Team cohesion and error culture in risky work environments

Laura Sophie Fruhen [a,*], Nina Keith [b]

[a] University of Aberdeen, King's College, Old Aberdeen, Scotland AB24 2UB, United Kingdom
[b] Technische Universität Darmstadt Institut für Psychologie, Alexanderstrasse 10, 64283 Darmstadt, Germany

A R T I C L E   I N F O

A B S T R A C T

The joint influence of safety specific team processes and general team processes on safety outcomes is not fully understood. This study investigates how cohesion (task and social) and error culture (error management and error aversion culture) relate to accident occurrence in low and high risk situations. A sample of 30 fire fighting teams ($N = 199$) completed questionnaires. The results indicated significant effects of error management culture, error aversion culture and task cohesion on accident occurrence in low and high risk situations. Error management culture was found to mediate task cohesion's relationship with accident occurrence. Social cohesion was not found to relate to accident occurrence. These results complement the safety literature with its focus on leadership as an antecedent of safety specific team process and provides an opportunity for practitioners to broaden the focus of their interventions to include some of the here investigated team processes.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

Team characteristics have long been recognised as contributing to safety in work teams. Yet, there is a need for further investigation of multiple processes that contribute to safety performance of teams (e.g. Zohar, 2010). Considering safety specific team processes (e.g. safety climate) together with general team processes that are not inherently safety related (or foundation climates, e.g. work ownership, commitment), can enhance our understanding of the ways in which teams achieve safety (Zohar, 2008). Zohar describes these two types of team processes as interacting or synergising and he proposes that understanding their influence will enable a better prediction of accidents and safety related behaviour.

Next to the academic benefits, considering safety specific and general processes in relation to safety outcomes in work-teams, can contribute to a reduction of accidents and injuries in workplaces. The most recent statistic of the Health and Safety Executive (HSE, n.d.; reporting data for 2007) reports an average rate of work related fatal injuries in the European Union (excluding transport accidents) as 2.1 per 100,000 workers. Risks that can lead to accidents are even more pronounced for employees who carry out their work in risky environments, such as the sample included in this study, fire fighters. The work of fire fighters involves frequent exposure to risks. Although a reduction of injuries has been recorded for other industries (HSE, n.d.), this trend is not evident for fire fighters.

Statistics from the US (National Institute of Standards & Technology, 2004) show that, while the number of fire calls have dropped over a period of 15 years (1988–2002), the number of injuries has remained the same over this period of time (22.4 injuries per 1000 fires in 2002). This stagnation in injury frequency, despite reduced calls, suggests that the situation is not improving for fire fighting teams. Accordingly, there is a need to better understand the contributing factors to accidents in this work context so that these can be targeted in making fire fighters' work safer.

So far, the safety research has primarily focused on leadership as a general team process in relation to safety specific team climates and processes (e.g. Hofmann et al., 2003; Zohar, 2002a, 2002b). Another study by Wallace et al. (2006) applied management support and employee relations as foundation issues relevant for safety specific team processes. Although this focus on leadership has provided valuable insights into the ways leaders influence workplace safety, findings regarding the contribution of other general team processes to safety are lacking. To address this gap in the literature, this study investigates team cohesion as a general, non-safety specific team process together with the safety specific team process of error culture in fire services. By doing so, we follow Zohar's (2008) suggestion to combine safety specific as well as general team processes. The subsequent sections introduce the concepts considered in this study and describe the ways in which these might influence safety outcomes. We start with error culture (error management culture and error aversion culture), as the proximate antecedent of safety outcomes, followed by cohesion, which is considered to be the more distal predictor. We refer to the riskiness of the situation (low vs. high) as a contextual factor of fire fighters' work environment. Because not much is known

* Corresponding author. Tel.: +44 1224272668.
E-mail addresses: fruhen@abdn.ac.uk (L.S. Fruhen), keith@psychologie. tu-darmstadt.de (N. Keith).

about the influence of contextual risks on the relation of error culture and accident occurrence, this issue is addressed as an explorative research question. Fig. 1 depicts the conceptual model summarising the relationships investigated in this study.

1.1. Error management culture, error aversion culture and safety

Error culture describes how teams learn from errors and what norms and values they follow when dealing with errors and their consequences (Keith and Frese, 2011; van Dyck et al., 2005). Van Dyck et al. (2005) conceptualise error culture along two dimensions: Error management culture and error avoidance culture. Error management culture has been defined as "organizational practices related to communication about errors, to sharing error knowledge, to helping in error situations, and to quickly detecting and handling errors." (p. 1229) by van Dyck et al. (2005). Members of teams with high error aversion culture are described as being afraid of committing errors, reacting to errors with negative emotions, and likely to cover up errors instead of communicating them to others (Rybowiak et al., 1999).

Errors, in terms of unintended deviations from plans and goals (Reason, 1997), will usually be avoided as best as possible by individuals and teams in organizations working in risky industries (Cigularov et al., 2010; Keith and Frese, 2011). However, some workplaces, such as the work environment of fire fighters, are inherently dangerous, unpredictable and often provide only limited or inaccurate information (HSE, 2010). Fire fighters regularly work in "dangerous, fast-moving, emotionally charged and pressurised situations" (see HSE, 2010, p. 4). These situations are extremely challenging, not only for the individual fire fighters, but also the teams. In this kind of work environment, errors are inevitable to happen (Pillai and Williams, 2004).

A reporting, or learning culture, in which people are ready to report their errors is suggested by Reason (1997) as one crucial dimension of safety culture. A recent meta-analysis by Beus et al. (2010) found error reporting to have a stronger relationship with subsequent injuries than any other safety climate dimension (together with management safety commitment). Error handling has been found to relate to unit performance in safety specific work environments, such as the health care sector (Edmondson, 1996; Hofmann and Mark, 2006). Other health care studies have shown that improving team processes such as planning and clear task allocation can reduce surgical errors (Catchpole et al., 2008). To our knowledge, only one study has investigated error handling as a cultural construct in a safety specific work environment: Cigularov et al. (2010) found error management culture to be positively

related to safety behaviour and negatively related to pain, but not work injuries in the construction industry. Conceptualising error handling as a cultural concept is more in tune with the learning culture that Reason (1997) describes in his safety culture dimensions.

Learning from errors and minimising their negative consequences is highly relevant for work teams in risky work environments, like fire services. It can help to reduce accidents and incidents and their possible negative consequences. Discussing errors openly will provide teams in risky work environments with opportunities to improve their error handling during future work. Error management culture can reduce the negative consequences of errors and increases positive error consequences, through quick error detection and immediate damage control (Keith and Frese, 2011; van Dyck et al., 2005). On the contrary, error aversion culture describes the tendency of team members to experience strain when committing errors. This strain can lead to increased experiences of stress in error prone situations. Teams, who treat errors as a "forbidden subject", might be tempted to cover up their errors. By doing so, the opportunities to learn from errors will be reduced (e.g. Helmreich, 2000). Furthermore, this might make it more likely for other team members to commit the same errors, in turn leading to more frequent accidents in these teams. Therefore, we hypothesise:

H1a. Error management culture is negatively related to accident occurrence.

H1b. Error aversion culture is positively related to accident occurrence.

Error occurrence is likely to depend to some extent on the level of risks in teams' work context. Context has been described as influencing observable behaviour of individuals (Lewin, 1951). In an essay concerning the role of context in organisational research, Johns (2006) defines it as "situational opportunities and constraints that affect the occurrence and meaning of organizational behaviour as well as functional relationships between variables" (p. 386). He highlights salient situational features of the context as having subtle, yet powerful effects on research results. A salient attribute of fire fighters' work context is the varying risk level that this group is exposed to in different work tasks. This paper considers this differing level of riskiness (i.e. the level of exposure to possible danger) of the work context of fire fighters through an exploration of the relation of error culture to accident occurrence across two situations. Norms and rules in groups are "especially
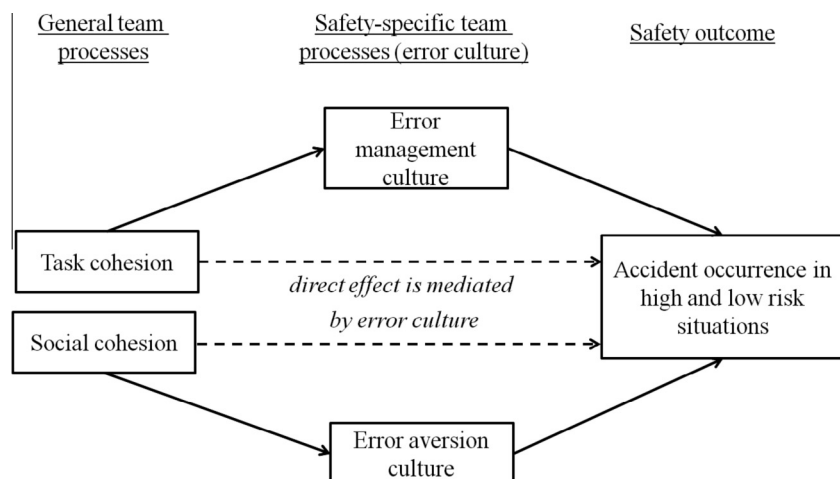

Fig. 1. Theoretical mediated model of relationships between team cohesion, error culture and safety outcomes.