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Psychosocial safety climate as an antecedent of work characteristics and psychological strain: A multilevel model

Maureen F. Dollard a, Tessa Opie a, Sue Lenthall b, John Wakeman b, Sabina Knight c, Sandra Dunn d, Greg Rickard e & Martha MacLeod f

a Work & Stress Research Group, Centre for Applied Psychological Research, University of South Australia, Adelaide, Australia
b Centre for Remote Health, a joint Centre of Flinders University & Charles Darwin University, Alice Springs, Australia
c Mount Isa Centre for Rural and Remote Health James Cook University, Mt Isa, Australia
d School of Health, Charles Darwin University, Darwin, Australia
e Healthcare Australia, Sydney, Australia
f School of Health Sciences, University of Northern British Columbia, Canada

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Psychosocial safety climate as an antecedent of work characteristics and psychological strain: A multilevel model

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aWork & Stress Research Group, Centre for Applied Psychological Research, University of South Australia, Adelaide, Australia; bCentre for Remote Health, a joint Centre of Flinders University & Charles Darwin University, Alice Springs, Australia; cMount Isa Centre for Rural and Remote Health James Cook University, Mt Isa, Australia; dSchool of Health, Charles Darwin University, Darwin, Australia; eHealthcare Australia, Sydney, Australia; fSchool of Health Sciences, University of Northern British Columbia, Canada

Psychosocial safety climate (PSC) refers to a specific organizational climate for the psychological health of workers. It is largely determined by management and at low levels is proposed as a latent pathogen for psychosocial risk factors and psychological strain. Using an extended Job Demands-Control-Support framework, we predicted the (24 month) cross-level effects of PSC on psychological strain via work conditions. We used a novel design whereby data from two unrelated samples of nurses working in remote areas were used across time (N = 202, Time 1; N = 163, Time 2), matched at the work unit level (N = 48). Using hierarchical linear modelling we found that unit PSC assessed by nurses predicted work conditions (workload, control, supervisor support) and psychological strain in different nurses in the same work unit 24 months later. There was evidence that the between-group relationship between unit PSC and psychological strain was mediated via Time 2 work conditions (workload, job control) as well as Time 1 emotional demands. The results support a multilevel work stress model with PSC as a plausible primary cause, or “cause of the causes”, of work-related strain. The study adds to the literature that identifies organizational contextual factors as origins of the work stress process.

Keywords: work stress; psychosocial safety climate; Job Demands-Control Model; Job Demand-Control-Support Model; nurses

Introduction

Psychosocial safety climate (PSC) is a novel construct defined as “policies, practices and procedures for the protection of worker psychological health and safety” (Dollard & Bakker, 2010, p. 580; Dollard, 2012). Psychosocial safety climate describes management support and commitment for psychological health and work stress prevention. Consistent with the safety climate literature, a low level of PSC is argued to be a latent, or underlying pathogen for hazardous work conditions (i.e. psychosocial risk factors) and psychological injury (Law, Dollard, Tuckey, & Dormann, 2011). This paper aims to study organizational PSC and its effect on work

*Corresponding author. Email: Maureen.Dollard@unisa.edu.au
Psychosocial safety climate is a property of the organization, and is largely driven by senior management (Dollard & Bakker, 2010). It reflects senior management commitment, participation and consultation in relation to stress prevention, and is a communicated position from management about the value of human psychological health and safety at work (Dollard, 2012). As management and supervisors play a significant role in its development, we expect that PSC will vary between organizations, work units and teams. Psychosocial safety climate is evident as a shared phenomenon, and empirically in several studies has shown robust group characteristics including both strong between-group (e.g. unit) variation and strong within-group agreement (Dollard & Bakker, 2010; Hall, Dollard, & Coward, 2010; Dollard, 2012; Law et al., 2011). In high PSC contexts managers will act to protect and enhance employee psychological health via policies, practices and procedures that influence work conditions.

Psychosocial safety climate is related to the safety climate construct that has been extensively studied for 30 years, and it is proposed as a latent pathogen for the likelihood of workplace accidents and injury due to physical hazards (Zohar, 2010). Safety climate within an organization is defined in terms of shared perceptions regarding policies, practices and procedures related to safety and protection from physical hazards in the workplace (Neal & Griffin, 2006). Particularly in high-risk industries the safety climate construct has been extremely useful for promoting best practice in occupational health and safety (OHS) (Cox & Cheyne, 2000). By contrast to physical health, psychological health and safety at work has received far less attention. Therefore, from a public health and social policy perspective, elaborating safety climate in terms of psychological health (i.e. PSC), is important to draw attention to it, to enhance policies, practices and procedures for the protection of the psychological health of employees (Dollard, 2012). In our view, psychosocial safety climate theory therefore addresses a major gap in theory that has emerged in the safety climate and work stress literature and is important for both theory and practice in that it connects the OHS and occupational health psychology literatures via the PSC construct (Dollard & Bakker, 2010).

Psychosocial safety climate is different from safety climate because it focuses on psychosocial rather than physical hazards, and on psychological rather than physical health (Dollard, 2012). Psychosocial safety climate is a component of organizational climate but, following recommendations by Schneider (2000), it is defined specifically as, for instance, “climate for service” (Dollard & Bakker, 2010). It is a facet-specific aspect of organizational climate, a climate for psychological health and safety (i.e. freedom from psychological harm). In essence it is a high fidelity safety climate measure.

Psychosocial safety climate theory builds on earlier work that considers a link between OHS and work stress (for example, Glendon, Clarke, & McKenna, 2006). It is broadly consistent with organizational health frameworks (e.g. Wilson, DeJoy, Vandenberg, Richardson, & McGrath, 2004) that emphasize the important influence of overall organizational climate on job design and in turn psychological health and morale. Previous research has theorized that safety climate is related to psychological strain and in turn safety outcomes, e.g. injuries, near misses (see for example, Goldenhar, Williams, & Swanson, 2003). But the safety climate construct itself has
not been specifically related to psychological health and wellbeing, and job design characteristics (such as workload) have not been proposed as the mechanism linking safety climate to psychological health.

In its specific focus on psychological health, PSC is also distinct from constructs such as team psychological safety (Edmonson, 1999), and perceived organizational support (Eisenberger, Huntington, Hutchison, & Sowa, 1986). Empirically it is divergent from these constructs and was found to be a better predictor of workload, emotional demands and psychological demands in a Malaysian sample, and psychological distress and emotional exhaustion in both a Malaysian and Australian sample (Idris, Dollard, Coward, & Dormann, 2012).

An important challenge in work stress research is to identify the correct origins of work stress, so that intervention efforts are guided to the most efficient and effective target. Current research is shaped by dominant work stress theories that focus on job task conditions as the origins of work stress. The theories propose, for example, that work stress arises when high job demands are combined with low levels of control (i.e. Job Demand-Control theory, Karasek, 1979), and support (Job Demand-Control-Support (DCS) theory, Johnson & Hall, 1988), or more generally when job demands are not balanced by adequate resources (Job Demands-Resources theory, Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). However, organizations are complex multi-layered systems (Mathieu & Taylor, 2007) therefore the origins of work stress could reasonably lie in the dynamic interplay between different levels of influences (e.g. the organization, work unit and/or individual). Calls have been made to integrate meso-thinking into organizational research (Hackman, 2003), and specifically for multilevel work stress models (Kang, Staniford, Dollard, & Kompier, 2008; Sauter et al., 2002). Psychosocial safety climate theory, as presented in the current paper, offers a multilevel perspective on work stress because according to the theory the genesis of stress, PSC, is further upstream than is commonly considered.

A particular process via which the relationship between PSC and worker psychological health exists can be explained via reference to the Job Demand-Control-Support Model. According to the DCS model, three dimensions of work, job demands, job control and job support, are related to psychological strain. Job demands are commonly operationalized in terms of quantitative demands such as workload or work pressure (Karasek, 1979) and qualitative demands, such as emotional demands (Karasek et al., 1998). Job control refers to two components; skill discretion, which reflects the opportunity to utilize specific job skills at work, and decision authority which reflects the opportunity for decision making about how the job is done. Social support at work “refers to overall levels of helpful social interactions available on the job from both co-workers and supervisors” (Karasek & Theorell, 1990, p. 69). In the current study we operationalize demands, control and support similarly.

When workers are faced with chronic demands without the opportunity for control over timing, pace, or decisions regarding demands, or without helpful supportive inputs from others (i.e. helping to get the job done), psychological strain can result. Further, job control and social support help meet basic human needs: such needs for autonomy and affiliation (Deci & Ryan, 2000), and in low supply are potentially important stressors. Empirical evidence from major reviews of the DCS model from 1979 to 2007 (van der Doef & Maes, 1999; Häusser, Mojzish, Niesel, & Schulz-Hardt, 2010) and of longitudinal studies (de Lange, Taris, Kompier,
Houtman, & Bongers, 2003), generally supports a main effects model whereby demands, control and social support additively predict psychological strain. In this paper we define psychological strain as an individual’s negative emotional response to a stressor (Greenhaus & Parasuraman, 1987). We operationalize it in terms of emotional exhaustion, the most common indicator of burnout (Demerouti et al., 2001) and psychological distress that incorporates common reactions to stressors such as anxiety, depression, social dysfunction and loss of confidence (Gao et al., 2004). In line with DSC theory we propose the following hypothesis:

**Hypothesis 1.** High job demands (*H1a*), low job control (*H1b*) and low social support (*H1c*) will predict high psychological strain.

Specifically, job design factors will explain variance in perceived strain that is due to between-group effects (i.e. due to work unit effects). We propose this because in this study we are interested in understanding the antecedent processes to worker psychological strain that arise from the characteristics of the work unit. We contextualize the DCS model by putting work unit PSC in the foreground as a “cause of the causes” of task condition outcomes (Dollard, 2012). As managers are responsible for the way jobs are designed (Yukl & Fu, 1999), we expect that in high PSC contexts where managers are vigilant and concerned about worker wellbeing, jobs will be designed within the unit so that workers will be able to manage the demands they face (Dollard, 2012). Managers will monitor and adjust work demands to enable workers to get the job done. A lack of regard for worker psychological health may lead managers to ignore working conditions that pose a risk to worker wellbeing. Over and above individual perceptions of job conditions these managerial responses will lead to differences in perceived job design between work units. In this study we operationalize demands in terms of emotional demands and workload and propose:

**Hypothesis 2a.** Work unit psychosocial safety climate will negatively account for between-group variance in perceived job demands.

Psychosocial safety climate theory also proposes that in high PSC contexts, managers also ensure that workers have sufficient resources to do the job (Dollard & Bakker, 2010; Dollard, 2012). Senior managers play a substantial role in establishing the tone of organizational climate and allocating resources (Flin, Mearns, O’Connor, & Bryden, 2000). In particular, when managers are supportive of worker wellbeing, they would be expected to give workers the freedom to develop new skills, and give control over work methods and timing of tasks (Brown & Leigh, 1996). This leads to the next hypothesis:

**Hypothesis 2b.** Work unit psychosocial safety climate will positively account for between-group variance in perceived job control.

Similarly, in high PSC contexts managers would be aware of the essential role of social support, both emotional and instrumental, in getting the job done in a meaningful way. We expect managers would elicit supportive and cohesive relationships from both coworkers and supervisors. There is evidence linking PSC to supervisor support (Law et al., 2011).
Hypothesis 2c. Work unit psychosocial safety climate will positively account for between-group variance in perceived social support.

Taking the above paths together, we propose a process via which PSC is linked to psychological strain. This gives us our next hypothesis:

Hypothesis 3a. Job demands will mediate the between-groups relationship between psychosocial safety climate and perceived psychological strain.

In support of Hypothesis 3a, in a multilevel longitudinal study of education workers, Dollard and Bakker (2010) found a mediated relationship between PSC and change in psychological strain via emotional demands and work pressure. Further, Law et al., (2011) in a cross-sectional multilevel multi-occupational sample found PSC predicted between-organizational variance in bullying and harassment that in turn was related to between-organizational variance in strain.

In line with the theoretical premise of DCS theory that low job control is associated with psychological strain, we similarly expect the following:

Hypothesis 3b. Job control will mediate the between-groups relationship between psychosocial safety climate and perceived psychological strain.

Previously researchers have found that PSC predicted change in skill discretion; skill discretion in turn predicted psychological distress but not emotional exhaustion (Dollard & Bakker, 2010). We also expect that social support would be a mechanism via which PSC would relate to psychological strain. Therefore:

Hypothesis 3c. We expect that social support engendered by positive PSC would also mediate the between-groups relationship of PSC on psychological strain.

Although previously proposed, this mediation hypothesis was not then supported (Law et al., 2011).

Our study focuses on nurses because of their reported high levels of occupational stress (Dollard, LaMontagne, Caulfield, Blewett, & Shaw, 2007). Manifestations of nursing stress include psychological distress (Edwards, Burnard, Coyle, Fothergill, & Hannigan, 2000), and emotional exhaustion (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002). Reviews suggest that workload and emotional demands (Michie & Williams, 2003), and a lack of control and social support (McVicar, 2003) are common nurse stressors.

Nurses working in remote regions also experience high levels of occupational stress (Opie et al., 2010). Remote communities themselves often suffer poor health outcomes and have the least access to health resources (Australian Institute of Health and Welfare, 2008). Remote nurses play an important professional role (e.g. primary health care, health promotion and disease prevention, accident and emergency) to these disadvantaged populations, because in those locations they are the predominant professional health service group. Yet the high level of stress that they experience is likely to impact on the quality of patient care and amplify workforce turnover (Lenthall et al., 2009).

In occupational health psychology it is advocated that research studies use a longitudinal design in order to overcome problems due to common method, reversed causation and third variables (e.g. negative affectivity) (Zapf, Dormann, & Frese, 2001).
However, longitudinal research is a particular problem in relation to remote area nurses because of the high turnover. Multilevel modelling offers a potential mechanism to explore climate phenomena even in the context of high turnover. As PSC is proposed as a property of the organization, theoretically, PSC measured at the work unit level should predict work conditions and also the psychological health of different workers in that same unit at a later point in time. This process is possible theoretically as the phenomenon of PSC is independent of the individual workers in a unit, and is a result of organizational policies, practices, procedures and management values. In this context longitudinal research can be carried out at the level of the work unit rather than at the level of the individual.

Multilevel modelling (e.g. using HLM Raudenbush, Bryk, Cheong, & Congdon, 2005) enables researchers to combine upper- and lower-level data sets from independent sources so long as the data sets have a common identifier (e.g. organization, work unit). Previous longitudinal PSC research in police officers split data at the upper (police station) level (Dollard, Tuckey, & Dormann, 2012). PSC was found to moderate a lower interaction between perceived emotional demands and resources in predicting distress; this result was verified using PSC assessed by “other officers” within the same station. Combining data sets from different sources enables a strong test of the fundamental idea of climate as a property of the organization (independent of the individual). Moreover, any relationships that are uncovered are not due to common method. In our study we used data sets from a completely independent group of respondents at each point in time; the first group assessed the climate, and the second group reported on work conditions and psychological health status. This method also overcame the problem of employee turnover.

Finally, we chose to study data separated by 24 months to enable adequate time for the manifestation of the main variable PSC. A low level of PSC may be considered to be a social stressor, and in this respect a 24-month lag is recommended to show effects on psychological strain (Dormann & Zapf, 2002). The effect of PSC on work conditions and psychological distress has already been detected within 10 months (Dollard & Bakker, 2010). As organizational climate is defined as a relatively enduring characteristic of an organization (Moran & Volkwein, 1992, p. 20), a subsidiary aim was to determine if PSC would have sustained effects over a much longer period.

Method

Design and participants

A structured questionnaire was mailed at each time point to 1007 nurses working in very remote isolated settlements in regions across Australia in 2008 (Time 1) and 2010 (Time 2). Various recognized methods were adopted to maximize survey return, including contact with health clinics before and after survey distribution, personalized cover letters and non-monetary rewards (Nakash, Hutton, Jørstad-Stein, Gates, & Lamb, 2006).

Ethics approval was granted by four relevant health and university ethics committees. The voluntary nature of the study and confidentiality was explained to
Participants via letter, and surveys were returned directly to the researchers. Surveys from Time 1 and Time 2 were matched via a personal code provided by respondents. Responses at Time 1 were \(N = 349\) remote area nurses (35\% response rate) from 165 different work units. At Time 2 we received responses from \(N = 435\) remote area nurses (43\% response rate) from 170 different work units. We selected into the study work units that had at least two responses at Time 1 and at least one response at Time 2. To ensure no overlap of individuals between the two time samples, we deleted those who responded at both Time 1 and Time 2 (\(N = 44\) participants). Within the final 48 work units there were \(N = 202\) participants at Time 1, and \(N = 163\) participants at Time 2. In the data set, average organizational group size at Time 1 was 4.2, and at Time 2 it was 3.4. This compares well with the average size of the work units in the population, which was 4.0. At Time 2, organizations with only one participant (\(N = 20\)) were allowed as we were trying to predict between-group variance as discussed below.

**Representativeness of the sample**

The representativeness of the sample obtained at Time 1 (\(N = 349\)) is described elsewhere and was established in terms of age and gender, proportions of representation by Australian states, and proportion working in very remote clinics (Opie et al., 2010). The final selected samples at Time 1 and at Time 2 were representative of the original sample by gender (non-significant chi-square tests), and age (non-significant unrelated samples \(t\)-test). The only difference between the final samples was that workers were slightly older in the Time 2 sample \(t (363) = 2.46\ p < .05\). To summarize, women comprised around 86\% of the participating samples, and the average age was around 44 years.

At Time 1, average years in current position ranged from 0 to 26 years, with an average of 2.66 years (\(SD = 4.34\)). Many had been in their position for 1 year or less (40\%), and 74\% for two years or less. The sample at Time 2 was very similar.

The 48 work units were mainly from public sector state government services (\(N = 42\), state government; \(N = 5\) Aboriginal Community Controlled Service; and \(N = 1\) private provider), from across six states of Australia, and there were 25 different employers. Most work units were remote hospitals, defined as health centres with inpatient facilities (\(N = 22\)), or very remote primary health care clinics that did not have inpatient facilities (\(N = 22\)).

**Measures**

*R Psychosocial safety climate.* It is proposed that PSC has four domains: management support and commitment, organizational communication, organizational participation and involvement and management priority (Hall et al., 2010). This was measured using a four-item scale reported by Dollard and Bakker (2010) (we excluded management priority). Items relate to issues of stress prevention and occupational health and safety, i.e. “Senior management shows support for stress prevention through involvement and commitment”; “In practice, the prevention of stress involves all levels of the organization”; “In my organization my contributions to resolving occupational health and safety concerns regarding psychological well-being are listened to”; and “Participation and consultation in occupational health and safety issues occurs with employees, unions and occupational health and safety
representatives”. Responses in this study are on a 5-point scale ranging from 0 (strongly disagree) to 4 (strongly agree). Cronbach’s alpha (\(\alpha\)) was .82 at Time 1 and .78 at Time 2. We also found that unit level PSC at Time 1 was related to between-group variation in PSC at Time 2, indicating a stability in this measure beyond individual perception, \(\gamma = .30, SE = .13, p < .05\).

Previous research with this four-item scale (Dollard & Bakker, 2010) has shown that PSC has good group-level properties, with a mean \(r_{(WG)}(j)\) agreement index (James, Demaree, & Wolf, 1984) of .76, suggesting homogeneity of perceptions within work units, and significant between-group variance, ANOVA, \(F(17, 190) = 3.90, p < .001\), with an intra-class correlation coefficient, (ICC) (1) of .22, indicating 22% of the variance in PSC is explained by differences between work units. The ICC (2) or reliability of the group mean was .74, reaching the \(\alpha > .70\) threshold (Nunnally, 1978). Dollard and Bakker (2010) showed that high PSC was associated with lower sickness absence and burnout, and higher skill discretion across time, thus showing adequate predictive validity. The scale showed good psychometric qualities, and there was sound justification for assuming that the tool assesses a “shared” climate construct (Bliese, 2000).

**Psychological strain.** Emotional exhaustion was measured with the first four items of the five-item subscale from the Maslach Burnout Inventory General Survey (MBI-GS; Schaufeli, Leiter, Maslach, & Jackson, 1996) with items such as “I feel emotionally drained from my work”, and responses corresponding with a 7-point scale ranging from 0 (never) to 6 (everyday) (\(\alpha = .93\) at Time 1 and .94 at Time 2). Psychological distress was measured using the General Health Questionnaire-12 (GHQ-12) (Goldberg & Williams, 1991). The GHQ-12 assesses change in general well-being and psychological health in the past two weeks, and includes 12 items such as, “Have you recently lost much sleep over worry?”. Participants are required to respond on a 4-point scale ranging from 1 (not at all) to 4 (much more than usual). The GHQ is a well-established scale with high internal consistency as found here (\(\alpha\) at Time 1 was .91 and at Time 2 was .88).

**Demands.** Workload was assessed using the format “How often do you?” followed by five items such as “Perform excessive overtime” and “Perceive your workload as unmanageable” with a 7-point rating scale ranging from 0 (less than once a year) to 6 (everyday) (\(\alpha = .83\) at Time 1 and .83 at Time 2). Emotional demands were assessed using a three-item subscale from the well-established Copenhagen Psychosocial Questionnaire (COPSOQ) (Kristensen, Hannerz, Høgh, & Borg, 2005). An example item is, “Does your work put you in emotionally demanding situations”, with responses from 1 (very rarely/never) to 5 (very often/always). The internal consistency in this study was sound (\(\alpha\) at Time 1 was .83 and at Time 2 was .80).

**Job control.** In line with Karasek’s original formulation of job control as “decision latitude” we combined the influence at work subscale (10 items) (e.g. “I have some influence on how I do my work”) and the degree of freedom subscale (four items) (e.g. “I can decide when to take a break”) of the COPSOQ. Responses are on a 5-point scale, ranging from 1 (never) to 5 (always) (\(\alpha\) at Time 1 was .84 and at Time 2 was .81).
Social support. Supervisor support and co-worker support were measured using the relevant subscales of the Job Content Questionnaire (JCQ) (Karasek et al., 1998). Each subscale comprises four items, such as “My supervisor pays attention to what I am saying” and “People I work with are competent in doing their job” respectively. Responses were on a 5-point scale, ranging from 0 (strongly disagree) to 4 (strongly agree). Cronbach’s alpha for supervisor support ($\alpha$ at Time 1 was .90 and at Time 2 was .94), and for co-worker support ($\alpha$ at Time 1 was .85 and at Time 2 was .79) were acceptable.

Demographics. Participants were asked about age, gender and time in position.

Statistical analyses

We used hierarchical linear modelling (HLM) as the main statistical analysis strategy using HLM 6.06 software (Raudenbush et al., 2005). Our data were nested, individuals within work units ($N = 48$), under different employers ($N = 25$). This implies the need for a three-level HLM model; we ruled this out because there was no significant random variance due to employer in the three-level model. We proceeded with a two-level model.

We used Statistical Package for the Social Sciences (SPSS) for Windows, version 16, to create two data files for HLM. The Level 2 data file was aggregated at the work unit level; the variables in this file were from both Time 1 and Time 2, merged to form a single aggregated data set. Data could be matched across time at the work unit level. The Level 1 data file was at the individual level, and individual responses at Time 1 and Time 2 within this data set could not be matched. The data files were linked via the work unit variable.

Modelling mediation in multilevel models is very complex. Zhang, Zyphur, and Preacher (2009) suggest that it is important to consider the variance in the criterion measure that is due to between-group effects (i.e. due to the unit, or organization), and within-group effects (i.e. individual influences, such as personality). It is important to note that because PSC varies only between Level 2 work units, it cannot be associated with differences across people within units i.e. individual differences in psychological strain. It can however be associated with variance that is due to differences between groups in work conditions and in psychological strain. Therefore, following Zhang et al. (2009) we focus on the between-group mediation effect only.

In preparation we assessed baseline random coefficients models to determine the relative magnitude and significance of variance that resides within and between Level 2 units, for each Level 1 mediator and criterion variable, to establish that sufficient between-group variance existed to warrant prediction.

Next we assessed the effects of the components of the mediation path ($X \rightarrow M$, $M \rightarrow Y$) determined in the following steps. Note that each Level 2 $\rightarrow$ Level 1 relationship is of a between-groups effect; Step 1 tested the Level 2 $M$ (mediators, job demands, job control, supports Time 2) $\rightarrow$ Level 1 $Y$ (psychological strain Time 2) relationships as proposed in Hypotheses 1a, b and c.

Step 2 tested Level 2 $X$ (PSC Time 1) $\rightarrow$ Level 1 $M$, proposed as Hypotheses 2a, b and c. Step 3 tested the Level 2 $M$ (Time 2) $\rightarrow$ Level 1 $Y$ (Time 2) relationship with Level 2 $X$ (Time 1) in the model, not adding any significant additional variance to ascertain full mediation (Hypotheses 3a, b, c). Following Zhang et al. (2009), we
used group-mean centred analysis for lower level independent variables, and reintroduced the means for the variable at Level 2 in Step 3 (between-group effects are the ones of interest in the study). Example equations are available from the first author on request.

Finally, we formally assessed the significance of the indirect effect of PSC on psychological strain (i.e. the between-groups mediation) using a Monte Carlo approach that utilizes confidence intervals (Bauer, Preacher, & Gil, 2006; Selig & Preacher, 2008). This approach is thought to be superior to Sobel tests (MacKinnon, Lockwood, & Williams, 2004).

To confirm that PSC could be validly aggregated to the group level we assessed: (1) the between-group variance relative to within-group variance using the ICC (1); the homogeneity of perceptions within units using the James, Demaree, and Wolf (1984) mean $r_{WG}$ agreement; and the reliability of the measure at Level 2, i.e. the ICC (2).

There was significant between-group variance as indicated by one-way ANOVA, $F(45, 107) = 1.77, p < .01$. The ICC (1) at Time 1 indicated that 15% of the variance in PSC was due to work unit-level effects. The reliability of the group mean, the ICC (2) for Time 1 was .85, reaching the threshold of .70 (Nunnally, 1978). These results indicated that aggregating PSC to the unit level was justified.

**Results**

Means and standard deviations are shown in Table 1. There were no differences between work conditions and psychological distress in the Time 1 and Time 2 samples; however, emotional exhaustion was significantly lower at Time 2. As shown in Table 1, chi-square results from the baseline models showed that sufficient variance resided between work units to warrant prediction by between-group factors for workload, emotional demands, job control, supervisor support, co-worker support and emotional exhaustion (all at Time 2). For example, nearly 32% of the variance in workload was due to group effects.

**Mediation model: Emotional exhaustion as outcome**

Step 1 tested Hypothesis 1, that Level 2 work conditions (mediators) will be related to Level 1 psychological strain. As shown in Table 1, at Level 2 (our central interest), demands, control, and co-worker support, but not supervisor support were significantly related to emotional exhaustion (column 8, with Variables as column 1), supporting Hypotheses 1a and 1b, with partial support for 1c.

Step 2 tested Hypothesis 2, that Level 2 PSC Time 1 is significantly related to the Level 1 mediators Time 2. As shown in Table 1 (last column), Level 2 PSC at Time 1 was significantly negatively related to Level 1 workload at Time 2 $\gamma = -.92, SE = .33, p < .05$ but not to emotional demands; this is in partial support of Hypothesis 2a. PSC was positively related to job control, supporting Hypothesis 2b. PSC was positively related to supervisor support but not to co-worker support. This is partial support for Hypothesis 2c.

Step 3 required that $M \rightarrow Y$ between-groups relationships were significant with $X$ in the model. As shown in Table 2, at Level 2, only workload Time 2 was significantly related to Level 1 emotional exhaustion Time 2. This effect was over and above Level
Table 1. Means, standard deviations, variance and between-group effects.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time 1 Mean</th>
<th>SD</th>
<th>Time 2 Mean</th>
<th>SD</th>
<th>Chi-square df =45</th>
<th>% Variance</th>
<th>Y Emotional Exhaustion Time 2</th>
<th>Y Psychological Distress Time 2</th>
<th>X Psychosocial Safety Climate Time 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Workload</td>
<td>17.48</td>
<td>5.09</td>
<td>12.96</td>
<td>5.10</td>
<td>106.75***</td>
<td>31.69</td>
<td>0.67 (0.13)***</td>
<td>0.28 (0.11)*</td>
<td>-0.92 (0.33)*</td>
</tr>
<tr>
<td>Emotional demands</td>
<td>7.09</td>
<td>1.72</td>
<td>7.35</td>
<td>2.39</td>
<td>62.58*</td>
<td>7.27</td>
<td>1.29 (0.26)***</td>
<td>0.97 (0.21)***</td>
<td>-0.17 (0.11)</td>
</tr>
<tr>
<td>Job control</td>
<td>24.89</td>
<td>5.07</td>
<td>25.46</td>
<td>6.48</td>
<td>64.65*</td>
<td>6.05</td>
<td>0.28 (0.10)**</td>
<td>0.36 (0.10)***</td>
<td>0.54 (0.24)*</td>
</tr>
<tr>
<td>Supervisor support</td>
<td>10.34</td>
<td>2.32</td>
<td>10.38</td>
<td>3.93</td>
<td>117.96***</td>
<td>34.47</td>
<td>-0.13 (0.23)</td>
<td>-0.34 (0.16)*</td>
<td>0.48 (0.17)**</td>
</tr>
<tr>
<td>Co-worker support</td>
<td>10.95</td>
<td>1.81</td>
<td>11.45</td>
<td>2.47</td>
<td>70.07*</td>
<td>11.21</td>
<td>-0.69 (0.28)</td>
<td>-0.94 (0.21)***</td>
<td>0.19 (0.11)</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSC</td>
<td>7.72</td>
<td>3.61</td>
<td>8.37</td>
<td>3.38</td>
<td>98.12***</td>
<td>26.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Y</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional exhaustion</td>
<td>14.66</td>
<td>7.67</td>
<td>10.33</td>
<td>6.60</td>
<td>65.18*</td>
<td>8.90</td>
<td></td>
<td>0.29 (0.10)**</td>
<td></td>
</tr>
<tr>
<td>Psychological distress</td>
<td>14.05</td>
<td>5.85</td>
<td>12.86</td>
<td>6.04</td>
<td>49.07</td>
<td>1.23</td>
<td></td>
<td>-0.20 (0.10)</td>
<td></td>
</tr>
</tbody>
</table>

Note: *HLM regression analysis, parameter estimates with standard errors in brackets, all Level 2 → Level 1. Means and SDs are at the work unit level; however Y (dependent measure) is at the individual level; X = independent measure PSC; M = mediator.

*p < .05, **p < .01, ***p < .001.
1 within-groups effects in the model (i.e. individual workload, emotional demands and job control, Time 2, were significantly related to emotional exhaustion Time 2). The final model accounted for 90% of the between-group variance and the $R^2$ for the total model was 35%. In the final model PSC was no longer significant consistent with full mediation.

Hypotheses 3a, b, c, proposed that the between-groups relationship between Level 2 PSC and exhaustion will be mediated via job demands, job control and job support. To test these hypotheses we took the parameter estimate of $X \rightarrow M$ (Table 1) along with the between-group result $M \rightarrow Y$ from Table 2. We found a significant mediation effect PSC Time 1 $\rightarrow$ workload Time 2 $\rightarrow$ emotional exhaustion Time 2, using the Monte Carlo method, with the 95% Confidence Interval (CI), Lower Level (LL) = −.57, Upper Level (UL) = −.08. Note that the 95% confidence interval for the indirect effects did not contain zero, therefore the result is significant.

Hypothesis 3a was supported and the effects are shown in Figure 1. There was no support for Hypothesis 2b (mediator job control), or 3c (mediator supervisor and co-worker support).

Another potential path linking PSC to strain is via Time 1 work conditions. PSC Time 1 was related to emotional demands Time 1, $\gamma = -0.24$, S.E. = .11, $t = -2.13$. As shown in Table 2, emotional demands at Time 1 were in turn related to emotional exhaustion at Time 2. The mediation effect was significant, 95% CI, LL = −.54, UL = −.01 (see Figure 1), providing additional support for H3a.

Table 2. HLM random coefficient models of psychological strain

<table>
<thead>
<tr>
<th></th>
<th>Emotional Exhaustion Time 2 $M(T2) \rightarrow Y(T2)$</th>
<th>Psychological Distress Time 2 $M(T2) \rightarrow Y(T2)$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1 (Within-groups effects)</strong></td>
<td>Estimate (SE)</td>
<td>Estimate (SE)</td>
</tr>
<tr>
<td>Supervisor support T2</td>
<td>−0.08 (0.18)</td>
<td>−0.33 (0.19)</td>
</tr>
<tr>
<td>Job control T2</td>
<td>−0.25 (0.07)***</td>
<td>−0.26 (0.08)**</td>
</tr>
<tr>
<td>Workload T2</td>
<td>0.27 (0.06)***</td>
<td>0.17 (0.08)**</td>
</tr>
<tr>
<td>Emotional demands T2</td>
<td>0.45 (0.19)**</td>
<td>0.22 (0.18)</td>
</tr>
<tr>
<td><strong>Level 2 (Between-groups effects)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>−4.26 (4.51)</td>
<td>5.49 (5.08)</td>
</tr>
<tr>
<td>Psychosocial safety climate T1</td>
<td>−0.14 (0.18)</td>
<td>−0.11 (0.23)</td>
</tr>
<tr>
<td>Supervisor support T2</td>
<td>0.14 (0.19)</td>
<td>−0.19 (0.20)</td>
</tr>
<tr>
<td>Job control T2</td>
<td>−0.12 (0.08)</td>
<td>−0.30 (0.14)*</td>
</tr>
<tr>
<td>Workload T2</td>
<td>0.44 (0.09)***</td>
<td>0.48 (0.09)</td>
</tr>
<tr>
<td>Emotional Demands T1</td>
<td>0.68 (0.25)**</td>
<td>0.22 (0.22)</td>
</tr>
<tr>
<td><strong>Variance components</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work unit $\mu_0$</td>
<td>3.39*</td>
<td>0.01</td>
</tr>
<tr>
<td>Individual $r$</td>
<td>40.40</td>
<td>34.92</td>
</tr>
<tr>
<td>Final model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work unit $\mu_0$</td>
<td>0.34</td>
<td>0.08</td>
</tr>
<tr>
<td>Individual $r$</td>
<td>27.96</td>
<td>25.02</td>
</tr>
</tbody>
</table>

Note: *$p < .05$, **$p < .01$, ***$p < .001$. Variance components refers to variance unexplained; $\mu =$ work unit error; $r =$ individual-level error.
Next we considered the mediation hypotheses with GHQ (psychological distress) as the outcome. Between-unit variance was not significant for GHQ. As explained by Mathieu and Taylor (2007) a significant effect provides reassurance that there is significant variance to be predicted, but they explain that a lack of a significant chi-square does not rule out a cross-level effect because “$\chi^2$ is an omnibus test that has relatively low power to detect such differences” (Mathieu & Taylor, 2007, p. 158). They recommend that researchers proceed to test a priori theorized cross-level relationships even if the chi-square test is not significant.

Step 1 tested the Level 2 $M$ (stressor Time 2) $\rightarrow$ Level 1 $Y$ (psychological distress Time 2) relationships (see Table 1, column 9); each was significant, providing additional support for Hypotheses 1a, b, c. Step 2, Level 2 PSC $\rightarrow$ Level 1 $M$ relationships (Table 1, last column) were confirmed above, showing that PSC was related to workload, control and supervisor support, all eligible mediators for Step 3.

Step 3 required significant Level 2 $M$ $\rightarrow$ Level 1 $Y$ relations with $X$ in the model. Level 2 job control Time 2 was significantly negatively related to psychological distress Time 2. The final model $R^2$ was 28%. Monte-Carlo results showed significant between-groups indirect effects, PSC Time 1 $\rightarrow$ job control Time 2 $\rightarrow$ psychological distress Time 2, 95% CI, LL = −.37, UL = −.01. This supports Hypothesis 3b, but not Hypotheses 3a or 3c. No Time 1 work conditions were related to distress at Time 2.

At this juncture, it is important to consider the directionality of the relationships and whether the reverse of the hypotheses is true. Only two of the seven reverse effects of work conditions and strain at Time 1 on PSC at Time 2 were significant: workload Time 1, $\gamma = -.18$, S.E. = .08, $p < .05$, and emotional demands Time 1 $\gamma = -.41$, S.E. = .17, $p < .05$, were related to PSC Time 2.

**Discussion**

This study is one of the first to examine the multilevel PSC theoretical framework and specifically PSC as a “cause of the causes” of hazardous work conditions (i.e. psychosocial risk factors), and psychological strain. In doing so, it is one of a small but fortunately growing number of studies that considers the multilevel aetiology of work stress. We tested a multilevel model of work stress, and found cross-level effects...
of PSC estimated at a group level, on Time 2 work conditions (workload, job control, supervisor support) and psychological strain (emotional exhaustion) at the individual level. We found that the individual experience of exhaustion and distress may be predicted by the climate context, and that the mechanism may be explained by the mediation effect of work conditions. It is notable that the expected effects of work unit PSC on exhaustion and distress were found in an unrelated sample (i.e. other members of the unit) two years later via effects on work conditions (demands, control). Our study relied on data from one cohort linking to data from a completely independent cohort over 24 months. A positive feature of the design is that it ruled out test-retest effects; on the other hand it must be acknowledged that matching at the individual level would have been a true longitudinal design.

Our study has the potential to make a valuable contribution to the work stress literature in several respects. First, we showed the effects of work unit-level PSC on work conditions and the psychological health of workers 24 months later. Previous research has shown the long-lasting effects of safety climate whereby workgroup safety climate showed effects on individual safety behaviours over time (Neal & Griffin, 2006). Our study is similar in that climate (in this case PSC) showed effects, but the target was different; in this case PSC showed effects on emotional distress, an outcome that was present in a different sample two years later.

Second, the multilevel design enabled us to use completely independent data sets from Time 1 to Time 2 (recall participants who participated at Time 1 and Time 2 were removed from the study) so that in testing PSC effects, artefacts involving individual perceptual bias, common method effects or other personal predisposition factors were designed out of the study. This design also enabled us to examine the aetiology of work stress in a high-risk industry. A particular challenge in the field is the longitudinal study of stress in workers in high-turnover industries when analyses are conducted at the individual level. Yet the threat to an individual-level repeated measures study design, i.e. turnover and increased sickness absence, is a likely outcome of stress and precisely the reason why the occupation is of interest to study in the first place. Our multilevel design assisted the research by utilizing data over time matched by work unit, making it possible to study effects over time at the level of the work unit rather than the individual.

Thirdly, our study enabled, for the first time, the examination of the direction of relationships proposed in PSC theory (Dollard & Bakker, 2010), albeit at the level of the work unit – we cannot claim this at the individual level because we could not test this relationship. We found that the relationship was generally in the direction of PSC → psychological strain and work conditions. We did not find a relationship here predicting Time 2 emotional demands from PSC, but we did find that PSC was cross-sectionally related to emotional demands. Also we detected a reverse effect of emotional demands on PSC. The hypothesised relationship has been shown previously, controlling for baseline levels of emotional demands (Dollard & Bakker, 2010) and using a shorter 12-month time frame. Taken together these results suggest that PSC and emotional demands may be related in the short and longer term, as a reciprocal relationship, that leads to a negative spiral of psychological strain over time. Reciprocal effects were also noted with the other demand measure, workload. Future research should examine the reverse and reciprocal effects of PSC, work conditions, and strain using three waves of data, to really tease out the process.

We believe that the most potentially valuable theoretical implication of the study, however, is its support for the proposition that PSC is the genesis of JDC hypotheses;
this is because, as we suggest, it could be a precursor to the JDC core components – workload and job – controls that are in turn related to psychological strain. Previously evidence has been provided of the role of PSC as trigger for both the health erosion and motivational hypotheses of the Job Demands-Resources theory (Dollard & Bakker, 2010; Idris, Dollard, & Winefield, 2011; Law et al., 2011). At the heart of PSC theory is the proposition that PSC presages work conditions. Our results support the theory that PSC appears to engender opportunities for control at the task level that might offset psychological strain. PSC was also related to supervisor support over time, but in the context of the other measures this antecedent path could not explain between-group variance in strain.

There are several practical implications of this research. First, the multilevel model implies that primary prevention may be achieved by targeting PSC. Remote health work is carried out in a demonstrably under-resourced system coping with high population health needs (AIHW, 2008). The prevailing climate in remote area nursing is one of poorly “managing at a distance” (Wakeman & Davey, 2008). Managers are not properly trained, and are supervising staff who are not particularly well prepared for their jobs. High turnover is indicative of these conditions. Living and working in very small remote communities (which sometimes experience endemic violence, with very limited amenities and services), likely affects psychological health, especially if management does not adequately recognize and address the impacts of these demands on nurses. This essentially means that more effective management, enhanced training for psychological health leadership (Gurt, Schwennen, & Elke, 2011) and changing management behaviours and values is required for remote nurse management. More research is needed to establish whether the implications of this research are generalizable to other working populations.

Further, if a strong PSC is built, we expect that it will lead to more sustainable productivity objectives (Dollard & Karasek, 2010). For example, several studies of PSC have shown that PSC is linked to motivational outcomes such as work engagement (Dollard & Bakker, 2010; Idris et al., 2011; Law et al., 2011), job satisfaction (Dollard, 2012), reduced intention to leave (Dollard, 2012), and sickness absence (Dollard & Bakker, 2010).

We would also like to raise a cautionary note, as Dollard (2012) found that in the implementation of a participatory action research intervention, significantly better intervention implementation was achieved with higher starting levels of work unit PSC. This suggests that higher level systems strategies may be required to build PSC, as described in the Healthy Conducive Production Model (Dollard & Karasek, 2010). The foundational strategies require management political will, employee goodwill, union support and financial or capacity surpluses, to build a higher level social control system to design well-coordinated policies, practices and procedures that protect worker psychological well-being, in this case across far-flung remote nurse work units (Dollard & Karasek, 2010; Dollard, 2012). This will enable the better management or reduction of unexpected and uncontrollable demands within the system, with increased system control to manage them, rather than requiring individuals to respond in isolation.

**Limitations**

A proposition of PSC theory is that it interacts with work conditions, reducing their possible deleterious effects on psychological health (see Dollard, 2012). We examined
two-way and three-way interaction effects between PSC, demands and control, and found no support for interaction effects. Previous research has found PSC interaction effects (i.e. two-way interactions, Dollard & Bakker, 2010; Dollard & Karasek, 2010, and three-way interactions, see Dollard et al., 2012), so our result may be an artefact of the research design. In terms of timing, it is possible that PSC may not be potent enough to reduce the impact of work conditions on psychological strain two years later. Therefore, research should continue to investigate interactions as a component of PSC theory testing, with consideration to the proximity of assessed PSC to perceived demands and psychological strain.

We used a four-item scale which canvases all of the proposed domains of PSC (management support and commitment, organizational communication, organizational participation and involvement) except management priority (Hall et al., 2010). Since the present study began, the PSC scale has been enlarged to the PSC-12, now comprising four domains, each with three items. In a sample of 30 organizations, the aggregate relationship between PSC-4 used here and the PSC-12 was .82, p < .01 (Law et al., 2011). This strong association, along with the sound psychometrics reported for this study, suggests that the present results using the small scale are valid.

Another possible limitation is that we used the first four items of the emotional exhaustion subscale of the MBI for the HLM analysis because the between-unit variance was stronger and significant when doing so. However, the four- and five-item scales correlated .99, so it is unlikely that the validity of the scale was affected, and the mediation results were the same using the five-item scale. Also, although the baseline model for GHQ was not significant the test proved conservative because we found cross-level mediated effects of PSC to psychological distress. Further, since we used groups that were composed of few very members, our study may underestimate within-group variance relative to between-group variance in the mediator and outcome measures.

Although we found differences between Time 1 and Time 2 samples on age, when this was controlled for all results remained virtually the same. Overall we believe the sampling was not biased in a way that affected the findings and, given the general nature of the measures used and consistency of our results with theory, we believe that our findings should generalize across occupations.

In our study we were unable to test differences between organizations with different employers because of a relatively small number of upper level work units. Future research should try to discern the variation in PSC at the highest levels within an organization (top-level management) vs. lower levels (e.g. employees within a specific remote hospital). We expect that the psychosocial safety climates would be globally aligned (see Zohar & Luria, 2005), but would also vary because of the discretion that local managers have to enact policies, practices and procedures for PSC, and also because top-level management may differ in their approach towards specific work units. This clarity would further help focus intervention efforts.

Not having a three-wave longitudinal design means that mediation could not be tested adequately. Therefore future research could also consider having three time points. There is also a need for future studies to replicate the findings in other populations.
Conclusion
This study adds to the literature that is increasingly concerned about organizational contextual factors as origins of the work stress process. From our findings it would appear that a low level of psychosocial safety climate within a work unit is a latent pathogen for adverse work conditions (i.e. high job demands, low job control) that in turn have knock on effects of emotional exhaustion and psychological distress in workers. There was a little evidence of reciprocal relationships between PSC and job demands. The effects of PSC on psychological strain were found 24 months later, in different nurses within the same units. The study used a design in which effects were studied over time at the level of the work unit rather than the individual. This design could be applied to other occupational samples where high rates of turnover are expected across time. Our results imply that primary prevention of strain is best achieved by targeting PSC and changing management behaviours towards the psychological care of workers.

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References


