
Original Article

Assessing the Psychosocial Work Environment in Relation to Mental Health: A Comprehensive Approach

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Abstract

Objectives: Prevailing job stress models encourage a multidimensional view of the psychosocial work environment and highlight the role that multiple co-occurring stressors play in the aetiology of mental health problems. In this study, we develop a latent typology of psychosocial work environment profiles to describe how a comprehensive array of job stressors are clustered in the Canadian labour market. We also examine the association between these latent psychosocial work environment profiles and several indicators of mental health.

Methods: Data were collected from 6408 workers who completed the Canadian National Psychosocial Work Environment Survey. Psychosocial work exposures were measured using standard items from the Copenhagen Psychosocial Questionnaire. We employed latent profile analyses to identify groups of individuals with similar psychosocial work environment profiles. We used log-linear regression models to examine the association between latent psychosocial work environment profiles and burnout, stress, and cognitive strain.

Results: Four distinct groups with highly divergent psychosocial work environment profiles were identified. Adjusting for a range of demographic and socioeconomic factors, latent psychosocial work environment profiles were strongly related to mental health. Individuals who reported exposure to a comprehensive array of psychosocial job stressors (11% prevalence) reported the highest probability of burnout (PR: 7.51, 95% confidence interval [CI]: 5.56–10.15), stress (PR: 8.98, 95% CI: 6.20–13.0), and cognitive strain (PR: 7.29, 95% CI: 5.02–10.60).

Conclusions: Findings suggest that psychosocial work stressors are tightly clustered in the Canadian labour market, and that the clustering of work stressors is strongly associated with adverse mental

What's important about this paper?

Prevailing job stress models encourage a holistic view of the psychosocial work environment as a complex configuration of interacting stressors. Yet, prior literature has predominantly examined individual dimensions of the psychosocial work environment in relative isolation. In this study, we develop a novel typology of psychosocial work environment profiles with the aim of describing how job stressors are clustered in the Canadian labour market and how these clusters of job stressors are related to mental health. Our findings support the notion that the psychosocial work environment is comprised of multiple co-occurring job stressors that act in combination with each other to impact the mental health of workers. These results in turn highlight the value of adopting a holistic and integrated approach to the assessment of the psychosocial work environment as a determinant of worker health and well-being.

health outcomes. Future scholarship may benefit from adopting a more comprehensive approach to the assessment of psychosocial job quality as a determinant of health and well-being.

Keywords: cluster analysis; COPSQ; job strain; job stress; latent class analysis; work stressors

Introduction

The relationship between the psychosocial work environment and health is well established, with an extensive body of evidence linking adverse psychosocial work exposures to outcomes such as mortality, cardiovascular disease, mental illness, and musculoskeletal disorders (Hauke *et al.*, 2011; Gilbert-Ouimet *et al.*, 2014; Theorell *et al.*, 2016; Rugulies *et al.*, 2017; Taouk *et al.*, 2020). Within the occupational health sciences, prevailing theoretical models emphasize the complex and multidimensional nature of the psychosocial work environment as a determinant of worker health and well-being. The demand–control model, for example, posits that those who experience a combination of high demands and low control at work (i.e. job strain) are particularly susceptible to occupational stress and its associated health consequences (Karasek and Theorell, 1990). Other prominent approaches, including the effort-reward imbalance and job demands–resources models, also rely on a multidimensional view of the psychosocial work environment and highlight the role that multiple interacting job stressors play in the aetiology of occupational injury and illness (Siegrist, 2002; Bakker and Demerouti, 2007).

Recent scholarship has sought to combine these frameworks with the aim of developing a more comprehensive account of psychosocial job quality as a ‘package deal’ of co-occurring work factors (Christensen *et al.*, 2018; Burgard, 2020). Efforts to advance a more comprehensive view of the psychosocial work environment are supported by previous research demonstrating a graded relationship between the number of concurrent

job stressors to which individuals are exposed and the prevalence of adverse health outcomes (Butterworth *et al.*, 2013; Milner *et al.*, 2017; Stauder *et al.*, 2017). For example, studies have repeatedly shown that workers exposed to both job strain and effort-reward imbalance report more negative physical and mental health outcomes than workers exposed to either of these factors alone (Peter *et al.*, 2002; Ostry *et al.*, 2003; Niedhammer *et al.*, 2006; Dragano *et al.*, 2008; Jood *et al.*, 2017; Ndjaboue *et al.*, 2017; Nigatu and Wang, 2018). While prior literature illustrates the value and importance of adopting a comprehensive approach to the measurement and assessment of psychosocial job quality, research has to date focussed on a relatively narrow set of work exposures, privileging some aspects of the psychosocial work environment (e.g. demands, control, effort, and reward components) to the exclusion of other factor combinations (Bakker and Demerouti, 2017). Commonly available instruments for the measurement of psychosocial risk factors at work highlight a much wider range of possible exposure combinations than have previously been investigated (Kristensen *et al.*, 2005; Burr *et al.*, 2010; Clausen *et al.*, 2019).

Recent methodological developments—including the growing availability and popularity of latent class clustering techniques—present researchers with a unique opportunity to address this limitation and undertake a more comprehensive analysis of the psychosocial work environment as a determinant of health and well-being (Christensen *et al.*, 2018). Such techniques have recently been applied to develop multidimensional indicators of overall job quality in Canada, Europe, and the USA

(Van Aerden *et al.*, 2014; Van Aerden *et al.*, 2016; Chen *et al.*, 2019; Peckham *et al.*, 2019). In this study, we use a similar methodological approach to develop and validate a multidimensional measure of psychosocial job quality using a national sample of the general working population in Canada. Our objectives are to (i) construct a latent typology of psychosocial work environment profiles that captures a comprehensive array of relevant work exposures; (ii) evaluate how latent psychosocial work environment profiles are distributed across demographic and socioeconomic groups; and (iii) examine the relationship between latent psychosocial work environment profiles and three indicators of mental health: burnout, stress, and cognitive strain.

Methods

Data and sample

We used data from the National Psychosocial Work Environment Survey (NPWES), a population-based cross-sectional survey providing the most comprehensive available portrait of the psychosocial work environment in Canada. NPWES respondents were drawn from an existing panel of 100 000 Canadians maintained by EKOS Research Associates. Panel members were randomly recruited, broadly representative of the Canadian population, and eligible to complete the survey if they were working in an organization with six or more employees. The survey was administered online in English and French. A full version of the survey questionnaire can be found in the supplementary materials accompanying this article. The first wave of the NPWES was administered between February and March of 2016. A second wave of data was collected between February and March of 2019. A total of 108 804 invitations were sent and a total of 12 895 surveys were completed, yielding a response rate of 12%. From this initial sample, we removed 4774 individuals who did not meet the study criteria. After dropping observations missing information on key variables, we retained a final sample of 6408 respondents.

Measures

Psychosocial work factors were measured using standard items from the Copenhagen Psychosocial Questionnaire (COPSOQ) (Kristensen *et al.*, 2005; Pejtersen *et al.*, 2010; Burr *et al.*, 2019). The NPWES incorporated 36 items from the second and third versions of the COPSOQ to measure the following seventeen dimensions of the psychosocial work environment: quantitative demands, work pace, emotional demands, influence at work, possibilities for development, meaning of

work, commitment to the workplace, predictability, rewards, role clarity, role conflicts, quality of leadership, social support from supervisors, social support from colleagues, social community at work, job insecurity, work-life conflict, vertical trust, and organizational justice. The multidimensional nature of the COPSOQ instrument has previously been validated in a Canadian sample (Ramkissoon *et al.*, 2019). We excluded two common dimensions of the COPSOQ—work-life conflict and commitment to the workplace—as we believe these are better conceptualized as outcomes of the psychosocial work environment. Items were measured using five-point Likert-type response scales (e.g. from ‘never/hardly ever’ to ‘always’; from ‘not at all’ to ‘all the time’). Item scores within each dimension of the psychosocial work environment were pooled and rescaled from 0 to 100, with higher values indicating more negative exposure levels. Properties of the seventeen psychosocial work dimensions are presented in Table 1. Using a theory-driven (i.e. *a priori*) approach and drawing insight from recent work in this area (Berthelsen *et al.*, 2018; Clausen *et al.*, 2019), we proposed the following six-factor latent structure of the psychosocial work environment: (i) job demands, (ii) job control and meaning, (iii) co-worker support, (iv) supervisor support, (v) justice, trust, and rewards, and (vi) job security. The proposed factor structure is described in Table 1, and the broader conceptual model informing our study is presented in the supplementary materials (see Supplementary Fig. S1). Below, we describe the steps that were taken to validate the factor structure. Dimension scores within each psychosocial work environment factor were pooled and rescaled from 0 to 100 with higher values indicating more negative exposure levels.

Outcomes of interest were self-reported burnout, stress, and cognitive strain. All outcomes were measured using questions from the COPSOQ II (long version) (Pejtersen *et al.*, 2010). Burnout was measured using four questions: ‘How often have you felt worn out?’; ‘How often have you been emotionally exhausted?’; ‘How often have you been physically exhausted?’; and ‘How often have you felt tired?’ Stress was measured using: ‘How often have you been stressed?’; ‘How often have you been irritable?’; ‘How often have you had problems relaxing?’; and ‘How often have you been tense?’ Cognitive strain was measured using: ‘How often have you had problems concentrating?’; ‘How often have you found it difficult to think clearly?’; ‘How often have you had difficulty in making decisions?’; and ‘How often have you had difficulty with remembering?’ All items were measured using five-point Likert-type response scales ranging from ‘not at all’ to ‘always’. Item scores were pooled and

Table 1. Dimensions of the psychosocial work environment: Canadian National Psychosocial Work Environment Survey.

Psychosocial work factor	Factor loading	COPSOQ dimension	Items	Sample question	Mean	SD
Job demands	0.52	Quantitative demands	2	Do you get behind with your work?	45.6	23.5
	0.55	Work pace	2	Do you have to work very fast?	61.0	22.5
	0.72	Emotional demands	3	Is your work emotionally demanding?	46.8	25.3
	0.69	Role conflicts	3	Are contradictory demands placed on you at work?	47.8	25.0
Job control and meaning	0.57	Influence at work	2	Can you influence the amount of work assigned to you?	52.2	25.5
	0.61	Possibilities for development	3	Can you use your skills or expertise in your work?	30.8	21.5
	0.63	Meaning of work	2	Do you feel that the work you do is important?	30.6	26.7
	0.66	Role clarity	2	Does your work have clear objectives?	30.2	23.1
Co-worker support	0.73	Support from colleagues	1	How often could you get help and support from your colleagues, if needed?	23.3	19.9
	0.81	Sense of community	1	Is there a good atmosphere between you and your colleagues?	18.2	17.2
Supervisor support	0.83	Quality of leadership	3	To what extent would you say your immediate superior is good at work planning?	45.9	26.8
	0.89	Support from supervisors	2	How often could you get help and support from your superior, if needed?	33.4	27.9
Justice, trust, and rewards	0.81	Predictability	2	Do you receive all the information you need in order to do your work well?	47.0	25.8
	0.76	Rewards	2	Is your work recognized and appreciated by the management?	39.3	27.0
	0.79	Vertical trust	2	Can the employees trust the information that comes from the management?	35.4	24.4
	0.88	Organizational justice	2	Are conflicts resolved in a fair way?	42.1	24.8
Job security		Job insecurity	1	Are you worried about becoming unemployed?	40.0	29.8

Notes: Higher scores indicate more negative exposure levels; SD, standard deviation.

rescaled from 0 to 100 with higher values coded to indicate more negative burnout, stress, cognitive strain outcomes. Accounting for the overall distribution of observed values, we dichotomized these variables using a cut-off point of 75. Using these dichotomous indicators, the sample-wide prevalence of burnout, stress, and cognitive strain was 11.7%, 7.8%, and 7.2%, respectively.

We also collected information on the following demographic and socioeconomic characteristics: age (18–29, 30–39, 40–49, 50–59, or 60 and above), gender (man, woman, or transgender), region (Western, Central, Eastern, or Northern Canada), education (high school degree or less, some postsecondary, or postsecondary degree), employment status (full-time, part-time, or casual), shift type (regular daytime, regular evening/night, rotating, or irregular), industry (according to the North

American Industry Classification System), and employment in a managerial position (yes or no).

Analyses

We completed our analyses in four steps. First, we conducted confirmatory factor analysis (CFA) to validate the proposed factor structure for measuring the psychosocial work environment. CFA models were estimated using the maximum likelihood procedure in Mplus 8.1. On the basis of recommended practice, model fit was deemed acceptable with a root mean square error of approximation (RMSEA) value below 0.06; a standardized root means square residual (SRMSR) value below 0.08; a Comparative Fit Index (CFI) value above 0.95; and a Tucker–Lewis Fit Index (TFI) value above 0.95 (Kline, 2016).

Second, we used latent profile analysis (LPA) to identify groups of individuals with similar configurations (or profiles) of risk factors in the psychosocial work environment. The goal of LPA is to classify a seemingly heterogeneous sample of cases into a smaller number of groups that are each relatively homogeneous with respect to a given set of properties (Hagenaars and McCutcheon, 2002; Masyn, 2013). In contrast to traditional clustering techniques, cases are not allocated to a single group, but rather assigned a posterior probability of membership for each of the enumerated profiles (Christensen *et al.*, 2018). We applied LPA to the six psychosocial work environment factors validated in the first step of our analysis. LPA models were estimated using the maximum likelihood procedure in Mplus 8.1. We used the following model indices to evaluate the statistical adequacy of resultant profile solutions: the Akaike information criterion (AIC), the Bayesian information criterion (BIC), the sample-size adjusted BIC (ABIC), the Lo–Mendell–Rubin adjusted likelihood ratio test (LMR), and the Vuong–Lo–Mendell–Rubin likelihood ratio test (VLMR). Given that model indices are largely heuristic in nature, we applied the above statistical tools in concert with more conceptual and substantive criteria (Masyn, 2013). For example, we ruled out profile solutions that provided superior fit but extracted latent groupings that were negligible in size. We cross-validated the outcome of our profile enumeration process by conducting supplementary LPA analyses on the first and second waves of the data, separately.

Third, we used descriptive statistics to characterize the main features of each group, considering how each of the latent psychosocial work environment profiles differed with respect to key demographic and socioeconomic variables. We also compared the prevalence of burnout, stress, and cognitive strain across each of the latent profile groups.

Finally, we conducted multivariate log-linear regression analyses to examine the cross-sectional association between the latent psychosocial work environment profiles and burnout, stress, and cognitive strain. We fit two separate models for each of the respective outcomes: a crude model (Model 1) with posterior probabilities of membership in each of the latent profile groups entered into the regression equation as continuous independent variables; and a fully adjusted model (Model 2) with the complete set of demographic and socioeconomic covariates entered into the regression equation. We assessed the robustness of our main regression results by conducting supplementary analyses using alternative cut-off points for the three outcomes of interest. In the first supplementary model (Model 3), we employed a lower cut-off point (65 versus 75). In a second supplementary

model (Model 4), we employed a higher cut-off point (85 versus 75). Regression analyses were performed using Stata 16.0 (StataCorp LP, College Station, TX, USA) and weighted to match the age, gender, and geographic characteristics of the Canadian working population.

Ethics

Ethics approval was obtained from the Health Sciences Research Ethics Board at the University of Toronto (#33521).

Results

Descriptive characteristics of the sample

Descriptive characteristics are presented in Table 2. Men and women were equally represented in the sample. On average, study participants were older and more educated than the general working population in Canada. For example, the proportion of participants with a postsecondary degree was 50.4% compared to 30.5% in the overall labour force. Individuals employed in educational services and other service industries were also overrepresented in the study sample. The proportion of the sample working full-time (30 h or more) was similar to the Canadian population (80.8% versus 81.1%).

Validation of the psychosocial work environment factors

Validation of the six psychosocial work environment factors via CFA supported the adequacy of the proposed factor structure. The resultant indices suggested an acceptable level of model fit, with an RMSEA value of 0.056, an SRMSR value of 0.030, a CFI value of 0.965, and a TFI value of 0.952. Based on a post-hoc inspection of the modification indices, the initial model was re-specified to allow for error covariance between five pairs of items that were conceptually linked or highly correlated: (i) possibilities for development and meaning of work; (ii) possibilities for development and influence at work; (iii) predictability and rewards; (iv) vertical trust and organizational justice; and (v) social support from colleagues and social support from supervisors. Factor loadings are presented in Table 1.

Identification of the latent psychosocial work environment profiles

Fit statistics from the LPA models are presented in the supplementary materials (see Table S1). We excluded models with seven or more profiles, as they extracted groups that were negligible in size (i.e. less

Table 2. Descriptive characteristics of the study sample, weighted proportions: Canadian National Psychosocial Work Environment Survey.

		<i>n</i> = 6408
Age	18–29	15.3%
	30–39	26.6%
	40–49	23.6%
	50–59	21.0%
	60 or above	13.5%
Gender	Man	48.6%
	Woman	51.2%
	Transgender	0.2%
Region	Western Canada	31.3%
	Central Canada	62.2%
	Eastern Canada	6.1%
	Northern Canada	0.5%
Education	Postsecondary degree	50.4%
	Some postsecondary	35.1%
	High school degree or less	14.5%
Employment status	Full-time	80.8%
	Part-time	12.9%
	Casual	6.2%
Shift type	Regular, daytime	72.4%
	Regular, evening, or night	5.8%
	Rotating	10.1%
	Irregular	11.8%
Industry	Agriculture	1.8%
	Mining	1.8%
	Utilities	3.2%
	Construction	4.1%
	Manufacturing	7.4%
	Wholesale trade	1.7%
	Transportation, warehousing	4.6%
	Information	6.4%
	Finance, insurance, real estate	5.5%
	Administrative, support	2.2%
	Educational services	13.5%
	Health care, social assistance	13.6%
	Arts, entertainment, recreation	2.4%
	Accommodation, food services	3.3%
	Public administration	10.4%
Retail trade	7.4%	
Professional, scientific, technical services	7.5%	
Other services	3.4%	
Managerial position	Yes	26.9%
	No	73.1%

than 2% of the sample) (Masyn, 2013). The LMR and VLMR likelihood ratio tests were consistently significant ($P < 0.01$), suggesting that model fit improved

as the number of groups increased. AIC, BIC, and ABIC values decreased with each consecutive model, providing further indication of improvements in model fit. Improvements in the latter three indices showed a clear plateau after three or four profiles (see [Supplementary Fig. S2](#)). We therefore excluded model solutions with five or more profiles from subsequent analyses (Masyn, 2013).

Estimated scores on the psychosocial work environment factors for model solutions with two to four profiles are plotted in [Fig. 1](#). Profiles with higher scores indicate groups with more negative psychosocial work environment exposures. Emergent profiles were clearly distinguishable from one another, with each group in a given solution scoring consistently better (or consistently worse) than the rest across all six of the psychosocial work environment factors. We selected the more discriminant four-profile solution as our LPA model of choice. One group of respondents with consistently favourable (i.e. lower) profile scores accounted for 22% of the sample (Profile 1). A second group with consistently negative (i.e. higher) profile scores accounted for 11% of the sample (Profile 4). Two further groups comprising 40% and 27% of the sample, respectively, exhibited profile scores that were roughly in between the latter groups (Profiles 2 and 3). While the four groups exhibited different profile scores across all six psychosocial work environment factors, observed scores diverged more substantially along some work environment factors than others. The least variation in group-level scores was observed along the job demands and co-worker support factors, while the greatest variation in scores was observed along the supervisor support and justice, trust, and rewards factors.

Results of the cross-validation analyses in which we re-estimated LPA models on the first and second waves of the data separately are presented in [Supplementary material](#). Overall findings from these analyses were well aligned with the results presented here.

Descriptive characteristics of the latent psychosocial work environment profiles

Descriptive characteristics of the latent psychosocial work environment profiles are presented in [Table 3](#). Generally, age, gender, and regional characteristics were evenly distributed across the four-profile groups. However, the proportion of individuals 60 years of age or older was somewhat greater in the most favourable profile (Profile 1) compared to the other groups. Individuals in Profile 1 and Profile 2 were higher educated and more likely to report maintaining

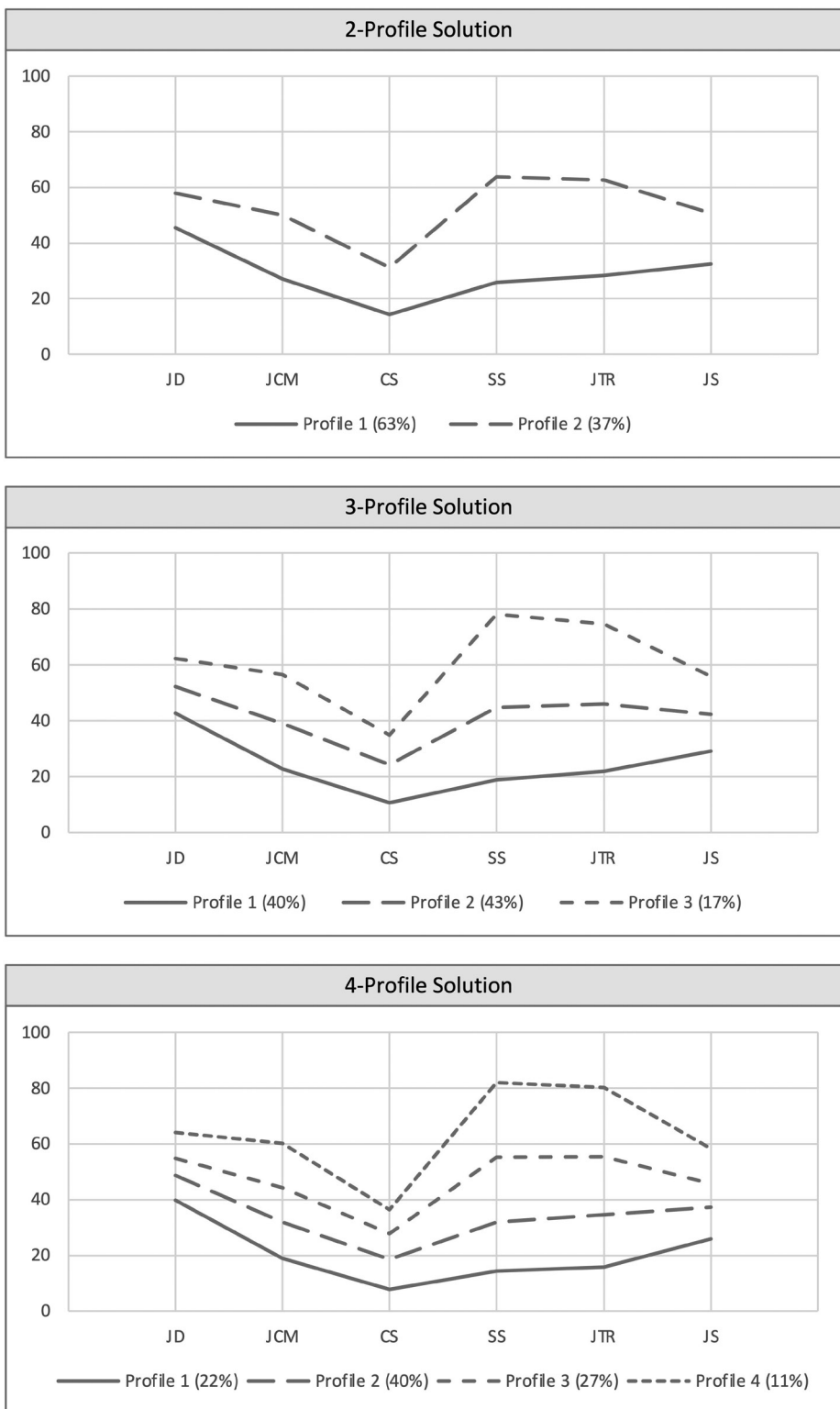


Figure 1. Estimated factor scores for the latent psychosocial work environment profiles: Canadian National Psychosocial Work Environment Survey (notes: higher scores indicate more negative exposure levels; JD = job demands; JCM = job control and meaning; CS = co-worker support; SS = supervisor support; JTR = justice, trust, and rewards; JS = job security).

Table 3. Descriptive characteristics of the latent psychosocial work environment profiles, weighted proportions: Canadian National Psychosocial Work Environment Survey.

		Profile 1	Profile 2	Profile 3	Profile 4	
		<i>n</i> = 1387 (22%)	<i>n</i> = 2562 (40%)	<i>n</i> = 1758 (27%)	<i>n</i> = 701 (11%)	
Age	18–29	8.6%	10.3%	8.8%	7.2%	
	30–39	19.6%	21.8%	20.4%	17.4%	
	40–49	21.4%	24.9%	26.5%	25.1%	
	50–59	25.9%	24.4%	26.1%	30.4%	
	60 or above	24.5%	18.6%	18.1%	19.9%	
Gender	Man	46.8%	48.6%	47.9%	48.6%	
	Woman	53.0%	51.3%	51.7%	51.0%	
	Transgender	0.2%	0.2%	0.4%	0.4%	
Region	Western Canada	30.1%	30.1%	31.5%	34.8%	
	Central Canada	62.6%	63.1%	60.4%	57.5%	
	Eastern Canada	6.6%	6.4%	7.3%	7.7%	
	Northern Canada	0.7%	0.4%	0.8%	0.0%	
Education	Postsecondary degree	52.9%	52.8%	48.6%	44.7%	
	Some postsecondary	34.4%	34.1%	36.0%	40.6%	
	High school degree or less	12.6%	13.1%	15.4%	14.7%	
Employment status	Full-time	79.9%	81.7%	82.0%	81.4%	
	Part-time	12.6%	12.6%	11.7%	12.9%	
	Casual	7.5%	5.8%	6.4%	5.8%	
Shift Type	Regular, daytime	77.7%	74.4%	70.7%	66.2%	
	Regular, evening, or night	4.1%	4.9%	6.7%	6.5%	
	Rotating	7.1%	9.5%	11.0%	13.4%	
	Irregular	11.2%	11.2%	11.7%	13.9%	
Industry	Agriculture	2.3%	2.1%	1.3%	1.1%	
	Mining	1.5%	1.7%	1.4%	2.2%	
	Utilities	2.3%	3.3%	3.9%	3.5%	
	Construction	5.3%	3.8%	3.6%	2.7%	
	Manufacturing	6.0%	7.4%	7.8%	8.9%	
	Wholesale trade	1.7%	1.6%	1.7%	1.9%	
	Transportation, warehousing	3.4%	3.7%	5.2%	9.6%	
	Information	7.8%	5.6%	6.1%	6.2%	
	Finance, insurance, real estate	6.9%	5.8%	4.7%	3.9%	
	Administrative, support	2.0%	2.2%	2.1%	1.4%	
	Education	13.8%	15.1%	14.0%	12.1%	
	Health care, social assistance	11.8%	13.7%	15.5%	12.2%	
	Arts, entertainment, recreation	2.4%	2.6%	1.9%	1.9%	
	Accommodation, food	3.6%	2.5%	2.9%	2.7%	
	Public administration	8.5%	11.4%	11.8%	11.8%	
	Retail trade	7.1%	6.7%	6.7%	8.5%	
	Professional, scientific, technical	9.7%	7.7%	5.9%	5.0%	
	Other services	3.8%	3.1%	3.4%	4.3%	
	Managerial position	Yes	35.7%	29.5%	20.8%	19.8%
		No	64.3%	70.5%	79.2%	80.2%
Burnout		5.2%	8.1%	13.2%	34.1%	
Stress		3.2%	5.4%	7.9%	26.3%	
Cognitive strain		3.3%	5.7%	7.3%	20.1%	

a managerial role. By contrast, individuals in the least favourable profile (Profile 4) were more likely to report rotating or irregular shifts. Individuals in Profile 1 were approximately twice as likely to be employed in professional, scientific, and technical services than their counterparts in Profile 4 (9.7% versus 5.0%). Individuals in Profile 4 were nearly three times as likely to be employed in transportation and warehousing services (9.6% versus 3.4%). Similar proportions of individuals were engaged in full-time (versus part-time or casual) employment in each of the four groups. Clear gradients in burnout, stress, and cognitive strain were present between the four groups. The prevalence of burnout, stress, and cognitive strain was 5.2%, 3.2%, and 3.3% among individuals in Profile 1, compared to 34.1%, 26.3%, and 20.1% among their counterparts in Profile 4.

Associations with burnout, stress, and cognitive strain

Results of the multivariate logistic regression models are presented in Table 4. Estimates in this table represent the association between full exposure to a given profile (i.e. a 100% posterior probability of membership) and each outcome of interest. In every model, we treated the most favourable profile (Profile 1) as the reference group.

Table 4. Associations between latent psychosocial work environment profiles and mental health outcomes: Canadian Psychosocial Work Environment Survey.

	Model 1	Model 2
	PR (95% CI)	PR (95% CI)
Burnout		
Profile 1	Ref.	Ref.
Profile 2	1.71 (1.21–2.42)	1.68 (1.18–2.38)
Profile 3	2.63 (1.94–3.56)	2.64 (1.94–3.59)
Profile 4	7.62 (5.68–10.22)	7.51 (5.56–10.15)
Stress		
Profile 1	Ref.	Ref.
Profile 2	1.53 (1.00–2.34)	1.48 (0.96–2.29)
Profile 3	2.31 (1.59–3.37)	2.51 (1.71–3.67)
Profile 4	8.52 (5.96–12.17)	8.98 (6.20–13.01)
Cognitive strain		
Profile 1	Ref.	Ref.
Profile 2	1.93 (1.27–2.92)	1.87 (1.23–2.84)
Profile 3	2.32 (1.59–3.38)	2.43 (1.65–3.57)
Profile 4	7.27 (5.04–10.48)	7.29 (5.02–10.60)

Notes: Model 1 is unadjusted; Model 2 is adjusted for age, gender, region, education, employment status, shift type, industry, and management position; PR, prevalence ratio; CI, 95% confidence interval.

In the fully adjusted model (Model 2), membership in Profile 2 was associated with a 68% higher probability of reporting burnout (prevalence ratio [PR]: 1.68, 95% confidence interval [CI]: 1.18–2.38), a 48% higher probability of reporting stress (PR: 1.48, 95% CI: 0.96–2.29), and an 87% higher probability of reporting cognitive strain (PR: 1.87, 95% CI: 1.23–2.84). Membership in Profile 3 was associated with a 164% higher probability of reporting burnout (PR: 2.64, 95% CI: 1.94–3.59), a 151% higher probability of reporting stress (PR: 2.51, 95% CI: 1.71–3.67), and a 143% higher probability of reporting cognitive strain (PR: 2.43, 95% CI: 1.65–3.57). Finally, membership in Profile 4 was associated with a 651% higher probability of reporting burnout (PR: 7.51, 95% CI: 5.56–10.15), a 798% higher probability of reporting stress (PR: 8.98, 95% CI: 6.20–13.01), and a 629% higher probability of reporting cognitive strain (PR: 7.29, 95% CI: 5.02–10.60).

Results of supplementary analyses using somewhat lower (i.e. 65) and somewhat higher (i.e. 85) cut-off points for defining burnout, stress, and cognitive strain are presented in Table 5. These analyses revealed similar overall patterns, though associations between

Table 5. Associations between latent psychosocial work environment profiles and mental health outcomes, using alternative specifications of burnout, stress, and cognitive strain: Canadian Psychosocial Work Environment Survey.

	Model 3	Model 4
	PR (95% CI)	PR (95% CI)
Burnout		
Profile 1	Ref.	Ref.
Profile 2	2.07 (1.69–2.54)	1.44 (0.92–2.24)
Profile 3	3.07 (2.56–3.69)	2.57 (1.74–3.80)
Profile 4	6.58 (5.65–7.70)	7.63 (5.19–11.20)
Stress		
Profile 1	Ref.	Ref.
Profile 2	2.05 (1.59–2.66)	1.48 (0.86–2.52)
Profile 3	3.30 (2.62–4.15)	2.67 (1.66–4.30)
Profile 4	6.92 (5.50–8.72)	10.22 (6.47–16.15)
Cognitive strain		
Profile 1	Ref.	Ref.
Profile 2	2.22 (1.55–3.16)	1.46 (0.87–2.47)
Profile 3	2.99 (2.16–4.14)	1.83 (1.12–2.99)
Profile 4	7.04 (5.09–9.73)	6.70 (4.22–10.62)

Notes: Model 3 employs an alternative outcome cut-off point of 65 (versus 75); Model 4 uses an alternative outcome cut-off point of 85 (versus 75); estimates are fully adjusted for age, gender, region, education, employment status, shift type, industry, and management position; PR, prevalence ratio; CI, 95% confidence interval.

membership in Profile 4 and the mental health outcomes of interest were somewhat smaller in magnitude. For example, in the supplementary model using a lower cut-off point (Model 3), membership in Profile 4 was associated with a 558% higher probability of reporting burnout (PR: 6.58, 95% CI: 5.65–7.70), a 592% higher probability of reporting stress (PR: 6.92, 95% CI: 5.50–8.72), and a 604% higher probability of reporting cognitive strain (PR: 7.04, 95% CI: 5.09–9.73). Overall, however, our findings were robust to different specifications of burnout, stress, and cognitive strain.

Discussion

In this study, we sought to develop a novel typology of psychosocial work environment profiles that describes how a wide range of job stressors are clustered in the Canadian labour market and to assess the relationship between these latent psychosocial work environment profiles and mental health outcomes in the general working population. Whereas previous literature has examined the association between multidimensional indicators of psychosocial job quality and workers' mental health (Peter *et al.*, 2002; Niedhammer *et al.*, 2006; Butterworth *et al.*, 2013; Milner *et al.*, 2017; Nigatu and Wang, 2018), the strength of our study lies in the broader set of job characteristics that we incorporated to obtain a more comprehensive portrait of the psychosocial work environment as a determinant of mental health.

Our main findings can be summarized as follows. First, in line with recent studies of a similar nature, we were able to identify distinct and contrasting psychosocial work environment profiles in the Canadian labour market (Van Aerden *et al.*, 2014, 2016; Christensen *et al.*, 2018; Chen *et al.*, 2019; Peckham *et al.*, 2019). Our LPA analyses supported the existence of four clearly discernible profiles that exemplified varying levels of psychosocial job quality. Approximately one in five workers in the sample (22%) reported consistently favourable conditions across all relevant psychosocial work environment factors (Profile 1), while approximately one in 10 workers (11%) reported consistently negative working conditions (Profile 4). The remaining majority of workers (67%) were situated in two latent groups whose psychosocial job characteristics fell in between the former extremes (Profiles 2 and 3). Notably, the four groups diverged substantially across all of the measured psychosocial work environment factors.

Second, in contrast to previous literature in this area (Landsbergis *et al.*, 2014), many of the demographic and socioeconomic factors that are known to predict psychosocial job quality were not strongly related to the

psychosocial work environment profiles extracted from our sample. We observed some minor compositional differences between groups with respect to age, education, and industry (Härenstam *et al.*, 2003; Van Aerden *et al.*, 2014; Christensen *et al.*, 2018; Chen *et al.*, 2019; Peckham *et al.*, 2019). However, in our sample at least, exposure to favourable versus unfavourable psychosocial work environments could not be explained simply in terms of personal and labour market characteristics.

Third, in multivariable regression models, latent psychosocial work environment profiles were strongly related to self-reported mental health outcomes. We observed a clear and stepwise gradient across the four latent profile groups, with the prevalence of adverse mental health outcomes increasing as a function of decreasing psychosocial job quality. Prior studies have established that workers exposed to a large number of concurrent work stressors report higher rates of mental illness (Butterworth *et al.*, 2013; Milner *et al.*, 2017; Stauder *et al.*, 2017). For example, individuals who report experiencing both job strain and effort-reward imbalance at work exhibit higher levels of mental health problems than individuals who are exposed to one of these factors alone (Peter *et al.*, 2002; Niedhammer *et al.*, 2006; Nigatu and Wang, 2018). Notably, however, the associations observed in our study are substantially greater in magnitude than those reported in previous empirical work, including recent meta-analyses of the relationship between psychosocial work environment factors and mental health (Theorell *et al.*, 2015; Madsen *et al.*, 2017). Thus, our findings suggest that adopting a comprehensive approach to the assessment of the psychosocial work environment—i.e. by going beyond job demands and job control to incorporate a broader set of work stressors—provides greater predictive validity than more conventional approaches that capture fewer dimensions of psychosocial job quality.

Finally, whereas prevailing job stress models describe complex and heterogeneous configurations of psychosocial work factors (e.g. work environments that are characterized by a combination of both favourable and unfavourable features) (Karasek and Theorell, 1990; Siegrist, 2002; Bakker and Demerouti, 2007), we found that dimensions of the psychosocial work environment are highly correlated at the individual level, such that individuals who experience positive (or negative) working conditions along one factor are very likely to report positive (or negative) conditions across all of them. These findings hint at the interrelated nature of psychosocial work exposures and highlight the importance of workplace mental health promotion strategies that adopt a comprehensive view of the psychosocial

work environment to consider the role that multiple, co-occurring stressors play in the aetiology of mental health problems (Peckham *et al.*, 2019; Burgard, 2020). Indeed, the results of our study suggest that, for some workers at least, there may be no ‘magic bullet’ for reducing stress and promoting mental health in the workplace. On the contrary, among the one in ten workers in Profile 4 who report overwhelmingly negative psychosocial working conditions, it is likely that interventions which aim to modify one or another dimension of the psychosocial work environment but leave all other aspects unchanged will offer little in the way of a solution for the higher rates of adverse mental health outcomes observed in this group. For these workers, successful interventions may instead be required which address a broader set of work factors or perhaps even the psychosocial work environment as a comprehensive whole (LaMontagne *et al.*, 2014; Memish *et al.*, 2017).

Our findings also contribute to ongoing discussions concerning the role of stress buffers in the workplace. Psychosocial resources have been shown to buffer the impact of job stressors, with the strongest interactions observed among individuals who experience the greatest levels of stress. On the other hand, psychosocial resources are also believed to exert their own direct effects on employee health and well-being. Extant research provides support for both positions (Bakker and Demerouti, 2017). Our findings provide some suggestive evidence in support of the latter hypothesis, with increasing levels of job control and meaning, co-worker support, supervisor support, and justice, trust, and rewards being strongly and linearly associated with more favourable mental health outcomes. Notably, however, we did not test potential interactions between various dimensions of the psychosocial work environment, in part because the extracted groupings diverged across all of the observed work factors. As a result, we are unable to comment directly on the extent to which, for example, individuals in Profile 4 report much worse levels of mental health due to their exposure to a larger number of concurrent job stressors or due to the occurrence of synergistic interactions between them.

The inclusion of a comprehensive array of psychosocial job characteristics measured using a widely validated and internationally recognized questionnaire represents an innovative feature and major strength of our study. Future scholarship should continue to move in this direction by incorporating a broad set of work stressors in the assessment of psychosocial job quality. In addition, further studies are needed to better understand the observed interrelatedness of psychosocial work factors. For example, prior research suggests that some

aspects of the psychosocial work environment, such as leadership quality and organizational climate, are causally antecedent to the rest (Härenstam, 2008; Berthelsen *et al.*, 2018; Rugulies, 2019). The hierarchical ordering of work factors and, in particular, the overall role that some of those factors play in determining other components of psychosocial job quality might provide one explanation for the findings reported here. Consistent with such an interpretation, we observed the largest differences in psychosocial job quality along the supervisor support and justice, trust, and rewards dimensions. Given our finding that psychosocial work exposures are highly interrelated at the individual level, structural interventions aimed at improving these contextual (or workplace-level) factors may present a particularly effective approach for addressing the psychosocial work environment as a whole (Martin *et al.*, 2016). Such an approach would be consistent with the notion of a ‘hierarchy of controls’ for the prevention of occupational stress and stress-related illnesses (Dollard *et al.*, 2007; LaMontagne *et al.*, 2007). The notion here is that structural interventions aimed at addressing upstream factors such as leadership quality and broader organizational processes stand the greatest chance of improving psychosocial job quality and promoting workplace mental health precisely because of the myriad effects they have on a wide range of downstream job conditions (Härenstam, 2008; Wood *et al.*, 2019). While our findings hint at the possibly hierarchical nature of psychosocial working conditions and, by extension, at the potential value of structural workplace interventions, further research is needed to explore this and other hypotheses concerning observed interrelationships between different aspects of the psychosocial work environment. This will require the development and evaluation of theoretical models that provide a more explicit account of the hierarchical (or multilevel) organization of psychosocial work exposures. Unfortunately, cross-sectional surveys such as the NPWES do not provide a rigorous framework within which to create and test such models. Future studies employing longitudinal—preferably multiwave—panel data will be better suited to the task, as they will enable researchers to assess temporal and causal relationships between various dimensions of the psychosocial work environment.

There are several methodological issues to consider in the interpretation of our results. First, we relied on subjective assessments of psychosocial work exposures and mental health outcomes, which may have implications for our findings. For example, our results may be influenced by common method bias, whereby respondents’ feelings and attitudes towards one dimension of the psychosocial work environment condition their subjective perceptions

of other dimensions (Podsakoff *et al.*, 2003). Second, our data were cross-sectional which raises issues of reverse (or reciprocal) causation (Bandura, 1978; Tang, 2014). That is, perceptions of burnout or stress may have influenced how respondents viewed their psychosocial work environment. Longitudinal studies are needed. Third, as we noted above, we were unable to test for the presence of interaction effects between various dimensions of the psychosocial work environment. Future research may provide a better understanding of whether the association we have observed between psychosocial work environment profiles and mental health simply reflects the main effects of individual job stressors or, alternatively, whether multiple co-occurring job stressors interact and act in combination with each other to influence the mental health of workers. Fourth, the NPWES had a low response rate (12%) and we lacked information on non-respondents. While we attempted to address the resulting representativeness problem by reweighting the sample to match the age, gender, and geographic characteristics of the Canadian population, we had a disproportionately high rate of postsecondary graduates (50.4% compared to 30.5% in the overall labour force). Despite this, we observed good overall variance in all measured variables, enabling a meaningful analysis of the relationship between psychosocial job quality and mental health (Rothman, 2013). The NPWES also lacked information on several important demographic and socioeconomic factors that have been found to predict psychosocial job quality. These include marital status, immigrant status, income, type of employment contract, and union representation. Finally, there remains a need to look at configurations of and interactions between a broader range of work and non-work factors (Härenstam, 2009).

Conclusions

The results of our study suggest that psychosocial work stressors are tightly clustered in the Canadian labour market, and that the clustering of work stressors is strongly associated with adverse mental health outcomes. These findings highlight the importance of adopting a comprehensive approach to the assessment of psychosocial job quality as a determinant of mental health and well-being.

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Data Availability

The data underlying this article cannot be shared publicly due to the privacy of individuals who participated in the survey.

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