Should We Agree to Disagree? The Multilevel Moderated Relationship Between Safety Climate Strength And Individual Safety Motivation

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Please cite as:

Flatau-Harrison, H., Griffin, M. A., & Gagné, M. (2020). Should we agree to disagree? The multilevel moderated relationship between safety climate strength and individual safety motivation. Journal of Business and Psychology. Advance online publication.

Abstract

Organisational research investigating climate perceptions often use constructs reflecting dispersion and disagreement, termed ‘climate strength’, to investigate situational pressures on behaviour expression. Within safety specific contexts, research has tended to emphasise the *prediction* of climate strength rather than an examination of its effects on behaviour. The present paper investigates the important first pathway in the prediction of safety behaviour by investigating the influence of safety climate strength on the relationship between safety climate perceptions and individual safety motivation in a safety critical

context using multilevel analyses. Contrary to expectations, results initially indicated that safety climate strength negatively influenced the relationship between safety climate perceptions and safety motivation, such that greater variability was associated with greater motivation. Post-hoc analysis re-grouping responses into broader functional levels found support for an interaction, suggesting a difference in the scope of influence for safety climate strength between the two levels of analysis. These findings are discussed in light of self-determination theory, and suggestions for future research and practice made.

Keywords: safety motivation; safety climate strength; safety climate; multi-level moderation; self-determination theory

Introduction

Employees working in safety critical industries are generally expected to consistently interpret and execute key safety policies and procedures to avoid accidents. Indeed inconsistent application of safety policies can lead to major incidents with significant business repercussions (Australian Transport Safety Bureau, 2012). Organisations frequently lack the resources and time to regularly and systematically assess whether all employees have uniform perceptions about safety priority and rely on assumptions around best practice in ensuring certainty and consistency in safety climate perceptions. There is a need to understand how psychological antecedents to behaviour and potential accidents, such

as motivation, operate under different situational pressures, as safety climate research increasingly becomes integrated with mature systems engineering perspectives that rely heavily on predictability (Casey, Griffin, Flatau Harrison, & Neal, 2017).

The present study investigates the effect that variability in safety climate perceptions within work units, labelled in the literature "climate strength", has on the primary individual level psychological antecedent of safety behaviour, namely individual safety motivation. By investigating the effects of situational pressure on motivation we contribute to the nomological network surrounding climate, motivation and behaviour by understanding under *which contexts* employees are likely to be motivated to behave safely. Importantly our analysis allows us to compare individual versus group safety climate influences and processes. We first discuss known factors that influence individual safety motivation before discussing theory relevant to the potential influence of climate strength. Following this, we present a multilevel study in a safety critical healthcare setting to test our hypotheses.

Theoretical Development and Hypotheses

Safety Motivation

Historically, safety motivation has been defined as "an individual's willingness to exert effort to enact safety behaviors and the valence associated with those behaviors" (Neal & Griffin, 2006). Safety motivation is known to play a mediating role between safety climate, defined as "individual perceptions of policies, procedures, and practices relating to safety in the workplace" (Neal & Griffin, 2006) and safety behaviours such as compliance (following rules and procedures) and participation (proactively promoting safety above and beyond compliance) (Griffin & Neal, 2000; Neal, Griffin, & Hart, 2000). Such behaviours are in turn

negatively associated with workplace accidents (Neal & Griffin, 2006), meaning safety motivation serves as the core behavioural antecedent for crucial outcomes of interest in safety research.

Safety motivation is influenced by both distal group level factors such as transformational leadership, which is positively associated with both intrinsic and identified motivation (Conchie, 2013), and distal individual differences such as conscientiousness personality traits, which is positively associated with motivation (Christian, Bradley, Wallace, & Burke, 2009). Nevertheless more work is needed to explore the impact of group contexts on motivation, particularly situational pressure such as safety climate strength which is likely to influence motivation specifically by reducing or increasing the frequency of potential environmental cues that would interact with relevant individual perceptions. Within this context we respond to calls within the broader safety motivation literature to reposition theoretical discussion within Self-Determination Theory (SDT) by considering the type of extrinsic motivation measured (Scott, Fleming, & Kelloway, 2014; Zohar, Huang, Lee, & Robertson, 2015) and how this relates with individual safety climate perceptions. Indeed different SDT types of motivation are likely to respond to this situational pressure in different ways: whilst extrinsic types may be more malleable by external prompts, internalised types may be less so and conversely more influenced by psychological processes. Understanding whether strength influences motivation as expected in this way is a crucial first step in integrating the two individual and group pathways influencing motivation.

While intrinsic motivation is being driven by interest and enjoyment for the task itself, extrinsic motivation is being driven by instrumental considerations, and can vary in how autonomously regulated it is. External regulation represents behavioral engagement based on reward contingencies, introjected regulation represents behavioral engagement based on feelings of self-worth contingent on performance, and identified regulation represents

behavioral engagement based on meaning and values (Gagné & Deci, 2005). Previous research has found that identified safety motivation (i.e. employees working safely because they value a safe working environment) is the strongest predictor of safety compliance behaviours (Scott et al., 2014), more so than intrinsic motivation. For this reason, the present research focused on identified safety motivation as an outcome.

SDT would suggest that the individual satisfaction of needs for competence, autonomy, and relatedness is required to promote the internalization of the importance of safety behaviours, thereby creating identified safety motivation (Gagné & Deci, 2005). Safety climate as it is perceived at the individual level is likely to influence employees' feelings of competence, autonomy, and relatedness around safety management. Factors such as perceived management values for safety relative to values for other seemingly competing goals (e.g., productivity) and having non-punitive tactics to reinforce safety behaviours could influence how employees internalise and then volitionally (autonomously) engage in safety behaviours. The availability and quality of safety training would enhance feelings of competence. Perceptions of managers' and co-worker support and endorsement of safety policies and procedures might influence perceived norms (relatedness). However, if communication about safety values are inconsistent, if training opportunity is not uniform, and if managers and co-workers express differential support for safety, the group safety climate is likely to be weak. Thus, it is one thing to examine how climate perceptions influence safety motivation, but without considering dispersion of climate perceptions within work teams, we do not have a full picture of its influence. For this reason, we consider climate strength as a variable of interest.

Climate Strength as a main effect

Climate strength represents the degree of agreement found within groups regarding members' perceptions of the work climate (Chan, 1998; González-Romá, Peiró, & Tordera, 2002; Schneider, Salvaggio, & Subirats, 2002), where climate is a facet-specific, socially-construed representation of those environment or situation based factors influencing behaviour (Zohar & Luria, 2004). Climate strength has been studied in contexts such as procedural justice climate (Colquitt, Noe, & Jackson, 2002; Walumbwa, Wu, & Orwa, 2008), ethical climate (Shin, 2012) and service climate (Schneider et al., 2002; Sowinski, Fortmann, & Lezotte, 2008). Most commonly it appears in organisational (Dickson, Resick, & Hanges, 2006; González-Romá et al., 2002; Schneider et al., 2002) and safety specific (Beus, Bergman, & Payne, 2010; Zohar & Tenne-Gazit, 2008) climate research settings. Safety climate research has typically focused on *predicting* safety climate strength (Beus et al., 2010; Luria, 2008; Zohar & Luria, 2005; Zohar & Tenne-Gazit, 2008), with a meta-analysis supporting the role of leadership and interpersonal interactions in predicting higher strength (He, Wang, & Payne, 2019).

The theory of situational strength provides a foundation for understanding the impact of climate strength (Mischel, 1973) and is defined as the "implicit or explicit cues provided by external entities regarding the desirability of potential behaviours" (Meyer, Dalal, & Hermida, 2010). Several authors have argued that a strong climate (with minimal variability in individual climate responses) produces uniform behaviour as individuals are likely to perceive events in the same way (Dickson et al., 2006; González-Romá et al., 2002; Saffold, 1988; Schneider et al., 2002). Conversely, they have argued, weak climates (with high variability in individual climate responses) are more likely to produce inconsistent behaviour, given that individuals are more likely to revert back to idiosyncratic habits and heuristics in situations where there is a less reliable indicator of appropriate behaviour (González-Romá et al., 2002). Understanding how variability in the way safety climate is interpreted within

groups impacts on underlying safety motivation is therefore an important relationship that likely precedes that of the safety behaviours themselves.

Situational strength places powerful psychological pressure on individuals to either engage in, or refrain from, particular behaviours as a result of contingencies re-enforced by having a consistent interpretation of organisational policies, mirrored by the similar expectations of their peers (Meyer et al., 2010). Components of situational strength include *clarity* (whether cues regarding policies or procedures are accessible and understandable), *consistency* (whether said cues are compatible with each other), *constraints* (whether an employee's workplace actions are deemed to be controlled by such policies and procedures) and finally *consequences* (in which decisions or actions have implications for the individual or group; Meyer et al., 2010).

The components of situational strength which establish clear expectations about behaviour lend themselves to an investigation of the relationship between climate strength and motivation. This is in line with expectancy-valence theory (Vroom, 1964), which suggests that employees will be more motivated to carry out safety procedures if they believe they can correctly enact safety behaviours and that it will result in favourable outcomes for themselves and others. Furthermore from social learning theory (Bandura, 1977), such expectations and behavioural intentions are likely to be greater in contexts where individuals are surrounded by employees consistently encouraged to engage in safety behaviours and who express uniform views on their importance. Therefore, within-group consistency in expressed values, expectations, and behaviours create a strong climate that is likely to fulfil psychological needs that will foster identified safety motivation, relative to low consistency. In consideration of the above, the following hypothesis is proposed:

Hypothesis 1: Safety climate strength will explain additional variance in safety motivation over and above the effects of group safety climate and individual safety climate perceptions, such that higher safety climate strength will be associated with higher levels of safety motivation.

Climate Strength as a moderator

Although two groups might ultimately have the same climate (i.e. the same average score), they might differ in their dispersion (i.e., one with minimal variation around the average score, and the second with large variation). A strong climate is one in which there is both agreement within the group or organisation, however without a particular requirement about the score that members are agreeing on. For example, a group could all rate their safety climate as a 5 on a scale of 1 to 5 (in which 5 is the most favourable) which would be just as strong as if they had all rated it as a 3 or a 1. Climate might be a poorer guide for behaviour in groups with weaker and more disperse climate perceptions relative to groups with strong climate (Lindell & Brandt, 2000). This can only be captured by looking at interaction effects between climate and climate strength. A number of authors have investigated this effect within a general organizational context (Dawson, González-Romá, Davis, & West, 2008; González-Romá et al., 2002; González-Romá, Fortes-Ferreira, & Peiró, 2009; Li, Frenkel, & Sanders, 2011; Schneider et al., 2002). Results have demonstrated that climate strength can be a moderator of the relationship between climate measures and affective dependent variables such as organisational commitment and work satisfaction (González-Romá et al., 2002), as well as objective performance (González-Romá et al., 2009).

Research within safety contexts has responded to Zohar and Luria's (2004) call for clarity after failing to find a moderation effect for safety climate strength on the relationship

between climate and injury amongst platoon soldiers. For example, Lee and Dalal (2016) found support for a cross level interaction between employee conscientiousness and safety behaviour, such that the relationship was attenuated in strong climates. The relationships between conscientiousness and safety behaviour were higher in weak climates compared to strong ones. Similarly Flatau-Harrison, Griffin, and Gagne (2020) demonstrated the impact safety climate strength has in shaping employee role clarity by moderating its relationship with conscientiousness. The authors found a relationship across time between passive leadership styles and lower safety climate strength which in turn increased the relationship between employee conscientiousness and role clarity. Specifically, employees located within low safety climate strength groups had higher positive relationships between conscientiousness and role clarity, suggesting they sought out more job related information in uncertain safety contexts. These recent papers indicate an important role for safety climate strength to play in shaping individual psychological states and behaviours specifically, however have failed to investigate the core precursor to safety behaviour which is motivation and position this within competing individual and group safety climate perceptions.

Thus within this paper for the interaction effect proposed climate is operationalised at the individual level as the immediate precursor to motivation. This novel approach is used to accurately detect the theoretical relationships proposed between aspects of self-determination theory and individual's perceived climate. As a weak climate would serve as a poorer guide for behaviour, it is likely to indicate ambiguous support for the psychological needs, thereby affecting the development of identified safety motivation. In consideration of the above the following hypothesis is provided, and reflects the multilevel moderation framework depicted in Figure 1:

Hypothesis 2: Safety climate strength will moderate the relationship between individual safety climate perceptions and safety motivation, such that when safety climate

strength is high the relationship between individual safety climate perceptions and safety motivation are also high whereas when safety climate strength is low the relationship is low.

Insert Figure 1 about here.

Method

Participants

Data was drawn from a safety critical research sample which included employees from an Australian hospital employing in excess of 7,450 multidisciplinary staff across specialties such as surgery, obstetrics and trauma services, and admits more than 90,000 patients every year. Teams were identified by the assignment of unique grouping codes to individual responses according to the smallest work unit that they reported to so we could accurately measure their most proximal group climate. In line with previous research, only teams with 5 or more members were used as it was reasoned that teams with less than 5 members were unlikely to have a demonstrable or stable group level safety climate (Schulte, Ostroff, & Kinicki, 2006). Given that teams could have as few as 5 team members, an emphasis was placed on including only complete (and thus the most accurate data) for each included team member.

Thus we obtained survey data from 2,197 individuals (with each variable containing no more than 1.6% missing cases) and excluded participants who had not completed all safety climate and motivation items of interest, leaving 2,114 cases. Results from Little's MCAR test on the original sample failed to reject the null hypothesis that the data are missing completely at random (χ^2=193.62, DF=177 p=.19), which led us to conclude that data was missing completely at random and listwise deletion a suitable method for dealing with

missingness (Little & Rubin, 2002). The small difference between the two sample sizes and large original sample of 2,197 further justified use of listwise deletion to remove cases with missing data. Following removal of cases with no recorded team identifier or which belonged to teams with less than 5 other complete responses we obtained the final total of 1,720 individual responses grouped into 114 teams. Team size in the final sample ranged from 5-90, with a median size of 18 members.

Of the 1,720 employees included in the final sample, 77% were female. Respondents had a mean age of 38.49 years (SD = 12.95). On average, respondents had worked at the hospital for a period of 8.08 years (SD = 7.14). A representative and diverse range of work backgrounds across many professions were captured across the dataset, with the three largest including catering (5.2%), neonatal intensive care (4.4%) and medical imaging administration (3.5%). Others included emergency medicine (2.3%) and anaesthesiology (1.8%), with a high number of other work areas (107 did not report) being represented by minor percentages.

Measures

Respondents were asked to complete a survey which included items assessing their perceptions regarding the safety climate of their organisation and their own personal safety motivation. Descriptions of the three scales included in the analyses of this study can be found in the appendix.

Safety climate was measured using eight items ($\alpha = .93$) assessing safety management values (e.g. "*management places a strong emphasis on workplace health and safety"*), safety training (e.g. "*employees receive comprehensive training in workplace health and safety issues*") and safety related communication (e.g. "*there is sufficient opportunity to discuss and deal with safety issues in meetings*"; Neal et al., 2000). Results of a higher-order CFA, with management values, training and communication as first-order factors and safety climate as

the second-order factor, revealed good fit, CFI = .97, SRMR = .04. Respondents rated the items on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Individual safety climate was operationalised as the mean of individual employee scores and group safety climate as the mean of these scores within each team.

Safety climate strength was measured as the standard deviation of individual safety climate responses within each group. Following the calculation of the standard deviation of individual responses within each group, each group score was centered at the grand mean of all group standard deviation scores. Finally, scores were multiplied by -1 to aid with interpretation (i.e. a higher climate strength score indicating *less* variability). The use of standard deviation as a measure of safety climate strength is consistent with other approaches (Beus et al., 2010; Dickson et al., 2006; Li et al., 2011; Schneider et al., 2002; Zohar & Luria, 2005; Zohar & Tenne-Gazit, 2008).

Safety motivation was measured using three items assessing individual identified motivation to perform safety-related activities (Neal et al., 2000). An example item is "*I feel that it is worthwhile to put in effort to maintain or improve my personal safety*". Items were rated on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5) (α = .84).

Analytical Strategy

Aggregation Procedures. In line with previous research, several statistics were calculated to investigate both within-group and between-group variability prior to the aggregation of data. A one-way between subjects ANOVA revealed that there was adequate between-groups variability in average individual safety climate scores F (113,1606)=3.20, p<.001. Assessing within-group variability, the average $r_{wg(j)}$ across the entire sample of groups was .79 which exceeds the recommended rule of thumb of .70 (Klein & Kozlowski,

2000). The decision was made to include teams with a wide range of $r_{wg(j)}$ scores (with the sample ranging from -.60≤ $r_{wg(j)}$≤.98) based on the recommendations made by Lindell and Brandt (2000), who argued that removing teams with low variability amounted to range restriction which could potentially mask the true nature of any relationship found. Previous studies using $r_{wg(j)}$ (Schneider et al., 2002; Zohar & Luria, 2005) have often been unclear about the full range of values included in analyses or primarily focussed on teams with high levels of agreement. An average ICC[1] value of .10 and ICC[2] value of .61 was calculated across items included in the safety climate questionnaire. Although the ICC[2] value was marginally lower than that found in previous research (Zohar & Luria, 2004, 2005), taken together the other statistics indicate sufficient levels of between-group variability and within-group agreement to justify analysis of safety climate at the group level.

Centering. Included in the final analyses were the level 2 predictors, group safety climate and group safety climate strength. Only one level 1 predictor, individual safety climate perceptions, was included. In line with recommended best practice level 2 predictors were centred at their grand mean, level 1 predictors at their group mean and no centering procedure was used with respect to the dependent variable, safety motivation (Enders & Tofighi, 2007).

Analytical Approach. MPlus 7.1 was used to conduct a multilevel analysis to account for variance both within groups and between groups. The overall model tested is represented by the equations below, in which ISC refers to individual level safety climate perceptions, GSC group level safety climate and SCS group level safety climate strength. The subscripts *i* and *j* refer to individuals and groups respectively. Equation 1 represents the level 1 regression where y_{ij} represents the individual variable of interest, safety motivation, B_{0j} the intercept, B_{1j} the slope of ISC and e_{ij} the overall error term. Each of equations 2 and 3 represent level 2 regressions (respectively intercepts as outcomes, and slopes as outcomes),

with γ_{00} the intercept of the regression predicting B_{0j}, γ_{01} the slope of GSC predicting B_{0j}, γ_{02} the slope of SCS predicting B_{0j}, and R_{0j} the error term for the level 1 intercept B_{0j}. Similarly, γ_{10} is the intercept of the level 2 regression predicting B_{1j}, γ_{11} the slope of GSC predicting B_{1j}, γ_{12} the slope of SCS predicting B_{1j} and finally R_{ij} representing the error term for the level 1 slope B_{1j}.

Additional main and interaction effects including group safety climate are included for completeness to account for the unique contribution safety climate strength makes in the prediction of individual safety motivation. Whilst this means the inclusion of variables with some degree of overlap in operationalisation, climate strength moderator research questions *inherently require* this for independent and moderating variables and the nature of the model is such that shared effects are controlled for.

(1) $y_{ij} = B_{0j} + B_{1j}ISC_{ij} + e_{ij}$

(2) $B_{0j} = \gamma_{00} + \gamma_{01}GSC + \gamma_{02}SCS + R_{0j}$

(3) $B_{1j} = \gamma_{10} + \gamma_{11}GSC + \gamma_{12}SCS + R_{ij}$

Substituting equations (2) and (3) into (1) yields the following reduced form equations creating the cross level interaction terms, $\gamma_{11}GSC * ISC_{ij}$ and $\gamma_{12}SCS * ISC_{ij}$:

(4) $y_{ij} = \gamma_{00} + \gamma_{01}GSC + \gamma_{02}SCS + R_{0j} + (\gamma_{10} + \gamma_{11}GSC + \gamma_{12}SCS + R_{ij})ISC_{ij} + e_{ij}$

(5) $y_{ij} = \gamma_{00} + \gamma_{01}GSC + \gamma_{02}SCS + +\gamma_{10}ISC_{ij} + \gamma_{11}GSC * ISC_{ij} + \gamma_{12}SCS * ISC_{ij} +$

$(R_{0j} + R_{ij}ISC_{ij} + e_{ij})$

Results

Preliminary analyses were conducted to examine inter-correlations for variables included in the present study. These correlations, together with the uncentered means and standard deviations of the variables, are presented in Table 1. Significant correlations were found

between all variables included. The correlation between group level safety climate and safety motivation was moderate and in the direction expected, with higher levels of safety climate associated with higher levels of safety motivation. Conversely, the correlation between safety climate strength and safety motivation was also moderate but in the opposite direction to that expected, with higher levels of strength associated with lower levels of safety motivation.

Insert Table 1 about here.

To assess hypotheses 1 and 2, a multilevel model was specified in MPlus using a MLR estimator to examine the main and interaction effects of group safety climate, individual safety climate perceptions and safety climate strength on individual safety motivation. The results of the regression conducted are presented in Table 2.

Insert Table 2 about here.

Although the parameter estimate for safety climate strength was significant, γ_{02}= -0.26, p<.01, in line with findings from the correlations, the main effect was such that safety climate strength was negatively related to individual safety motivation, and thus not in the direction predicted by Hypothesis 1. Similarly, support for Hypothesis 2 was not found with the parameter estimate for the interaction between safety climate strength and individual safety climate perceptions being non-significant, γ_{12}= -0.01. This suggests that safety climate strength did not moderate the relationship between individual safety climate perceptions and

individual safety motivation. Finally, as expected there was both a significant main effect for group safety climate on individual safety motivation, γ_{01}= 0.16, p < .01, and interaction between group safety climate and individual safety climate perceptions, γ_{11}= 0.26, p < .01. Simple slopes analyses revealed that at high levels of group safety climate, individual safety climate is positively related to safety motivation, slope = 0.18, p < .01, whereas at low levels of group safety climate the relationship between individual safety climate and safety motivation is negative, slope = -0.05, p < .05. Figure 2 presents a graph of the two way interaction effect, in which the individual safety climate axis represents values ± 1 S.D. above the mean.

Insert Figure 2 about here.

Taken together, results suggest that the significant negative main effect for safety climate strength found remains whilst controlling for any relationship between group safety climate, individual safety climate perceptions and the safety motivation dependent variable.

Post-hoc analyses

Although we initially combined individuals into their most proximal work unit, the novelty of our findings prompted re-analysis using alternative groupings. Specifically, we used ‘section’ identifiers that were automatically assigned to individual responses and provided codes allowing for grouping of teams in similar working areas together to form larger sections. Employees were thus involved in professional groupings which had similar daily safety requirements and exposure to physical tasks. For example, individual teams used in the main analysis such as nutrition and diet, occupational therapy, physiotherapy, social work and speech pathology were also identified as all belonging to the ‘allied health’ section.

This significantly reduced the sample size of identifiable units of analysis from 114 to 50 as in many cases multiple teams were combined into the new sections. The average size of each section was 34.4, approximately double that of the original analysis, although the range of $r_{wg(j)}$ values remained the same. Some teams did retain their independence however and were not subsumed into a larger section amalgamation due to their functional distinction. For example, the dental clinic team remained the same across both analyses as there were no other functional definitions of teams relating to dentistry in the original sample.

The same model identified in the initial analysis above was run again using MPlus. Results are presented in Table 3. In line with the original findings which rejected Hypothesis 1, the results indicate a significant negative main effect of group safety climate strength on individual safety motivation, γ_{02}= -.44, and a significant interaction between group safety climate and individual safety climate, γ_{11}= .24. Simple slopes analyses revealed that at high levels of group safety climate, individual safety climate is positively related to safety motivation, slope = 0.16, p < .01, however at low levels of group safety climate the relationship between individual safety climate and safety motivation is non-significant, slope = -0.03, p = .31. These slopes are plotted in Figure 3.

Insert Figure 3 about here.

In contradiction to the original findings however, and in line with Hypothesis 2, results indicate a significant interaction between group safety climate strength and individual safety climate, γ_{12}= .30, p <.01. Simple slopes analyses revealed that at high levels of safety climate strength, individual safety climate is positively related to safety motivation, slope = .08, p < .01, however at low levels of safety climate strength the relationship between

individual safety climate and safety motivation is non-significant, slope = -.02, p = .16. These slopes are plotted in Figure 4.

Insert Figure 4 about here.

Discussion

Support for Hypotheses

The purpose of the study was to examine the effect of climate strength on motivation in a safety critical context using situational strength theory and self-determination theory. Results initially suggested a significant negative main effect of safety climate strength on safety motivation, and no significant interaction between safety climate strength and individual safety climate perceptions on individual safety motivation. Thus, neither Hypothesis 1 nor 2 was initially supported, with an effect found in the opposite direction to that predicted. As higher safety climate strength is typically associated with *better* outcomes, post-hoc analyses were conducted based on re-grouping the teams into broader functional sections. The same negative relation between safety climate strength and individual motivation was found, failing to support Hypothesis 1. However, findings supported Hypothesis 2, showing that safety climate strength reinforced the positive relation between individual safety climate and safety motivation. Given strong methodological grounds for the initial organisation of clusters, the following sections discuss possible reasons for the findings.

Theoretical Contributions

Higher safety climate strength has in past research been found to be positively related to important behavioural outcomes such as safety compliance and citizenship behaviours (Lee & Dalal, 2016). So why would our results for motivation differ?

Firstly, strongly held views about safety climate in circumstances where they are well known within the group may have a negative influence on the internalization of the importance of safety climate, thereby stunting identified motivation, by imposing normative pressure on group members to think in a certain way (Meyer et al., 2010). This might particularly be the case when highly stipulated safety policies and procedures, with rewards and sanctions contingent on behaving in accordance with such policies, reflect controlling management safety practices. Such an environment would instead foster controlled motivation (i.e. external or introjected regulation) rather than identified motivation. In contrast, situations where there is an inconsistent perception of safety climate may encourage employees to form their own views of safety, and possibly discuss them with colleagues, consequently promoting internalisation. Indeed research in both laboratory (Deci, Eghrari, Patrick, & Leone, 1994) and applied organisational settings (Gagné, Koestner, & Zuckerman, 2000) has validated the role of autonomy supportive contexts with choice in encouraging internalisation of motivation to perform behaviours. Future research should examine this within safety contexts to explore the relationship between safety climate strength, autonomy support and other potentially related constructs such as voice.

Secondly, a high standard deviation on safety climate perceptions could create uncertainty in a work group. Research in social psychology has found that uncertainty threats have the capacity to cause reactive approach motivation states, in which anxious uncertainty and motivational conflict is masked with idealised confidence and displaced action which directs anxiety into pursuit of new goals (McGregor, Nash, Mann & Phills, 2010). Other research has further linked uncertainty psychological states with subsequent information

seeking behaviours in the context of threat (Brouwers & Sorrentino, 1993). This research suggests that uncertainty may motivate action, which could provide some explanation for the lack of interaction found here. Indeed, it may be the case that conversely, higher certainty in this context may be associated with complacency and greater inaction caused by lower motivation. Both may have relevance for safety contexts with uncertain guides for behaviour in which real physical threats exist in the workplace, and suggest an important role for individual differences that needs to be explored in the situational strength theory used for climate strength research.

Finally, social loafing effects would suggest that employees in groups with strong safety climates may believe that they are able to leave the responsibility for safety functioning to others within the group, thus decreasing their overall safety motivation. If their group safety climate is weak they may feel more motivated to behave safely to compensate for a perceived lack of adequate safety functioning. These perspectives are supported by social loafing research which has found motivation losses in groups where the perceived dispensability of effort is higher (Kerr & Bruun, 1983).

However, in light of our findings from the post-hoc analysis, these claims must be tempered. Given the presence of a significant interaction effect in the direction predicted, and the similarity in main effects found across the two safety climate strength groups, the negative main effect observed again in the post-hoc analysis becomes un-interpretable. Instead, the direction of the significant high safety climate strength slope *is* in line with Hypothesis 2, and suggests that at high levels of safety climate strength individual safety climate is positively related to safety motivation. These findings can be interpreted within the context of risk perception, self-determination theory and social network theory.

Firstly, the core catalyst for individual safety motivation may reside not at the team level of analysis, but instead the broader section in which an individual works due to the safety criticality of their work. This is in line with previous research which has found that the perceived priority of safety has an important moderating role to play in relationships between safety procedures and interpretations of manager safety practices, and treatment errors in health care industries (Katz-Navon, Naveh & Stern, 2005). Given that the grouping of multiple teams together typically resulted in larger sections, this is a plausible explanation as it is unlikely that employees would have had higher levels of direct interaction with their section members compared to their team members and may have been more influenced by section level 'criticality' factors.

Secondly, the distinction between work group and section may afford different opportunities for psychological needs to be met. Section identifiers may provide employees greater access to resources from the organisation to satisfy competence needs (i.e. training program funding) and also greater visibility and presence of a management style which leads but provides autonomy (versus a line-manager who may provide a controlling, transactional or management by exception approach as would be typical in a safety critical context). This is particularly relevant given the strong relationship between leadership and safety outcomes (Hofmann, Morgeson, & Gerras, 2003; Kapp, 2012; Zohar, 2002). Previous research has found positive relationships between transformational leadership behaviours and identified forms of motivation (Conchie, 2013). Given supervisors have different degrees of discretion over safety climate at different levels of an organisation (Zohar, 2000), the extent of communication from leaders within the hospital may have varied at the section level versus at the team level. Unfortunately we were unable to examine safety leadership at either level of analysis as it was not a focus of the original questionnaire. Interpreting relatedness needs is less clear as they would depend on the structure of work groups. For instance individuals may

have greater exposure to other employees from a similar background at the section level if their workgroups are designed in a lean fashion to incorporate limited occupational groups, though may have less direct contact with other employees than they would in teams.

Secondly, previous research on social networks has found communication density, the proportion of employees involved in work-related exchanges involving information exchange, to be positively related to climate strength, yet centralisation of communication networks, where most employees are remote and receive fewer work-related exchanges, negatively related to climate strength (Zohar & Tenne-Gazit, 2008). Decentralised networks may represent a wider spread of direct member-member exchanges and better opportunities for social diffusion of information (Zohar & Tenne-Gazit, 2008). This is particularly relevant given having many dyadic communications in a decentralised group may improve diffusion of information more than narrow communication (Borgatti, 2005). In larger teams the presence of many dyadic communication opportunities which contain a definite safety climate perception (i.e. high safety climate strength) may increase motivation more than they would in smaller teams with fewer dyadic communication opportunities. Future research should incorporate social network metrics to test this theory.

Overall, safety researchers would benefit from a re-evaluation of the role that different types of SDT motivation and team identification/level of analysis plays. Further work needs to be done to examine how this impacts on other safety related behaviours in the context of a SDT framework, and whether increases in safety climate strength might instead increase the levels of other categories of motivation. This might explore how it influences different types of motivational ‘profiles’, and how these influence outcomes. Research in non-safety contexts has successfully demonstrated that employees experience both different *amounts* and different *types* of motivation across different types of jobs, which influence performance and wellbeing outcomes (Howard, Gagné, Morin, & Van den Broeck, 2016).

Practical Conclusions

Broadly, we suggest that as long as the context within groups is autonomy supportive, allowing for divergent views and constructive dialogue amongst team members in a non-threatening way, weak climates may not be a bad thing in motivating safety behaviors. Such autonomy supportive contexts may be important for encouraging internalisation of motivation to perform safety behaviours. Recent research investigating safety motivation interventions (Hedlund, Gummesson, Rydell, & Andersson, 2016) have suggested safety training initiatives can have positive impacts on increasing intrinsic motivation. Education sessions involving a mix of both group professional training and computer based training regarding workplace safety risks unique to individual employees were successful. These may have had the dual impact of increasing individual competence through training and autonomy through the focus on individual experiences. This could replicate the recommendations provided by SDT researchers to provide meaningful rational, acknowledge the feelings of others and convey choice in order to make desired behaviours intrinsic within safety contexts (Deci et al., 1994; Gagné et al., 2000).

Furthermore, instances of variability could be capitalised on to be used as sources of discussion and questioning in group based interventions. Previous research has supported the important role of leader communication interventions on improving safety in teams, so teams could focus on leaders initiating 'brown bag' sessions for open discussion of workplace safety and climate (Zohar & Luria, 2004; Zohar & Polachek, 2014). If several members of a team do not perceive the safety climate of their organisation in the same way as other members of their team, why is this the case? Are they aware of, or exposed to, other factors which influence their perspective? The de-motivating nature of a highly homogenised collection of safety perspectives within a single team may reflect employees questioning why they need to behave in a certain way in the absence of a management style promoting

autonomy of thought. Just as near misses are used as a valuable reflection tool, variability in safety climate perspectives could be used to enhance and improve existing safety practices.

Future Directions and limitations

This paper's unique perspective on safety climate and safety motivation within workplaces presents an alternative viewpoint to the paradigm that greater consistency in psychological perceptions amongst workgroups inherently predicts better outcomes (dependent on the level of analysis). There are, however, a number of limitations to be acknowledged.

Firstly, data collected was cross-sectional, measuring safety climate and safety motivation simultaneously. Such a design does not lend itself to a statement of causality, and future research would benefit from an examination of not only the effect of safety climate on safety motivation over time, but even more importantly, the impact of variability in safety motivation on safety outcomes over time. This would investigate whether the variability in safety motivation as a product of variability in safety climate perceptions in fact predicts safety related behaviours, fulfilling the full path hypothesised by Neal et al. (2000).

Secondly, depending on the focus of safety behaviours within healthcare industries (i.e. does internalisation of the importance of safety focus on the safety of patients by avoiding unintended harm, avoiding incidents and accidents to other employees, the employee themselves, or basic maintenance of equipment) the industry specific nature of this paper may contribute to explaining the results. Teams within healthcare settings may involve significant amounts of multi-disciplinary contact, meaning the focus of the safety motivation may be divergent and involve varying levels of internalisation depending on the end result of safety directed behaviours. Thus here, a range of different teams within the hospital where safety may have held different meaning for different groups.

Thirdly, levels of analysis became blurred in the context of the re-grouping in the post-hoc analysis which combined similar functionalities together. Although past research has suggested that individuals can develop complementary climate perceptions at different levels of analysis (Zohar & Luria, 2005), it is an unavoidable limitation that some units of analysis were retained across both analyses given there were no other functional teams to group them together with. It was therefore difficult to fully contrast the two sets of findings.

Fourthly, the safety motivation items included in the present study examined exclusively levels of identified motivation, assessing the extent to which individuals had internalised the importance of behaving safely. To fully integrate SDT into a model of safety climate and motivation, a greater examination of how safety climate strength impacts on other types of motivation (i.e. external regulation or introjected regulation) and ultimately safety behaviour is needed. This would build on recent research which has validated more comprehensive SDT measures of motivation with safety research (Jiang & Tetrick, 2016) and could be paired with item reduction strategies used in previous safety research to improve responsiveness if faced with excessively long surveys (Flatau Harrison, Griffin, Gagne, & Andrei, 2018).

Fifthly, common method bias is a frequent criticism of cross-sectional samples such as that used here, with many different approaches for reasonably justifying such samples listed by Conway and Lance (2010). Consistent with common practice, internal reliabilities and factor structures were listed in the results section. In addition, safety climate and safety motivation represent strongly differentiated concepts within the literature with causal frameworks established by past research (Neal & Griffin, 2006) overcoming the possibility for overlap in the constructs used here. Future research would benefit from alternative rating sources (such as other and supervisor ratings of safety climate, as well as other and objective ratings of safety motivation) to fully examine the relationship proposed here.

Finally, within safety research social desirability may impact findings. Participants could feel the need to favourably respond to questions asking them about how safe they are to reflect positively on them. This has been investigated in various safety behaviours, such as road user speeding (Wahlberg, Dorn & Kline, 2010) and seat belt usage (Shults & Beck, 2012), where objective data is unable to be used. Some previous authors (Neal et al., 2000) have noted the possibility for safety motivation to be affected by social desirability by contributing to ceiling type results and the high mean of individual safety motivation here suggests this was a possibility. More comprehensive measures of safety motivation which assess multiple different types of motivation may reduce the likelihood of social desirability by helping employees accurately identify what they are actually experiencing.

Conclusion

Group situational pressure in the form of safety climate strength can have a significant impact on how motivated individuals are to perform their jobs safely. Depending on the group structure, this can positively or negatively attenuate the relationship between individual perceptions of how much safety is valued and an individual's safety motivation. This paper contributes to the nomological network surrounding safety climate and motivation, suggesting the influence of group pressure on individual psychological precursors of behaviour such as safety climate perceptions and motivation are driven by aspects of self-determination theory.

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Appendix

Safety climate

1. Management places a strong emphasis on workplace health and safety (*Management Values*)
2. Safety is given a high priority by management (*Management Values*)
3. Management considers safety to be important (*Management Values*)
4. There is sufficient opportunity to discuss and deal with safety issues in meetings (*Communication*)
5. There is open communication about safety issues within this workplace (*Communication*)
6. Employees are regularly consulted about workplace health and safety issues (*Communication*)
7. Employees receive comprehensive training in workplace health and safety issues (*Training*)
8. Employees have sufficient access to workplace health and safety training programs (*Training*)

Safety motivation

1. I feel that it is worthwhile to put in effort to maintain or improve my personal safety
2. I feel that it is important to maintain safety at all times
3. I believe that it is important to reduce the risk of accidents and incidents in the workplace

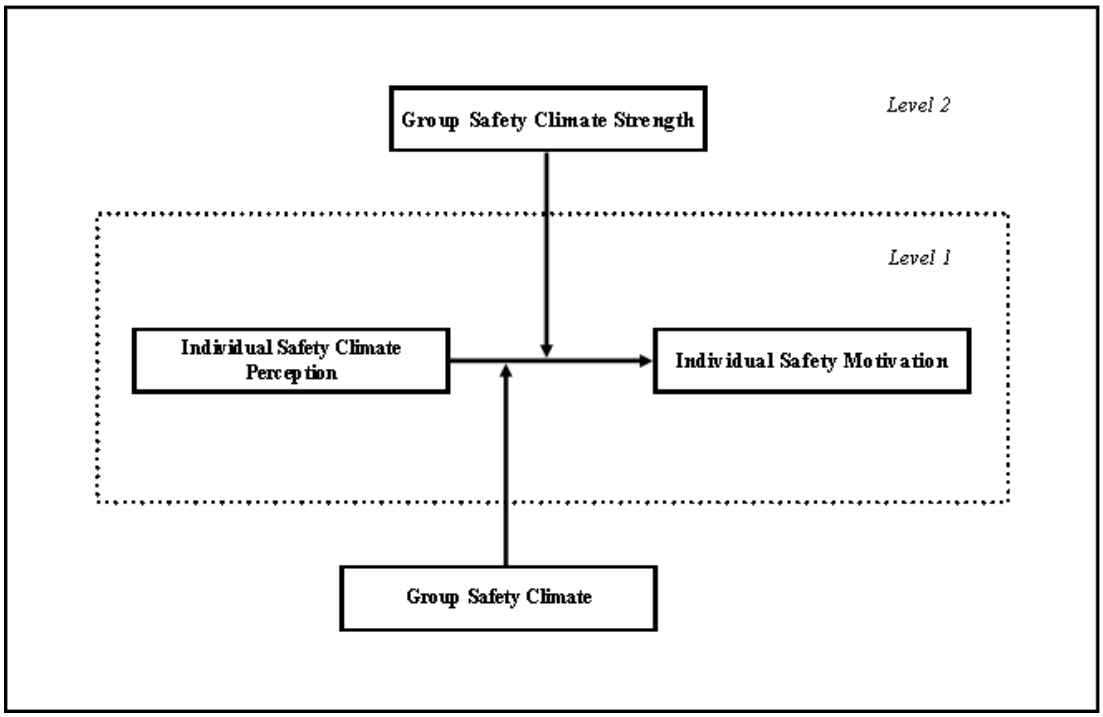

Figure 1. Hypothesised Multilevel Model.

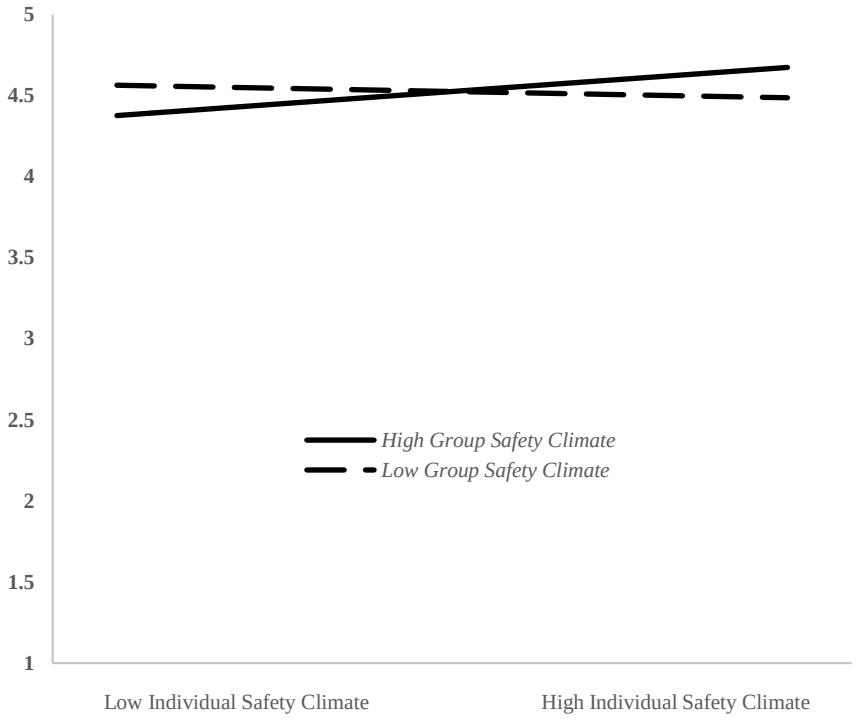

Figure 3. Section safety climate x Individual safety climate interaction plot

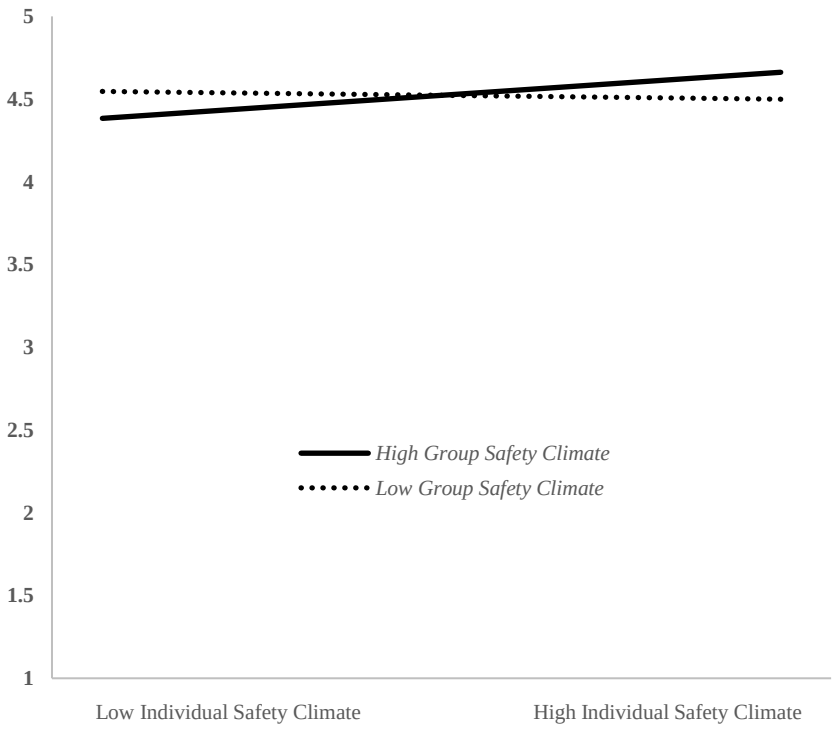

Figure 2. Group safety climate x Individual safety climate interaction plot

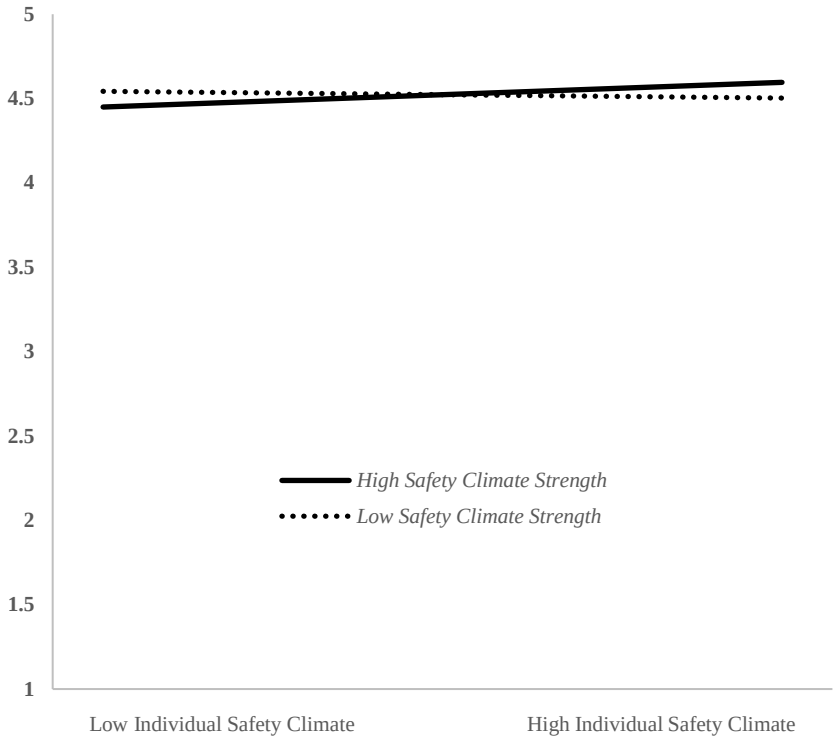

Table 1. Descriptive statistics and correlations for variables included in analyses.

	$\bar{x}$	SD	SCQ	SM	SCS
Safety Climate	3.48	.40 (.93)	-	.23**	N/A
Safety Motivation	4.54	.18 (.57)	.24**	-	N/A
Safety Climate Strength	-.85	.19	.31**	-.19**	-

N.B. Standard deviations in parentheses are based on individual level data (N = 1720). Correlations below the diagonal are based on group-level data and correlations above the diagonal are based on individual-level data. ** p <.05. ** p <.01.*

Table 2. Parameter estimates for multilevel model decomposed into fixed and random parts.

	Parameter	b	SE
Fixed part			
Intercept	γ_{00}	4.53**	0.02
GSC (L2)	γ_{01}	0.16**	0.05
SCS (L2)	γ_{02}	-0.26**	0.09

Figure 4.Section safety climate strength x Individual safety climate interaction plot

ISC (L1)	γ_{10}	0.15**	0.02
GSC*ISC	γ_{11}	0.26**	0.05
SCS*ISC	γ_{12}	-0.01	0.11
Random part			
Level two variation			
Intercept	R_{0j}	0.01*	0.01
Slope	R_{ij}	0.01**	0.00
Level one variation			
Intercept	e_{ij}	0.28**	0.02

N.B. b: parameter estimate; SE: Standard error for parameter estimate; GSC: Group Safety Climate; SCS: Safety Climate Strength; ISC: Individual Safety Climate; L1: Level 1; L2: Level 2. * p<.05, **p<.01.

Table 3. Parameter estimates for post-hoc multilevel model decomposed into fixed and random parts.

	Parameter	b	SE
Fixed part			
Intercept	γ_{00}	4.52**	0.02
GSC (L2)	γ_{01}	0.16**	0.05
SCS (L2)	γ_{02}	-0.44**	0.11
ISC (L1)	γ_{10}	0.17**	0.02
GSC*ISC	γ_{11}	0.24**	0.06
SCS*ISC	γ_{12}	0.30**	0.09
Random part			
Level two variation			
Intercept	R_{0j}	0.00	0.00
Slope	R_{ij}	0.00	0.00
Level one variation			

Intercept	e_{ij}	0.29**	0.02

N.B. b: parameter estimate; SE: Standard error for parameter estimate; GSC: Group Safety Climate; SCS: Safety Climate Strength; ISC: Individual Safety Climate; L1: Level 1; L2: Level 2. * p<.05, **p<.01.