work schedules, monitor adherence to medical restrictions, engage co-workers, communicate with providers and insurers, and monitor the effectiveness of job accommodations over time. Past research has shown that injured workers have extremely high expectations that a supervisor will provide personal guidance and support in the event of a work injury, especially with regard to providing meaningful, ergonomically sound, and non-pejorative job accommodations [13]. Supervisor training to communicate more effectively with injured workers may reduce disability costs [13–15]; yet, injured workers continue to report varying levels of assistance and support from supervisors [16, 17]. Supervisors have shown substantial variability in attitudes and beliefs about the need for job accommodations [15, 18, 19–21].

Many factors may play a role in supervisors' attitudes and beliefs towards job accommodations. Recent qualitative work identified potential categories of factors, including employer, supervisor, worker and provider factors, influencing supervisory support for different types of accommodations [22]. Using these categories, we developed a conceptual framework for our study (see Fig. 1 in [23]).

The goal of the current analysis was to determine which combination of supervisor and organizational factors explained the most variance in supervisors' overall support for temporary job accommodations for LBP-injured workers. A secondary objective was to conduct a subgroup analysis to determine if the effect of important factors changed with supervisor age, gender, or unionization status of the workers supervised.

METHOD

Study Design and Participants

We conducted a cross-sectional study of supervisors from 19 different employers within Canada and the United States. The participating employers represented a non-random, convenience sample drawn from existing researcher contacts, institutional ties, and past collaborations. The employers represented neither those with exceptional return to work statistics, nor poor disability management. The employers included a range of industries and company sizes. Recruitment targeted industries where manual materials handling and other physical tasks are common job requirements. The intention was to sample supervisors who have experienced job accommodation responsibilities in their supervisory work. While it would have been preferable to limit participation to supervisors with at least several years of supervisory experience, this was not feasible with the participating employers. Employers received aggregate survey results for bench-marking purposes as a benefit of participation.

All supervisors working at each of the participating employers were invited to participate. Supervisors were eligible for inclusion if they were aged 18 years or older, supervised at least one employee, and were English speaking. We did not have valid, culturally-adapted versions of the instruments for use in languages other than English. Higher level supervisors who supervise lower-level supervisors were eligible for participation. Employers provided time during the regular business day for supervisors to participate, but participation was voluntary and included no incentives or individual feedback.

Procedures

Supervisors were invited to participate in the study through the employer via email. The email invitation included a link that participants followed to access the consent form and online questionnaire. The survey took approximately 30 minutes to complete and requested the participant to: (1) indicate informed consent; (2) provide a description of a job position typically supervised; (3) read a hypothetical case scenario involving a worker in the previously identified position having an episode of LBP (see Appendix in [23]); (4) respond to survey questions including the outcome and factor measures; and (5) input demographic data. Non-respondents received up to four reminder e-mails sent weekly. Eight case vignettes were used for this study. Each case vignette was a particular combination of three

randomized variables: the gender of the worker, the location of the injury (home or work), and the number of prior work absences that year (0 or 30 days lost work time). Participants were randomly assigned to 1 of the 8 case vignettes.

The use of case vignettes is a well-established research method for studying the decision-making practices surrounding health and functional problems. In back pain research, case vignettes have been used to assess adherence of physicians to evidence-based treatment guidelines [24] and to assess differences in treatment recommendations by specialty group or practice experience [25]. Such studies have shown relatively poor adherence to evidence-based guidelines for the treatment of acute LBP among physicians, especially among general practitioners with more years of clinical experience. Other case vignette studies in medical research have focused on the professional judgments of social workers regarding the need for institutional care [26], the opioid prescribing practices of emergency room physicians [27], and the effect of racial bias in medical decision-making [28]. Case vignettes can test a number of hypothesized variables thought to influence decision-making, and predictive variables can include both experimental factors (randomized factors systematically altered in different versions of the vignette), and respondent factors (variables reflecting attitudes and characteristics of the decision-maker). Strengths of the case vignette approach are ease of administration, standardization of the decision-making scenario across respondents, and avoidance of the practical and ethical considerations associated with collecting information about actual decisions from real cases. As very little is known about the decision-making practices of supervisors to support or facilitate workplace accommodations, the case vignette approach is a feasible and appropriate method for assessing the effects of multiple factors.

Ethical approval for the study was granted by the ethics boards of Lakehead University, the University of Toronto, University of Lethbridge, and the Liberty Mutual Research Institute for Safety.

Measures

Outcome Measure: Job Accommodation Scale—The Job Accommodation Scale (JAS) measures supervisors' level of support for providing job accommodations for a back-injured worker. In this scale, job accommodation options include job modifications, which refer to changes to the worker's tasks. The JAS has recently been shown to have good face validity and internal consistency (Cronbach's alpha equal to 0.85) [23]. The JAS consists of 21 items representing specific job accommodations and modifications (changes to the worker's tasks) related to modifying the workers' physical workload (e.g., limiting the pushing, pulling or lifting of heavy objects); modifying the work environment (e.g., altering height of work surface); modifying the work schedule (e.g., changing work hours); finding alternate duties (e.g., replacing normal job tasks with easier tasks); and arranging for assistance (e.g., finding someone else to do the heavy work). Responses to individual items are measured on a 4-point numerical scale from 1 (very unlikely) to 4 (very likely). An average score is computed from the 21 items, with higher scores indicating greater support for job accommodations. In cases where a particular job accommodation was irrelevant to a job or work setting, respondents could indicate this item was "not an option for this job".

Participants were instructed to indicate their level of support for each JAS item given 1) the scenario described in the case vignette; 2) the physical job demands of the position that is typical of the workers they supervise; and 3) the typical practices in their organization including their usual supervisory demands. The JAS was recently used to show that supervisor autonomy and considerate leadership style were independently and positively associated with supervisors' likelihood to accommodate a back-injured worker [29].

Factors

Employer factors

Physical job demands: The physical workload and job demands of the position nominated as being typical of supervised workers were measured using the Physical Workload Questionnaire (PWQ) [30]. The PWQ is a shortened version of the Dutch Musculoskeletal Questionnaire and measures two constructs: "heavy physical workload" (PWH HP) and "long lasting postures and repetitive movements" (PWQ LR). Scores range from zero to 100 for both constructs.

Corporate safety climate: Safety climate refers to shared perceptions of employees about the safety of their work environment. Global work safety was assessed using the validated 6-item Global Work Safety Climate scale (GWSC) [31]. The GWSC has acceptable internal consistency and good convergent and discriminant validity. The scale taps four fundamental dimensions of safety climate: management commitment, safety performance feedback, worker involvement, and safety behavior norms. A total score is computed by averaging the score responses on the six items. Scores range from one to four, with lower scores indicating better work safety climate.

Workplace social capital: Workplace social capital was measured using the Social Capital at Work Questionnaire (SCWQ) [32]. The SCWQ is used to measure the key components of social capital at the workplace: shared attitudes and values among members of an organization, reciprocity, mutual respect and trust between workmates, collective action and participation in the networks at work, and trust in and trustworthiness of a supervisor. The 8-item scale has been shown to be a reliable and valid measure of social capital [32]. The internal consistency of this measure is good (Cronbach's alpha = 0.87). The responses are on a 5-point scale with higher scores indicating higher individual-level social capital.

Disability management: Disability management policies and practices were measured using 13 questions from the disability management scale of the Organizational Policies and Practices survey instrument (OPP) [33]. The 13 questions are relevant to claim management and return to work, which comprise the disability management scale. The total score is computed by averaging the scores on the 13 items. These items have been shown to have high reliability (interclass correlation r = 0.916) [33]. Higher scores indicate better disability management.

Supervisor factors

Autonomy: Supervisor autonomy within the workplace was measured using 3 constructed questions modeled after decision latitude, a factor included in the Job Content Questionnaire

[34]. The three questions ask supervisors to rate their autonomy with regard to making decisions about modified work, recommending specific job modifications, and personal input in company decisions about modified work.

Leadership style: Leadership style was measured using the Ohio State Leader Behavior Description Questionnaire (LBDQ), which consists of two dimensions: Initiating Structure (LBDQ IS) and Consideration (LBDQ C) [35, 36]. Initiating structure refers to the leader's behavior in delineating the relationship between him or herself and the members of his or her group, degree to which he or she is oriented toward goal attainment, and level to which he or she establishes well-defined patterns and channels of communication [37]. Consideration refers to the degree to which the leader shows trust, respect, appreciation, and concern for the welfare of group members [38]. Considerate leadership can result in relational justice when supervisors treat subordinates truthfully and with consideration [39]. Considerate leadership is usually measured with the LDBQ [39]. The LBDQ is a 40-item questionnaire that results in a range of scores from 0 to 60 on each dimension. Higher scores indicate greater Structure and greater Consideration.

Pain and work disability beliefs: Important beliefs and attitudes towards chronic pain were measured using a modified version of the Pain and Impairment Relationship Scale (PAIRS) [40]. PAIRS is a 15-item questionnaire with high test-retest reliability, good content validity, and good construct validity [41, 42]. High scores on the PAIRS indicate a strong belief that pain and impairment are related and that function should be restricted in the presence of pain.

Demographics: Participants provided information on their age, gender, education, experience and seniority within the workplace (i.e., number of years as supervisor, number of years with company, current managerial level); and the number and unionization status of the employees they supervised.

Worker factors—We incorporated control for worker factors as indicated in our conceptual framework (Fig. 1 in [23]). Worker factors were introduced through the randomized case vignettes, which included the gender of the worker, the location of the injury (home or work), and the number of prior work absences that year (0 or 30 days lost work time). We were unable to incorporate provider factors into the questionnaire as most supervisors do not have direct contact with the providers and cannot comment on the providers' knowledge of the workplace.

Data Analysis

Data were cleaned to detect and correct all inaccurate, incomplete, or erroneous entries. For each instrument, a total score was generated for each participant who provided at least one response. To address incomplete responses and to ensure comparability among supervisors, the scores for PAIRS and the LBDQ, which are usually summed [33, 39], were converted to percentage scores. We used a single JAS variable as the mean JAS scores for the case vignettes were very similar, with no statistically significant differences among them. Univariate statistics (means, standard deviations, frequency counts) were generated and

examined for all variables. We conducted bivariate analyses to determine the association between each predictor and the outcome using linear regression for continuous variables and ANOVA for categorical variables. Cronbach's alpha coefficients were computed for each study instrument to determine and verify internal consistency.

To determine the factors associated with supervisors' support for job accommodations we used multivariable linear regression, with clustering by employer. Clustering was used to account for potentially correlated data among supervisors from the same employer because supervisors were recruited from a non-random, convenience sample of employers.

We followed the guidelines of Hosmer & Lemeshow for model-building [43]. The initial multivariable model included all factors that were statistically significant (p value ≤ .20) based on the bivariate analysis. Nested models removing one factor at a time were compared to the initial multivariable model using the Wald Test [43]. A factor was dropped if the Wald Test $p<0.05$. In addition, the effect that dropping a factor had on factors left in the nested model was assessed using the percent difference between factor coefficients in the nested model and their counterparts in the initial multivariable model. If a marked (30%) difference was observed, the factor was considered important and was kept in the model. This verification process continued until we identified the most parsimonious model (reduced initial multivariable model). Factors not included in the initial multivariable model were then individually added to the reduced initial multivariable model to ensure no effect. Any factors found to make an important contribution at this point were retained, giving the preliminary main effects model. The main effects model was obtained after graphically assessing the assumption of normality and addressing any issues with scaling of continuous variables. After obtaining the main effects model, plausible two-way interactions among factors were assessed. Statistically significant interactions ($p \leq .05$) were added to the main effects model to generate the preliminary final model. We determined which interactions to test by evaluating the factors in the main effects model and identifying the plausible interactions among them. The fit of the preliminary final model was checked and determined to be the final model if the fit was acceptable. Finally, we conducted a stratified analysis to determine if the impact of the factors included in the final model varied according to subgroups of supervisor age, gender, and unionization status of the workforce. We tested interaction terms between each factor and these subgroups to identify statistically significant differences.

RESULTS

The 19 employers represented six different industrial sectors (energy/utility, manufacturing, construction, retail & wholesale trade, health care & social assistance, and education services). Of the 3,077 supervisors invited to participate, 804 (26.1%) accessed the survey website and completed at least the first page of the survey (i.e., name of company and job supervised). Eight supervisors were excluded because they did not supervise at least 1 employee, leaving 796 supervisors in the analysis. Three quarters of the supervisors were male and over half were US residents (Table 1).

The mean scores for the study instruments are presented in Table 2. The high mean JAS score indicated that supervisors tended toward a strong level of support for providing job

accommodations for a low back injured worker. Similarly, the high mean score observed for workplace social capital suggested that supervisors generally perceived a high degree of social capital in their workplace. The relatively low scores for both PWQ constructs suggested that the job positions typical of supervised workers tended to involve a low degree of both heavy physical work, and long lasting postures and repetitive movements. The low mean score for workplace safety climate and the high mean score for disability management indicated that the supervisors had very favorable perceptions of both. The supervisors generally appeared to hold moderate beliefs that pain and impairment are related and that work should be limited in the presence of pain. The results also suggested that the supervisors generally perceived themselves to possess a relatively high degree of autonomy, and a relatively high degree of both consideration and initiating structure in their leadership style.

The Cronbach's alpha coefficients for the JAS (0.83), PWQ HP (0.91), PWQ LR (0.82), GWSC (0.85), SCWQ (0.93), OPP (0.91), autonomy (0.81), LBDQ C (0.72), and LBDQ IS (0.76) indicated that these study instruments had good internal consistency. The PAIRS alpha coefficient was 0.64, indicating acceptable, but lower internal consistency.

Bivariate analyses suggested that supervisor gender, country of residence, education level, managerial level, physical demands of the position, autonomy, safety culture, disability management, social capital, and leadership style were significantly associated with supervisors' support for job accommodations ($p \leq 0.2$). There was no significant association between supervisors' support for job accommodations and supervisor age, years as a supervisor, years with the company, number of workers, unionization status of workers, pain and work disability beliefs, or the three variables within the case vignette (worker's gender, location of injury, prior worker absences) ($p > 0.2$).

Table 3 shows the twelve variables included in the final model. This model explained 20.1% of the variance in the support for job accommodations outcome (adjusted $R^2 = 0.2079$, 95% CI: 0.1493, 0.2665). Data from 556 supervisors were included in this model. Tables 1 and 2 indicate that the baseline characteristics and responses to the study instruments were similar between the full sample and those included in the final model, respectively.

The factors most strongly associated with supervisors' likelihood to accommodate a low back-injured worker were supervisors' increasing use of considerate leadership style, workplace disability management policies and practices, and supervisor autonomy for designing and providing workplace accommodations (Table 3). All three factors were positively associated with supervisors' likelihood to accommodate low back-injured workers such that higher scores on any three of these variables would result in greater supervisor support for accommodations (for example, a one unit increase in supervisor considerate leadership style would result in a 0.26 increase on the 4 point job accommodation scale score). Supervisors reporting greater social capital in their workplaces were less likely to provide accommodations for the back-injured worker in the vignette, but this association was moderated by considerate leadership style such that even minimal use of considerate leadership style removed the negative effect of social capital (Interaction $\beta = .056$; 95% CI: .019, .093). Supervisors working in the health care and social assistance sectors were also

less likely to support accommodations, but this association was moderated by disability management policies and practices such that even low scores on disability management removed the negative effect of the health care sector (Interaction β = .070; 95% CI: .006, .133). Supervisors working in Canada were more likely to support accommodations for the worker in the vignette than supervisors working in America (β = .155; 95% CI: .073, 0.238). There were small positive effects for accommodating jobs involving long-lasting postures and repetitive movements (β = .08; 95% CI: .011, .15) or workers with three prior absences (β = .086; 95% CI: .031, .141).

Only three statistically significant stratification effects were found when applying the model to the stratified data (Table 3). First, older supervisors, greater than 46 years old, with high use of a considerate leadership style were more likely to support accommodations for workers with LBP (β = .357; 95% CI: .266, .448) than younger supervisors, less than 47 years old, with a high use of a considerate leadership style (β = .178; 95% CI: .113, .244) (p = .004). Second, supervisors in a unionized workplace with good workplace disability management policies and practices were more likely to support accommodations for workers with LBP (β = .357; 95% CI: .198, .517) than supervisors in a non-unionized workplace with good workplace disability management policies and practices (β = .154; 95% CI: .086, .223) (p = 0.017). Finally, supervisors with many years of experience as a supervisor, working in non-unionized workplaces were less likely to support accommodations for workers with LBP (β = −.192; 95% CI: −.279, −.106) than experienced supervisors working with some unionized workers (β = .061; 95% CI: −.074, .196; p = 0.002) or in a completely unionized workplace (β = .031; 95% CI: −.090, .152; p < 0.001).

DISCUSSION

This study examined supervisor and organizational factors associated with supervisors' support for temporary job accommodations, including job modifications, for LBP injured workers. The factors with the largest effect on accommodation support for a LBP injured worker were supervisors' increasing use of considerate leadership style, workplace disability management policies and practices, and supervisor autonomy for designing and providing workplace accommodations. Subgroup analysis found that use of a considerate leadership style had the greatest influence on older supervisors, disability management policies and practices exhibited larger effects on unionized workplaces, and supervisors with more years of experience provided more accommodation support in unionized environments. The identification of these factors and modifying subgroups are important for guiding employer policies and practices that can facilitate the accommodation and return to work process of a worker with LBP.

Effective supervisor leadership is associated with fewer long-term sickness absence days [39, 44], job well-being and disability pension [39]. However, it is unknown how supervisor leadership influences workplace accommodation. Kotter [45] claims that leadership is most important in an environment with large change. A previous etiologic analysis examining the specific direct effect of considerate supervisor leadership on supervisors' likelihood to accommodate back injured workers found a small positive association (β = .012; 95% CI: .009–.016) [29]. When comparing factors included in our conceptual framework, the model

accounting for the most variance in the outcome suggested considerate leadership style to have the greatest influence on a supervisors' likelihood to accommodate a low back injured worker. McGuire et al. discuss the existing research on leadership style and supervisor training programs [29]. We reiterate and support the notion that further study of training programs designed to improve supervisors' use of considerate leadership style is warranted. We also found a positive interaction between a considerate leadership style and workplace social capital. This indicates that the influence of a considerate leadership style on supervisor support for accommodations can be enhanced by ensuring a positive workplace social environment. This corroborates the findings by Kwan and Schultz that identified trust as a critical core element in the return to work accommodation process [46].

Workplace disability management policies and practices are associated with the prevention and resolution of work disability [33]. Having a company policy on hiring persons with disabilities and having prior experience with disability has been shown to be more predictive of attitudes toward providing job accommodations than company size [47]. However, it is unknown how supervisor perceptions of these policies and practices influence supervisors and their decisions around workplace accommodation. We found disability management to be the most important employer factor associated with supervisor likelihood to provide workplace accommodations, especially for supervisors in unionized environments. Most disability and industry practices came into being by "trial and error" and were dependent on the organizational setting in which they originated [48]. Unsurprisingly, we found the influence of disability management policies and procedures on accommodation provision to be dependent on the industry sector. Organized labour, in the form of unions, negotiates job accommodations, workplace policies and procedures, and grievance mechanisms into collective agreements, which are legally binding. Supervisors with many grievances filed against them are costly to the employer and will have limited career opportunities, so supervisors generally follow the workplace policies and procedures written into their collective agreements.

There are a number of identified best practices in disability management, including use of an integrated approach, centralizing responsibility, providing disability management education and training, good communication strategies, standardizing case and claims management practices, using measurement to monitor and improve the program, developing a supportive infrastructure, having graduated return to work opportunities, and ensuring that early intervention is a cornerstone of the program [48]. Further work is needed to understand which of these best aids supervisors to support workplace accommodations.

Expectedly, supervisor autonomy was the third factor in terms of strength of association with supervisors' likelihood to provide workplace accommodations. If supervisors are given the authority and flexibility to design accommodations for their employees, they will be more likely to support them. These findings corroborate similar research that finds increased supervisor autonomy is associated with a safer workplace [49], increased workplace morale [50], and increased job performance [51].

A surprising finding was that of the negative association of workplace social capital and the provision of job accommodations. The social capital scale measures shared attitudes and

values among members of an organization, reciprocity, mutual respect and trust between workmates, collective action and participation in the networks at work, and trust in and trustworthiness of a supervisor. The focus is on the relationships at the workplace. Low workplace social capital is a predictor of depression and low self-rated health [52, 53]. We expected supervisors reporting higher social capital to also support more job accommodations. It may be that supervisors with a high perception of social capital in the workplace feel that workers do not need special accommodations as their coworkers will assist them where necessary to ‘make it work’ for the company and the returning worker by offering, for example, strategic support or by re-organizing schedules [54]. It could also be that low social capital in the workplace leads to the development of more enforcement mechanisms. Unionization often occurs due to poor relations between employers and employees. In support of this, our results indicated a negative correlation between supervisor perceptions of social capital and worker unionization (Pearson correlation coefficient (r) = −0.083, p = 0.048).

Canadian supervisors were more likely than US supervisors to support accommodations. Industry sector was highly correlated with country (r = 0.741, p < 0.001). Eighty-seven percent of the manufacturing industries were in the US, while 100% of the healthcare industries were in Canada. Therefore, 54% of the information in the industry sector and country predictors was shared. To avoid issues of collinearity, the industry sector variable had to be stratified as shown in Table 3. Healthcare was negatively associated with the provision of accommodations. Given healthcare was negatively associated, and 100% of the healthcare industry was Canadian, it was surprising that Canadian supervisors were positively associated with accommodation support. Work disability systems and laws vary by jurisdiction, and legal analysis has provided evidence that Canadian courts are more generous to disabled workers than their American counterparts in the field of employment [55]. Our findings supported this even with the collinearity issues.

This study was the first to examine a range of organizational and supervisor factors for their association with supervisors’ support for the provision of workplace accommodations for LBP. The study included a large sample size of supervisors from a range of industrial sectors, a conceptual framework for the identification of predictors, and validated measurement instruments. The use of case vignettes is a well-established research method for studying the decision-making practices surrounding health and functional problems [25–27]. The case vignettes allowed us to test a number of hypothesized variables thought to influence decision-making, and allowed predictive variables to include both experimental factors (randomized factors systematically altered in different versions of the vignette), and respondent factors (variables reflecting attitudes and characteristics of the decision maker). Strengths of the case vignette approach are ease of administration, standardization of the decision-making scenario across respondents, and avoidance of the practical and ethical considerations associated with collecting information about actual decisions from real cases.

There are important limitations to consider. First, the main limitation is the low response rate (26.1%) from a convenience sample of employers. Supervisors and employers who chose to participate may have led to a self-selection bias. This may explain the high scores on some of the workplace factors like safety culture, disability management policies and practices,

and workplace social capital. Hence, the generalizability of our findings may be restricted to similar workplaces with supervisors expressing similarly positive perceptions of the workplace. Future studies should recruit employers from a random sample of employers, preferably stratified by industry sector, to ensure greater generalizability and a better understanding of the impact of selection bias. Second, although also a strength, the use of the case vignette approach required self-reported measures of supervisors and their workplaces. We cannot discount social desirability (supervisors responding in a manner to please their employer) influencing the response of supervisors. The use of standardized measurement instruments would limit this effect. Further, the vignette only used the term "job modifications" and not "accommodations". This may have influenced the manner in which supervisors responded to the JAS. However, the JAS response options included both accommodations and modifications, so supervisors would most likely respond to the use of the item itself. The case vignette design also made it impossible to assess the influence of healthcare provider factors on supervisors' decisions to accommodate. An alternative design would be to measure actual job accommodation for LBP injured workers in the workplace including provider factors; however, this would be a much larger project using a different study design. Finally, our measure of supervisor beliefs of the relationship between pain and impairment was not internally consistent. Although this may be considered a limitation because the factor was likely not found to be associated due to its' less than ideal measurement characteristics, it can also be considered an important finding. Unlike healthcare providers and workers [40–42], supervisors do not consistently interpret the items related to pain and impairment. Although supervisors are not meant to be medical professionals, some training on musculoskeletal disorders may help them to understand the differences between pain and impairment.

Notwithstanding these limitations, we conclude that the strongest factors associated with supervisors' likelihood to accommodate a LBP injured worker were supervisors' increasing use of considerate leadership style, good workplace disability management policies and practices, and supervisor autonomy for designing workplace accommodations. Important relationships with older supervisor and workplace unionization status subgroups exist. These findings are important for all work disability prevention stakeholders as they identify important targets for intervention. For example, simple applications may be to improve disability management policies and practices, especially for non-unionized environments (an intervention that mimics the grievance process in unionized employers may be useful); or to train supervisors to use a more considerate leadership style, especially for older supervisors; or provide supervisors with more flexibility in the decision-making process regarding work accommodation. Establishing and improving disability management programs may improve supervisors' ability to accommodate, and training supervisors to use a more considerate leadership style may also improve their accommodation efforts. Future research should test these interventions and other hypotheses generated and discussed within this paper.

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Table 1

Characteristics of participating supervisors

Variable	Available for analysis Number (%)	Included in final model Number (%)
N	796	556
Gender		
Male	448 (73.0)	403 (72.5)
Female	166 (23.0)	153 (27.5)
Missing	182	0
Country of residence		
Canada	240 (39.8)	223 (40.1)
USA	363 (60.2)	333 (59.9)
Missing	193	0
Education level		
Completed post-secondary	345 (49.6)	319 (57.4)
Some post-secondary	153 (22.0)	142 (25.5)
High school or less	100 (14.4)	95 (17.1)
Missing	198	0
Managerial level		
Frontline	422 (69.9)	384 (69.1)
Mid-level	167 (27.6)	158 (28.4)
Executive	15 (2.5)	14 (2.5)
Missing	192	0
Number of workers supervised		
20 or more	275 (45.6)	252 (45.3)
10 to 20	149 (24.7)	140 (25.2)
6 to 10	94 (15.6)	87 (15.7)
Less than 5	85 (14.1)	77 (13.9)
Missing	193	0
Workers unionized		
Yes, all	165 (27.4)	148 (26.6)
Yes, some	107 (17.7)	96 (17.3)
No	331 (54.9)	310 (55.8)
Missing	193	2
Industrial sector		
Utilities	18 (2.3)	14 (2.5)
Manufacturing	448 (56.3)	325 (58.5)
Construction	14 (1.8)	8 (1.4)
Retail & Wholesale Trade	85 (10.7)	62 (11.2)
Health Care and Social Assistance	203 (25.5)	130 (23.4)
Education Services	28 (3.5)	17 (3.1)
Missing	0	0
Vignette received – gender		

Variable	Available for analysis Number (%)	Included in final model Number (%)
Male worker	359 (50.6)	276 (49.6)
Female worker	351 (49.4)	280 (50.4)
Missing	86	0
Vignette received – location of injury		
Injured at work	345 (48.6)	276 (49.6)
Injured at home	365 (51.4)	280 (50.4)
Missing	86	0
Vignette received – previous work absence		
Yes (3 absences)	343 (48.3)	271 (48.7)
No	367 (51.7)	285 (51.3)
Missing	86	0
Mean age, years (SD, range)	45.8 (9.59, 19 – 69)	45.8 (9.53, 19 – 69)
Mean Years as supervisor (SD, range)	13.8 (9.74, 0 – 39)	13.9 (9.78, 0 – 39)
Mean Years with company (SD, range)	13.7 (9.86, 0 – 45)	13.7 (9.81, 0 – 42)

Table 2

Mean supervisor responses to study instruments

Measure	Possible range of scores*	Available for analysis		Included in final model	
		N	Mean (SD)	N	Mean (SD)
Job Accommodation Scale score (JAS)	1 – 4	718	3.2 (0.48)	556	3.2 (0.46)
Employer factors					
Physical job demands (PWQ)					
Heavy physical workload score	0 – 100	796	29.2 (20.71)	556	30.5 (20.67)
Long lasting postures & repetitive movements score	0 – 100	796	37.5 (22.55)	556	37.6 (22.34)
Corporate Safety Climate score (GWSC)	1 – 4	678	1.4 (0.41)	556	1.3 (0.40)
Workplace Social Capital score (SCWQ)	1 – 5	672	4.2 (0.69)	556	4.2 (0.69)
Disability Management score (OPP)	1 – 5	679	4.5 (0.60)	556	4.5 (0.61)
Supervisor factors					
Autonomy score	1 – 5	704	3.7 (1.10)	556	3.7 (1.09)
Leadership style (LBDQ)					
Consideration score	0 – 100	669	77.3 (8.40)	556	77.6 (8.45)
Structure score	0 – 100	669	74.5 (9.55)	556	74.9 (9.28)
Pain beliefs score (PAIRS)	0 – 100	633	57.5 (8.09)	556	57.5 (7.80)

*All scales are scored such that higher scores indicate higher levels of the measure except for the Corporate Safety Climate score. This scale is reverse scored such that higher scores indicate lower safety climate.

Table 3

Standardized regression coefficients and 95% confidence intervals from all variables included in the final model (N = 556) identifying factors associated with supervisors' likelihood to provide workplace accommodations and selected subgroup results stratified by age, gender, and worker unionization status

	Final model	**Final model - Stratified by age (median)**		**Final model - Stratified by gender**		**Final model - Stratified by worker unionization**		
	(N = 556)	**<47 yrs old (N = 257)**	**≥47 yrs old (N = 263)**	**Male (N = 403)**	**Female (N = 153)**	**All (N = 148)**	**Some (N = 96)**	**None (N = 310)**
Factor	**Coef. (95% CI)**	**Coef. (95% CI)**	**Coef. (95% CI)**	**Coef. (95% CI)**	**Coef. (95% CI)**	**Coef. (95% CI)**	**Coef. (95% CI)**	**Coef. (95% CI)**
Employer factors								
Heavy physical work	−0.079 (−0.160, 0.002)			−0.037 (−0.126, 0.053)	**−0.175 (−0.341, −0.009)**	**−0.164 (−0.320, −0.007)**	0.004 (−0.172, 0.179)	−0.029 (−0.082, 0.024)
Long-lasting postures & repetitive movements	**0.080 (0.011, 0.150)**	0.048 (−0.028, 0.123)	**0.142 (0.049, 0.236)**			0.091 (−0.044, 0.226)	0.073 (−0.110, 0.257)	**0.124 (0.050, 0.197)**
Workplace social capital	**−0.089 (−0.171, −0.007)**	−0.091 (−0.189, 0.008)	**−0.148 (−0.266, −0.030)**	−0.054 (−0.150, 0.043)	**−0.156 (−0.241, −0.072)**	−0.169 (−0.367, 0.030)	**−0.250 (−0.380, −0.119)**	0.028 (−0.085, 0.141)
Disability management	**0.243 (0.188, 0.298)**	**0.237 (0.123, 0.352)**	**0.339 (0.198, 0.481)**	**0.239 (0.172, 0.305)**	0.185 (−0.019, 0.388)	**0.357 (0.198, 0.517)**	**0.374 (0.216, 0.532)**	**0.154 (0.086, 0.223)**
Industry sector								
Manufacturing vs All others								
Health care & social assistance and *Other industry sectors	0.000							
Manufacturing	0.058 (−0.012, 0.128)	0.068 (−0.029, 0.164)	**0.088 (0.006, 0.170)**			0.110 (−0.084, 0.304)	−0.159 (−0.357, 0.038)	**0.096 (0.040, 0.152)**
Health care & social assistance vs All others								
Manufacturing and *Other industry sectors	0.000							
Health care & social assistance	**−0.071 (−0.135, −0.006)**							**−0.088 (−0.151, −0.026)**
Country								
US	0.000							
Canada	**0.155 (0.073, 0.238)**	**0.220 (0.105, 0.335)**	0.088 (−0.012, 0.187)	**0.175 (0.065, 0.284)**	−0.002 (−0.207, 0.203)	0.103 (−0.142, 0.349)	−0.118 (−0.407, 0.171)	**0.244 (0.191, 0.297)**
Supervisor factors								
Autonomy	**0.156 (0.071, 0.241)**	0.134 (−0.035, 0.304)	**0.237 (0.173, 0.300)**	**0.138 (0.046, 0.230)**	**0.218 (0.034, 0.403)**	**0.181 (0.003, 0.359)**	**0.344 (0.117, 0.572)**	**0.126 (0.051, 0.201)**
Leadership style - consideration	**0.261 (0.212, 0.310)**	**0.178 (0.113, 0.244)**	**0.357 (0.266, 0.448)**	**0.235 (0.186, 0.283)**	**0.285 (0.166, 0.403)**	**0.294 (0.133, 0.456)**	0.199 (−0.037, 0.435)	**0.246 (0.207, 0.285)**
Years as supervisor	**−0.095 (−0.169, −0.021)**					0.031 (−0.090, 0.152)	0.061 (−0.074, 0.196)	**−0.192 (−0.279, −0.106)**
Worker factors								
Worker absences (case vignette)								
No prior absences	0.000							

Factor	Final model (N = 556) Coef. (95% CI)	Final model - Stratified by age (median) <47 yrs old (N = 257) Coef. (95% CI)	≥47 yrs old (N = 263) Coef. (95% CI)	Final model - Stratified by gender Male (N = 403) Coef. (95% CI)	Female (N = 153) Coef. (95% CI)	Final model - Stratified by worker unionization All (N = 148) Coef. (95% CI)	Some (N = 96) Coef. (95% CI)	None (N = 310) Coef. (95% CI)
3 prior absences	**0.086 (0.031, 0.141)**	**0.115 (0.008, 0.221)**	0.015 (−0.112, 0.142)	**0.087 (0.021, 0.153)**	**0.079 (0.029, 0.130)**	0.016 (−0.093, 0.124)	**0.155 (0.059, 0.250)**	**0.093 (0.018, 0.168)**
Interactions								
Industry sector								
Disability management x Manufacturing vs All others	**0.113 (0.031, 0.195)**	**0.126 (0.004, 0.248)**	0.004 (−0.186, 0.194)	**0.135 (0.024, 0.245)**	0.036 (−0.141, 0.213)			
Disability management x Health care & social assistance vs All others	**0.070 (0.006, 0.133)**	**0.086 (0.017, 0.155)**	−0.053 (−0.211, 0.106)			**0.141 (0.021, 0.261)**	−0.051 (−0.285, 0.184)	0.056 (−0.030, 0.142)
Leadership style - consideration x Workplace social capital	**0.056 (0.019, 0.093)**			0.052 (−0.004, 0.108)	**0.097 (0.045, 0.148)**	0.013 (−0.135, 0.161)	−0.012 (−0.259, 0.236)	**0.077 (0.033, 0.121)**

*Other industry sectors = Utilities, Construction, Retail & Wholesale Trade, and Education Services

Statistically significant differences (p<0.05) are identified in bold text.