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„Safety Engineers' Inclusion in Organizations – The Roles of Safety Climate, Expertise, and Support"

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Mag.ª Johanna Bunner

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Preface

The present doctoral thesis “Safety Engineer’s Inclusion in Organization – The Roles of Safety Climate, Expertise, and Support” is based on three already published or submitted journal articles. This thesis emerged from a cooperation project with the Austrian Workers’ Compensation Board – Allgemeine Unfallversicherungsanstalt (AUVA; #WA 108803/9100) and the results of the project have been published in the book “Sicherheitsfachkräfte im Betrieb – Wie Einbindung, Kooperation und Expertise die Arbeitssicherheit verbessern” by Bunner and Korunka (2018). The book can be considered an expansion of this dissertation as it a) reports the analysis of qualitative interviews on which the research questions of Studies 1 and 3 of this thesis were based, and b) includes extensive analyses of the data on safety engineers used in these studies. The purpose of the book was to make the results of the project and, to some extent, this thesis easily accessible to the general public and specifically, to safety engineers and managers. Including the book, this doctoral thesis comprises four additional publications which will not be discussed in this thesis.

Throughout this doctoral thesis two different active voices are used in line with the suggestions of the American Psychological Association (APA; American Psychological Association, 2010). The use of the first-person singular voice (“I”) is used whenever referring to the doctoral thesis in its entirety. When speaking about single studies, first-person-plural voice (“we”) is used to highlight that multiple authors contributed to each study.

Acknowledgements

First, I want to thank my supervisor, Christian Korunka, for providing me with this opportunity and his support and trust in this oftentimes challenging project. I also want to thank my colleagues, for their encouragement, feedback and advice made this doctoral thesis possible. My special thanks go to my colleague, co-author and statistics guru, Roman Prem, for being a sheer infinite well of wisdom and knowledge. Further, I want to thank my colleague Katja Kerman for tearing me away from my thesis for much needed and entertaining coffee breaks, ensuring I had a steady level of caffeine to keep me going.

I also want to thank my family and friends for their emotional and social support and their vital contributions to my work-life balance in the past four years. To Cornelia Gerdenitsch, my friend, former colleague, mentor and spirit animal, I am eternally grateful for your support from, literally, the first day of this endeavor to the last. You have encouraged me to take on this challenge, helped me to not lose faith on the way, and always believed in me – thank you. To my best friend, Lena, thank you for your constant moral support, always cheering me on, and, of course, the countless evenings reflecting about work, life, and everything else. Finally, I want to thank my partner, Martin, for his overall unconditional support and encouragement, his incredible patience when being talked at about this thesis, and the continuous supply with chili con carne during this time. Also, I solemnly swear that I will never make him proofread my doctoral thesis ever again.

The project surrounding this doctoral thesis was financed by the AUVA and I am grateful to have received such extensive funding and highly appreciate being entrusted with such an important project. My thanks also go out to all the safety engineers and managers whose participation made this doctoral thesis possible.

English Abstract

Safety engineers contribute to occupational safety and health by consulting employers and employees on the design of humane working conditions. Their effectiveness is strongly influenced by their organizational inclusion. However, their inclusion is difficult since organizations are legally bound to hire safety engineers, but they do not necessarily want one. In this cumulative doctoral thesis, I add to the literature on safety engineers by examining factors contributing to their organizational inclusion. In three studies, I investigate the roles of safety climate, safety engineers' expertise, and support from managers as well as the organization regarding safety engineers' inclusion.

The first study aims to answer the question how organizational and individual level aspects of safety engineers' inclusion relate to each other. Therefore, the reciprocal causal relationship between safety climate and safety engineer's perceived organizational support is investigated in a cross-lagged panel design. The second study utilizes safety engineers' expert assessments and manager perspectives to evaluate the relationship between work intensification and safety performance through safety climate, safety motivation, and safety knowledge at the organizational level. The third study investigates which of safety engineers' influence tactics are most successful in obtaining management support and, in turn, improve their performance. Special attention is paid to the role of expertise in the form of safety engineers' expert power, interacting with their influence tactics.

Overall, the present doctoral thesis sheds light on how safety climate, safety engineers' expertise, and their support from management and the organization contribute to their organizational inclusion and thus, to their effectiveness. Implications for both scholarly knowledge and safety engineers' work and training are discussed.

Publications included in this doctoral thesis

Study 1

Bunner, J., Prem, R., & Korunka, C. (submitted). Perceived Organizational Support and Perceived Safety Climate from the Perspective of Safety Engineers: Testing Reciprocal Causality using a Cross-Lagged Panel Design. Manuscript submitted for publication on April 15th, 2019.

Study 2

Bunner, J., Prem, R., & Korunka, C. (2018). How Work Intensification Relates to Organization-Level Safety Performance: The Mediating Roles of Safety Climate, Safety Motivation, and Safety Knowledge. *Frontiers in Psychology*, *9*, 2575. https://doi.org/10.3389/fpsyg.2018.02575

Study 3

Bunner, J., Prem, R., & Korunka, C. (revised and resubmitted). How do Safety Engineers improve their Job Performance? The Roles of Influence Tactics, Expert Power, and Management Support. Manuscript resubmitted for publication on April 15th, 2019 in *Employee Relations*.

Additional publications <u>not</u> included in this doctoral thesis

Books

Bunner, J. & Korunka, C. (2018). *Sicherheitsfachkräfte im Betrieb – Wie Einbindung, Kooperation und Expertise die Arbeitssicherheit verbessern*. Wien: Facultas Verlags- und Buchhandels AG.

Book chapters in edited volumes

Bunner, J. & Korunka, C. (2018). Wie beeinflussen Sicherheits- und Gesundheitsmanagementsysteme die Zusammenarbeit von Sicherheitsfachkräften mit KooperationspartnerInnen? In R. Trimpop, J. Kampe, M. Bald, I. Seliber, G. Effenberger (Hrsg.). *20. Workshop Psychologie der Arbeitssicherheit und Gesundheit – Voneinander lernen und miteinander die Zukunft gestalten!*. Kröning: Asanger Verlag GmbH.

Gerdenitsch, C., **Bunner**, J. & Tscheligi, M. (2018). Digitale Assistenz in der Produktion: Empfehlungen aus der Perspektive des ArbeitnehmerInnenschutzes. In R. Trimpop, J. Kampe, M. Bald, I. Seliber, G. Effenberger (Hrsg.). *20. Workshop Psychologie der Arbeitssicherheit und Gesundheit – Voneinander lernen und miteinander die Zukunft gestalten!*. Kröning: Asanger Verlag GmbH.

Kubicek, B., Paškvan, M. & **Bunner**, J. (2017). The Bright and Dark Sides of Job Autonomy. In C. Korunka & B. Kubicek (Hrsg.). *Job demands in a changing world of work.* Heidelberg: Springer. 10.1007/978-3-319-54678-0_4

Table of Contents

1 General Introduction

“Every 15 seconds, 150 workers have an accident & 1 dies from work-related accident or disease. We can prevent this.” (ILO, 2018)

The above-cited tweet from the International Labour Organization (ILO) is an excerpt from the global work-related accident and injury statistic. In Austria in 2017, approximately every five minutes a worker suffered a work-related accident and every fourth day a worker died from one (Statistik Austria, 2019). In comparison with the European Union (EU), Austria’s incidence rates of fatal injuries at work are above European average, and it leads the European statistic of workers who had an injury resulting in sick leave (Health and Safety Executive, 2015).

To prevent accidents and injuries and to protect workers’ safety and health, the EU issued the Council Directive 89/391/EEC (European Council, 1989), which legally binds organizations to avert harm from and provide healthy and safe work conditions for their workers. To support organizations in adhering to safety regulations and achieving maximum occupational safety and health (OSH), professionals for occupational safety, i.e. safety engineers, were legally installed. According to Austrian Labor Law (ASchG §76), their main responsibility is to consult employers, employees, safety representatives and work councils on the design of OSH and humane working conditions. Safety engineers are effective in improving OSH outcomes such as safety climate as well as in reducing accident and injury rates (Nielsen, 2014; Robinson & Smallman, 2013; Walters & Nichols, 2006; Winterfeld, Trimpop, & Forschungsgemeinschaft Sifa-Langzeitstudie, 2012). However, safety engineers’ inclusion in organizations is complicated because they are legally required consultants. This constitutes a rather exceptional constellation, since organizations usually decide autonomously whether they wish to hire a consultant for a specific challenge in their business. Therefore, this situation may lead to instances where organizations refuse to grant safety engineers’ adequate access and resources to properly do their job (Dawson, Poynter, & Stevens, 1984; Winterfeld et al., 2012). Considering the combination of Austrian safety statistics and safety engineers' difficult position, there is a need to further investigate how safety engineers operate within organizations. Therefore, with this doctoral thesis, I aim to further our understanding about the factors contributing to safety engineers' organizational inclusion in terms of safety climate, their expertise, and support.

1.1 Safety engineers' inclusion in organizations

Safety engineer's organizational inclusion is determined by three levels: the normative, the organizational, and the individual level (Dawson et al., 1984; Hale et al., 2005; Provan, Dekker, & Rae, 2017; Winterfeld et al., 2012). These three levels interact with each other and create boundaries as well as possibilities for safety engineers to operate. In the following sections, to ensure a general understanding of safety engineers' complex working conditions, I will present an overview of each level and its components, and point out research gaps concerning safety engineers' organizational inclusion.

1.1.1 Normative level

From a broad, societal perspective, safety engineers' education, general area of work and actions are tightly defined by external factors, such as globalization and demographic change, but also by the normative (legal) context of the country they work in (Winterfeld et al., 2012). In Europe and thus, Austria, the training for safety engineers is legally regulated by the European Council (1989) to ensure a quality standard and constant improvement in the training of safety engineers. According to the Austrian Employee Protection Act §74 (ASchG, 1995) and the educational regulation for safety engineers in Austria (SFK-VO, 1995), they are required to have relevant professional experience before being admitted to the education program. Their training comprises at least eight weeks of theoretical and practical OSH training and concludes with oral and written exams. Typical core qualifications are legal aspects, factors of labor science and business aspects of OSH practices. Their training provides safety engineers with the necessary expertise to fulfill their tasks which, according to ASchG §77, are:

- Planning and inspection of workplaces
- Inspection of construction sites and external workplaces
- Participation in visits by the labor inspectorate
- Determination, investigation and evaluation of the cause of work-related accidents and ailments
- Evaluation of hazards and OSH measures
- Documentation of OSH activities, results and measures
- Preparation of reports and programs in the field of OSH and work design
- Execution of workplace instructions and safety trainings
- Coordination of the activities of multiple safety engineers.

Safety engineers are to be included in organizations in a staff position, meaning they have no authority to issue directives and report directly to their organization's CEO as a consultant on OSH topics. In that function, safety engineers can be employed either as in-house or as external consultants. Their working hours, so called prevention time, depend on the number of employees in their organizations including contract workers and the exposure of the workplaces to dangers and stressors (ASchG §82a). Overall, the legal framework impacting safety engineers' organizational inclusion is rather dominant and rarely changes. More importantly, it is out of safety engineers' area of influence. Yet, it has an extensive influence on safety engineers' work within organizations.

1.1.2 Organizational level

The organizational level determining safety engineer's inclusion can be divided into three components: the organizational framework conditions, the relationship of safety engineers with their cooperation partners, and safety engineers' operating conditions. These three components not only influence each other, but also safety engineers' activities and attitudes (Provan et al., 2017; Winterfeld et al., 2012).

Organizational framework components include the size and structure of an organization and its industry sector. They cannot be changed by the safety engineer. Organizational framework components have a great impact on safety engineers' activities and inclusion as the number of employees dictates safety engineers' prevention time and the industry sector determines which specific OSH issues safety engineers will face (Winterfeld et al., 2012).

Safety engineers' relationships with partners concerns internal and external cooperation partners and institutions, such as employees, work councils, occupational physicians, social insurance providers, and the labor inspectorate. To have successful partnerships at work, safety engineers need to network within and outside of the organization and collaborate in interdisciplinary teams. However, their most important relationship is with the management, because it has the most influence regarding their performance and inclusion (Provan et al., 2017; Winterfeld et al., 2012). As managers control the budget and therefore ultimately approve or disapprove OSH measures, their support is crucial for safety engineers (Clarke, 2000; Winterfeld et al., 2012). A challenge in that relationship concerns the different point of views between managers and safety engineers. For example, managers perceive that their organizations put a high priority on the design of the work environment, whereas safety engineers perceive a high need for action in that field (Nordlöf, Wijk, & Lindberg, 2012). Regarding organizational safety indicators, such as safety climate, it is yet unclear how safety engineers' and managers' perceptions differ.

The operating conditions include the organization's accident rate, the presence of a certified OSH system, safety engineers' employment (in-house or external), and safety climate. An organization's accident rate determines its willingness to invest into safety measures: the more recent an accident has occurred, the higher the readiness to take measures to avoid future accidents of that sort (Sheehan, Donohue, Shea, Cooper, & Cieri, 2016). Certified OSH systems comprise organizational safety goals and structure organizations' safety strategies. Therefore, they improve safety engineers' inclusion because they enhance their visibility, structure tasks and responsibilities for stakeholders of occupational safety, and formalize communication channels between them (Bunner & Korunka, 2018). Safety engineers' employment as in-house or external consultants strongly determines their visibility among staff, their access to management, and their effectiveness (Winterfeld et al., 2012). The above-mentioned operating conditions can be influenced by the safety engineer, and while all of them play an important role in safety engineers' organizational inclusion, safety climate is arguably the most critical.

1.1.2.1 Safety climate

Safety climate is defined as shared employee perceptions of safety in the work environment regarding the priority of safety during production processes (Zohar, 1980, 2000, 2014). It is a second-order construct that comprises five first-order factors, namely safety practices, management values, safety equipment, safety training, and safety communication (Braunger, Korunka, Kubicek, Frank, & Lueger, 2015; Griffin & Neal, 2000; Neal & Griffin, 2004). Organizations with a strong (or high) safety climate invest more time, money, and know-how in the continuous improvement of their occupational safety. They attach great value to safety climate for maintaining productivity and see occupational safety itself as a central value of their corporate culture (Griffin & Curcuruto, 2016; Zohar, 2010, 2014). Overall, the role of safety climate has been researched quite extensively and is directly and indirectly related to better OSH outcomes, including fewer accidents and injuries. Numerous meta-analyses and literature reviews have found that a positive safety climate increases employees' motivation to work safely as well as their knowledge about how to work safely. Both, safety motivation and safety knowledge contribute to an improved safety performance of the workforce, which reduces accidents and injuries (Beus, McCord, & Zohar, 2016;

Christian, Bradley, Wallace, & Burke, 2009; Griffin & Curcuruto, 2016; Hofmann, Burke, & Zohar, 2017; Jiang, Lavaysse, & Probst, 2018; Nahrgang, Morgeson, & Hofmann, 2011; Zohar, 2008, 2010, 2014).

While the consequences of safety climate are well-examined, research regarding its antecedents is less extensive. So far, they have been investigated at the individual and the organizational level. At the individual level, the focus lies on leadership behaviors and employee perceptions, e.g., psychological work ownership, organizational commitment, job stress, and personality traits (Zohar, 2014). At the organizational level, organizational climate as well as structural attributes of the work environment, such as organizational policies and practices have been considered (Neal, Griffin, & Hart, 2000; Zohar, 2014). However, there are only few studies that have explored antecedents of safety climate and safety performance across organizations (Sheehan et al., 2016), and none that have considered whether extra-organizational factors, such as societal developments and economic changes, might impact organizational safety climate. This is remarkable, since there are strong indicators that societal and market changes influence occupational safety. For example, during the financial crisis in 2008, after declining for almost 30 years, Austrian accident numbers increased over 14% compared with the previous year, reaching a record high since the year 1996 (Statistik Austria, 2019). The reason for this may be that amid recession, resources are shifted away from OSH because organizations are focused on restructuring and downsizing (ILO, 2013; Jhang, 2018). Yet, the impact of more recent changes of the working world, such as work intensification – a result of accelerated technological advancement (Green, 2004; Green & McIntosh, 2001; Kubicek, Paškvan, & Korunka, 2015) – have not been researched as predictors of safety climate and subsequent safety outcomes. Although work intensification poses an increasing problem for workers' health and safety, and safety engineers are confronted with workers' changed behaviors because of it, previous research has not investigated safety engineers' ability to perceive such overarching work-related changes in their organizations.

Furthermore, safety climate is heavily intertwined with safety engineer's working conditions. Although organizations' attitudes toward and support of safety engineers have been investigated as part of the development of safety climate scales, it has not proven to be a significant first-order factor of safety climate (Clarke, 2000; Cooper & Phillips, 2004; Zohar, 1980). Yet, there is empirical evidence that safety engineers working in organizations with high safety performance records are employed in higher ranking positions, leading teams of other safety engineers (Mearns & Flin, 1999). In contrast, safety engineers working in organizations with a poor safety climate, have a lower social status (Zohar, 1980). In addition, safety climate is directly related to a safety engineer's tasks and therefore, can be directly influenced by them (Nielsen, 2014; Winterfeld et al., 2012). While it is indisputable that safety climate is a key aspect of safety engineers' work, it remains unclear how safety climate influences safety engineers' inclusion in the organization, and how, in turn, safety engineers' organizational inclusion influences safety climate.

1.1.3 Individual level

Safety engineers' performance, their technical and social skills, their perception of their own role, and their perceived support from the organization and the management can be subsumed under the individual level. Safety engineers' personal requirements, such as previous training, work experience and the need for further training regarding specific competencies, also fall into that category.

1.1.3.1 Expertise

Safety engineers' expertise can be observed from two perspectives. First, their expertise in observing safety indicators and identifying safety hazards in their surroundings, and second, their expertise as a power base in the sense of expert power.

Safety engineers' technical skills allow them to professionally assess occupational safety factors, such as safety climate and determinants and components of safety performance

(Braunger et al., 2015). As experts, they have a better representation of tasks within their area of expertise and can encode new information more efficiently. This allows them access to information and knowledge relevant to the demands of action in current situations and tasks (Feltovich, Prietula, & Ericsson, 2006). Thus, utilizing safety engineers’ expertise for the evaluation of organizational safety factors allows researchers to investigate organizational level safety processes across multiple organizations instead of focusing on individual employee perceptions.

Another aspect of safety engineers’ expertise concerns the extent to which they use their expertise to convey their ideas to management. Expertise in the sense of expert power refers to the perception that a person has special knowledge in a specific area (French & Raven, 1959; Raven, 2008). Individuals that need to be convinced of a request are more likely to agree to agents with expert power because experts’ suggestions are assumed to be conducive to success (Lines, 2007). For example, managers are more likely to follow consultants’ advice because they perceive them as possessing high expertise in their respective field (Elias, 2008). However, even though safety engineers are experts in workplace safety because of their professional OSH training, and are explicitly employed for their technical skills and competencies in that area, previous research has not yet touched the issue of their expert power and how it may help with their organizational inclusion.

1.1.3.2 Organizational and management support

Safety engineers are expert consultants and need organizational and management support to perform well at their job (Winterfeld et al., 2012). In fact, safety engineers’ attribute most of their success directly to organizational support (Lawrence, 2008). In general, organizational support provides employees with access to information and resources that facilitate their work. This, in turn, leads to increased employee performance and a higher commitment (Eisenberger, Huntington, Hutchinson, & Sowa, 1986; Kurtessis et al., 2017). In research about safety engineers, however, no studies have investigated whether organizational support for safety engineers has positive effects on occupational safety. At the same time, it is unclear which factors contribute to organizational support for safety engineers.

Furthermore, positive cooperation between safety engineers and managers leads to improved occupational safety (Winterfeld et al., 2012). As part of their consulting process, safety engineers are expected to provide information and proposals on safety, discuss progress and advise on current OSH projects. However, in their cooperation with managers, safety engineers have been found to be lacking social skills and fail to argue for OSH measures with regard to organizational resources or economic considerations (Blair, 1999; Winterfeld et al., 2012). Yet, previous research has not examined which strategies safety engineers use in communication with their managers and which factors may help or hinder them from gaining support and, consequently, performing well.

2 Own Research

The goal of my doctoral thesis is to contribute significantly to the understanding of how safety engineers are included and operate in organizations. I focus on three factors concerning this inclusion, namely safety climate, expertise, and support. To reach this goal, my colleagues and I have conducted three studies which pursue different research questions and therefore, in each study the individual and organizational level of safety engineers' inclusion are addressed. In Study 1, we attempted to answer the question of how organizational support for safety engineers and organizational safety climate are related over time. In Study 2, we asked how work intensification relates to safety performance by considering safety engineers' and managers' perspectives. In Study 3, we aimed to answer how safety engineers obtain management support and increase their performance by analyzing the success of their influence tactics in combination with their expert power.

All studies are based on online-survey data of safety engineers and, in Study 2, also managers. The cross-sectional sample of Study 3 is to some extent included in the longitudinal design of Study 1, as my colleagues and I conducted a cross-lagged panel based on the participants of Study 3. All three studies were carried out in accordance with the recommendations of the APA (APA, 2010). The research protocols fully complied with the standards of the University of Vienna. These include strict guidelines to store potentially identifying information such as e-mail addresses, separate from individual data. Individuals interested in participating in the studies of this doctoral thesis were informed about the general aims and the protocol of the studies before their participation. At the beginning of each online questionnaire, participants were informed about the confidentiality of the respective study and their voluntary participation. They had the option to quit their respective survey at any time.

In the following sections, I will present a brief summary containing the aims, method, and main findings for each study. Full reports of the manuscripts can be found in chapter *5 Reprints of Publications*.

2.1 Perceived Organizational Support and Perceived Safety Climate

Bunner, J., Prem, R., & Korunka, C. (submitted). Perceived Organizational Support and Per-ceived Safety Climate from the Perspective of Safety Engineers: Testing Reciprocal Causality using a Cross-Lagged Panel Design. Manuscript submitted for publication on April 15th, 2019 in *Safety Science*.

The aim of the first study of my doctoral thesis was to explain how safety engineers are included in organizations by investigating how their perceived organizational support (POS) and their perception of safety climate are related over time. Since most studies about safety engineers are cross-sectional or qualitative, we conducted a cross-lagged panel study to test the causal reciprocity between safety engineers' POS and their perception of safety climate and, in turn, the relationship between their perception of safety climate and POS over time.

Safety engineers' work improves OSH outcomes, such as injury rates and safety climate (Nielsen, 2014; Robinson & Smallman, 2013; Walters & Nichols, 2006). They are most effective when their organization's management is motivated and ready to engage in and support OSH practices (Walters & Nichols, 2006; Walters, Nichols, Connor, Tasiran, & Cam, 2005). Therefore, it is not surprising that safety engineers attribute most of their success directly to the organizational support they receive (Lawrence, 2008). According to Organizational Support Theory (Eisenberger, Huntington, Hutchinson, & Sowa, 1986), employees who perceive organizational support gain access to resources that facilitate their work and motivate them to reciprocate with increased performance and higher commitment. As a result, POS is related to positive organizational outcomes (Kurtessis et al., 2017; Rhoades & Eisenberger, 2002; Riggle, Edmondson, & Hansen, 2009). Also, POS has been found to be positively associated with first-order factors of safety climate, such as safety communication, safety training and safety management values (Credo, Armenakis, Feild, & Young, 2010; Fariba, Hossein, & Siamak, 2011; Hofmann & Morgeson, 1999). Accordingly, we expected safety engineers' POS to be positively related to their perceived safety climate over time.

Safety climate is positively associated with a higher status of the safety engineer (Zohar, 1980) and some aspects of its first-order factors, e.g., the importance of safety to management, increase support of and resources for safety engineers (Provan et al., 2017; Walters & Nichols, 2006). Additionally, safety engineers' personal and organizational resources continuously increase over time in organizations with a high safety climate (Winterfeld et al., 2012). Furthermore, safety engineers highly value OSH topics because they strongly identify with their work (Winterfeld et al., 2012). In organizations with a high safety climate, this can be expected to increase their POS, because having congruent values with the organization one works for increases POS (Kurtessis et al., 2017). In line with social exchange theory (Blau, 1964), organizations with a high safety climate should support their safety engineers as an act of reciprocity, appreciating safety engineers' contributions to safety climate. Therefore, we expected safety engineers' perceived safety climate to be positively related to their POS over time.

We conducted a two-wave longitudinal online study with 162 safety engineers and a time lag of 12 months. Data of the two surveys was matched by a personal code that participants filled in at the beginning of each questionnaire. The hypotheses of the cross-lagged design were analyzed simultaneously using structural equation modeling with Mplus 8 (Muthén & Muthén, 1998-2017). Before hypotheses testing, confirmatory factor analyses were run to test construct validity and configural as well as metric measurement invariance across time.

The results demonstrated that POS was significantly positively related to perceived safety climate over time, showing that the more organizational support safety engineers perceived, the higher they evaluated their organizations' safety climate in the following year. This result is in line with previous research, emphasizing the beneficial effects of POS on organizational outcomes by fostering the employee-organization relationship (Kurtessis et al., 2017). Considering the results through the lens of reciprocity proposed in social exchange theory (Blau, 1964), it can be deducted that organizations supporting their safety engineers indirectly contribute to their own safety climate by providing them with the resources to improve safety climate.

Perceived safety climate, however, was not a causal predictor of POS over time. One possible explanation for this outcome is that the organizations did not intend to direct their resources directly at the safety engineer but rather directed it at their overall safety program. However, for POS to lead to positive outcomes through reciprocity, the resources provided by the organization need to appear to benefit the employee more than the organization (Kurtessis et al., 2017). Another possible explanation is that organizations only attributed specific safety tasks as their safety engineers' accomplishments rather than considering the overall safety climate as part of their performance. This would lead to the organizations failing to acknowledge safety engineers' actions as beneficial to their safety climate, which would not elicit the implicit obligation of future reciprocity.

2.2 How Work Intensification Relates to Organization-Level Safety Performance

Bunner, J., Prem, R., & Korunka, C. (2018). How Work Intensification Relates to Organization-Level Safety Performance: The Mediating Roles of Safety Climate, Safety Motivation, and Safety Knowledge. *Frontiers in Psychology, 9, 2575*. https://doi.org/10.3389/fpsyg.2018.02575

The aim of the second study of my doctoral thesis was to show how work intensification impacted organizational-level safety performance based on the Model of Safety Performance (Griffin & Neal, 2000; Neal & Griffin, 2002, 2004), providing empirical evidence for the direct relationship and its underlying mechanisms at the same time. Safety engineers' expert perspectives and manager evaluations were utilized to assess work intensification, safety climate, the determinants (safety motivation and safety knowledge), and the components of safety performance (safety compliance and safety participation) at the organizational level.

Work intensification is a consequence of a changing world of work (EASHW: European Agency for Safety and Health at Work, 2007), resulting from the acceleration of economic and technical development through new technologies (Rosa, 2003). Work intensification means workers have to complete more tasks within a workday, work at a heightened speed, perform different tasks simultaneously, and/or reduce idle time (Kubicek, Korunka, & Tement, 2014; Kubicek et al., 2015). While work intensification has adverse effects on individual safety (Akamangwa, 2016; Koukoulaki, 2010; Papadopoulos, Georgiadou, Papazoglou, & Michaliou, 2010; Walters & Wadworth, 2017), its impact on occupational safety at the organizational level is unknown, even though it has been found to have detrimental effects across a variety of organizations from hospitals to manufacturing productions (EASHW, 2007; Kubicek, Korunka, & Ulferts, 2013; Kubicek et al., 2015; Mullen, 2004; Oxenbridge & Moensted, 2011; Paškvan, Kubicek, Prem, & Korunka, 2016). As work intensification stems from societal developments that lead to organizational adjustments (Green, 2004), it can be assumed that work intensification has an impact on occupational safety at the organizational level.

Safety performance plays a crucial role in individual health and safety as well as the maintenance of a safe work environment (Burke, Sarpy, Tesluk, & Smith-Crowe, 2002). It is composed of two components: safety compliance and safety participation (Neal & Griffin, 2002). Safety compliance refers to behaviors that adhere to generally mandated core activities and safety regulations with the goal to uphold personal workplace safety. Safety participation describes behaviors that contribute to a safe working environment, for example an individual's voluntary participation in safety activities, and helping coworkers on safety related issues (Griffin & Curcuruto, 2016; Neal & Griffin, 2002, 2006). Work intensification has been found to negatively impact safety compliance at the individual level as it encourages employees to use workarounds, neglect their protective equipment, or disregard safety rules in order to sustain a heightened work speed and maintain production rates (Askenazy, 2004; Burchell, 2006; Cavazza & Serpe, 2009; EASHW., 2007; Quinlan & Bohle, 2009). Work intensification has also been found to compromise factors contributing to safety participation, such as time to attend safety trainings and safety meetings, and by deteriorating communication between workers (EASHW, 2007; EFILWC: European Foundation for the Improvement of Living and Working Conditions, 2002; Koukoulaki, 2010; Papadopoulos et al., 2010). Therefore, we expected work intensification to be negatively related to both safety compliance and safety participation.

The model of safety performance proposes that safety behaviors are affected by the determinants of safety performance, namely safety motivation and safety knowledge. These determinants are in turn affected by safety climate. As work intensification is negatively related to all first-order-factors of safety climate, we argued that it also negatively affects safety climate. Following the model of safety performance, this assumption then led to the expectation that the proposed negative relationship of work intensification with safety performance was serially mediated by safety climate followed by safety motivation, respectively safety knowledge.

Safety engineers and managers from 122 Austrian high-accident companies participated in a cross-sectional online survey that was presented to them during free consulting sessions of the AUVA. Access to the online questionnaire required log-in with the organization's insurance number which was later also used to match the descriptive company data provided by the AUVA. The hypotheses of the serial multiple mediation model were tested using structural equation modeling in Mplus 7.4 (Muthén & Muthén, 1998-2015).

As hypothesized, work intensification was significantly negatively related to both components of safety performance, safety compliance and safety participation. Furthermore, the results of the serial multiple mediation analysis revealed that safety climate and safety motivation mediated the relationship between work intensification and safety compliance as well as work intensification and safety participation. Safety knowledge and safety climate serially mediated the relationship between work intensification and safety compliance, but not the relationship between work intensification and safety participation.

2.3 How do Safety Engineers improve their Job Performance?

Bunner, J., Prem, R., & Korunka, C. (revised and resubmitted). How do safety engineers improve their job performance? The roles of influence tactics, expert power, and management support. Manuscript resubmitted for publication on April 15th, 2019 in *Employee Relations*.

The aim of the third study of my doctoral thesis was to address the issue of safety engineers' reputed lack of social skills in cooperation with management (Blair, 1999, 2013; Winterfeld et al., 2012). Therefore, we investigated which influence tactics are useful for safety engineers to obtain management support and, in turn, improve their individual task performance (ITP). An important role was attributed to safety engineers' expert power and its interaction with their influence tactics. In this cross-sectional survey, we examined the relationship between safety engineers' influence tactics and ITP in a moderated mediation model with expert power as the moderator and management support as the mediator.

A sample of 251 Austrian safety engineers participated in an online survey. Mplus 7.4 (Muthén & Muthén, 1998-2015) was used to run confirmatory factor analyses to test construct validity. For hypotheses testing, three moderated mediation models were calculated using the SPSS macro PROCESS v3.0 (Hayes, 2017).

Results showed that the relationship between rational persuasion and ITP was mediated through management support and strengthened at all levels of expert power. This result indicates that safety engineers' rational arguments reflect to some extent on their job performance. Considering the role of safety engineers' expertise in this relationship, the findings suggest that expert power moderated the relationship of rational persuasion and management support in a way that high expert power strengthened the positive relationship of rational persuasion and management support.

The relationship between pressure and ITP was mediated through management support at low and average levels of expert power and worsened with decreasing levels of expert power. Similarly, the relationship between upward appeal and ITP was mediated through management support and mitigated at low levels of expert power. Pressure and upward appeal had no direct negative relationship with management support, therefore, it did not mediate the relationship between these influence tactics and ITP. However, when including expert power, it moderated the relationship between pressure and management support, and upward appeal and management support. For both pressure and upward appeal, low expert power led to negative outcomes on management support. In turn, high expert power negated that effect, though the effect differed for upward appeal and pressure. Upward appeal only had a negative effect on management support and, in turn, on performance when expert power was low. When expert power was at average or high levels, the negative relationship ceased. The results indicate that it is accepted for safety engineers to call upon higher-ranking managers to achieve their goals, if they convey a reasonable amount of expertise. Pressure, however, had a negative effect on performance through management support when expert power was low or average. High expert power protected safety engineers from harming their relationship with management and their own performance when using pressure tactics.

3 General Discussion

This doctoral thesis is based on three manuscripts that have either already been accepted, invited for a revision, or submitted for publication in peer-reviewed academic journals. The aim of this thesis was to contribute to the understanding of the organizational inclusion of safety engineers. In particular, the previously described studies have focused on investigating this topic through safety climate, expertise, and support. So far, I presented three main research questions that guided my research and for each, a contribution has been made. Following this, I provided an overview of the studies addressing these research questions and, in this chapter, I will integrate and discuss my findings and infer theoretical implications. I will also discuss limitations and formulate directions for future research.

This thesis contributes to the existing research about safety engineers and provides theoretical implications within three broad contexts of safety engineers' organizational inclusion: safety climate, expertise, and support. Safety climate was included in this doctoral thesis in its role as a predictor and consequence of organizational support for safety engineers (Study 1) and as a mediator between work intensification and consequentially, safety performance (Study 2). Safety engineer's expertise was observed in two ways: In Study 2 safety engineers' assessments as experts on OSH were utilized to evaluate organizational-level work and safety factors, and safety engineers' expertise was investigated in its role as expert power in cooperation with managers in Study 3. Studies 1 and 3 addressed two different kinds of support for safety engineers: organizational support and management support.

The first research question asked for the causal reciprocity between safety engineers' organizational support and safety climate. In Study 1, my colleagues and I showed that safety engineers' POS predicted safety climate, but safety climate did not predict POS. The results indicate that safety engineers' inclusion in the form of organizational support through tangible, but also psychological resources improves safety climate over time. For organizations, this is a strong implication to not take safety engineers' work for granted but to actively assist them in fulfilling their tasks as this directly reflects on the organization's OSH. Furthermore, organizations should consider more structured onboarding processes for safety engineers. Safety engineers entering organizations are often left alone without being introduced to employees or middle management (Bunner & Korunka, 2018). This is highly detrimental, as their visibility among staff has a significant influence on their performance and the effectiveness of their safety measures (Ollé-Espluga et al., 2015).

Safety climate, however, had no significant contribution to safety engineers organizational support over time. This opens the question which long-term factors foster organizational support of safety engineers and thus, strengthen their organizational inclusion. Future research could focus on individual level characteristics of safety engineers' inclusion, such as their proactive behavior concerning organizational needs and their adaptability to organizational change. Another indicator for safety engineers' organizational inclusion comes from case studies by Bunner & Korunka (2018). They were able to demonstrate that safety engineers with similar or identical views on how to treat employees as their organizations where better integrated, stayed in the organizations longer, and received more overall support and recognition for their work.

The second research question dealt with the influence of work intensification on safety performance at the organizational level by investigating the mediating roles of safety climate, safety motivation, and safety performance in this relationship. The findings of this study indicated that work intensification, as a result of societal change, has a direct and indirect negative impact on safety performance. The contribution to the topic of safety engineers' organizational inclusion, however, was achieved through utilizing their expert eye and manager perspectives in assessing the work and safety indicators. In this study, we statistically controlled for the respondents' role to rule out confounding effects, as safety engineers and managers have been found to have different perspectives on the work environment (Nordlöf et al., 2012). Our analyses also demonstrated that safety engineer and manager perspectives are not identical; but they were positively correlated – with safety engineers' assessments of safety factors being more negative than that of managers. This indicates that safety engineers have a stricter view of their field than managers and this is precisely why they are hired. Safety engineers' critical view on safety climate factors, employees' safety motivation and knowledge, and safety performance stems from their expertise and experience, and is necessary to identify possible improvements regarding OSH. While managers appear to know the general state of safety in their organization, they cannot be expected to have the same detailed awareness as safety engineers, as they usually have no training and other, occasionally competing responsibilities. Therefore, they must rely on safety engineers' expert assessments and their consultation.

As seen in Study 2, managers and safety engineers have somewhat different perspectives on OSH topics. As safety engineers tend to perceive more need for action than managers, the question arose how they persuade managers to support their point of view. Therefore, Study 3 revolved around the question how safety engineers communicate with managers, how this influences their support and performance, and whether their expertise in form of expert power could help them in their cooperation with managers. The results indicated that safety engineers using rational persuasion tactics were most effective in obtaining management support and thus, increasing their performance. Safety engineers that resorted to pressure tactics or upward appeal strategies were less successful, unless they had enough expert power to counteract the negative consequences of these strategies on management support. These results are especially relevant amidst safety engineers' organizational inclusion in a staff position. In this position, safety engineers have no authority to issue directives, however, using hard influence tactics gets them some leeway in pushing forward their OSH proposals if they are perceived as competent and professional. Overall, however, using factual evidence, logic, and rational argumentation are safety engineers' best tools in persuading managers from OSH measures. Study 3 demonstrates that safety engineers' competence and professionalism are strong indicators of their organizational inclusion and performance. Future research should dive deeper into the exact challenges' safety engineers face in rational argumentation with managers, to develop guidelines that support them in gathering convincing arguments for safety measures.

Social insurance agencies, which work closely with both organizations and safety engineers, should be aware of these findings. The results of this thesis leave social insurance agencies with three tasks. First, they should foster safety engineers' access to management by educating managers about the importance of their cooperation with and support of safety engineers, and its impact on organizational safety and safety engineers' effectiveness. Therefore, organizations should be consulted on the necessity to include safety engineers in their operational processes and that doing so properly might exceede the minimal legal requirements of safety engineers' inclusion. Second, social insurance agencies (and other training providers) should expand their advanced training programs for safety engineers by including courses on communication and negotiation skills. Safety engineers should be trained to better recognize organizations' aims and interests and learn how to communicate their requests in their organization's language. Third, both safety engineers and managers need to be made aware that their different perspectives on OSH topics are not incompatible and not the ends of two opposite poles: safety vs. profitability. Their different perspectives are a chance to constructively improve operational procedures by exchanging arguments and finding solutions that cater to the requirements of both, by merging safety with productivity.

3.1 Strengths, Limitations, and Future Research

A main strength of my doctoral thesis is that it combined cross-sectional and longitudinal cross-lagged research designs to answer the proposed research questions. Furthermore, the research questions for Studies 1 and 3 were derived from qualitative interviews with stakeholders of occupational safety about safety engineers' organizational inclusion. Additionally, the cumulative format of this doctoral thesis requires the results to be published in peer-reviewed academic journals. This is a significant contribution to the field of safety engineer research as most of it is published outside of academia as reports or books in a national context. Even though this makes a lot of sense considering the practical relevance and national legal framework regarding this topic, it is problematic for two reasons. First, publishing national reports or books outside of academia makes research results less accessible to other researchers, thus hindering them to be up-to-date with possibly relevant literature. Second, even if this literature is accessible, because it is not peer-reviewed, it is deemed *gray literature* and its citation in academic journals is discouraged (APA, 2010). Therefore, by publishing my manuscripts in peer-reviewed academic journals, I hope to facilitate future researchers' efforts to push forward research on safety engineers and OSH.

As all research, my studies face their limitations which are discussed in the respective manuscripts. One overarching limitation is that all three publications relied on self-report data, which raises concerns about common-method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff, MacKenzie, & Podsakoff, 2012). However, each study took measures to reduce common-method bias, such as temporal, proximal, or psychological separation between predictor and criterion. Future research should consider combining objective data, e.g., accident and injury statistics, with safety engineers' evaluations of occupational safety. Another possibility to reduce concerns about common-method bias would be to obtain measures of, e.g., safety behavior or management support from other sources, such as employees or managers. Especially dyads between safety engineers and managers would make a great contribution in the future discovery of the dynamics of this cooperation and how safety engineers can strengthen their position.

A methodological strength concerns the approach of using one individual expert evaluation per organization to assess safety climate. It has the advantage that numerous organizations can be evaluated at once in a single study. However, this strength comes with the limitation that safety climate is defined as *shared employee perceptions* on the organization's priority of safety over production (e.g., Griffin & Curcuruto, 2016; Zohar, 2010, 2014). To overcome this challenge, future research should make the effort of validating the safety engineers' perception of safety climate against that of aggregated employee evaluations in a multitude of organizations. This was last done by Zohar in 1980 and safety engineers' safety climate evaluations correlated highly with that of employees. Yet, since then, safety climate definitions and measures have evolved profoundly. Therefore, different safety climate measures that use objective descriptions of safety climate factors (e.g., Braunger et al., 2015; Kines et al., 2011) should be tested to analyze which measure reflects employee and safety engineer perceptions most reliably. Accompanying this, researchers would have to consider the measurement of group-level safety climate within organizations (Zohar & Luria, 2005) and statistically control for safety engineer characteristics and organizational factors.

One of the challenges in research on safety engineers is to retrieve representative samples. There is no official registry of safety engineers in Austria, making it difficult to gather participants. However, the safety engineers surveyed in the three studies of this doctoral thesis can be considered representative for the demographic characteristics of Austrian safety engineers compared with previous studies (Braunger, Frank, Korunka, & Lueger, 2009; Braunger et al., 2015; Seubert, Peißl, Hopfgartner, Sachse, & Glaser, 2016). Therefore, the results of this doctoral thesis should be transferable to safety engineers working in the EU, where regulations have made their responsibilities and assignments comparable (European Council, 1989; Hale et al., 2005). However, researchers need to be cautious when transferring results to other legal and cultural contexts because there are over 100 job titles to describe people working as experts in safety (Brun & Loiselle, 2002) and there is rarely a common definition about what these people do, even when they carry the same title (Hill, 2006).

Future research on safety engineers' organizational inclusion should also regard their cooperation with safety representatives. In Austria, organizations with more than ten employees must occupy the function of safety representatives. Safety representative have a 24h training on OSH and act as a multiplier of the safety engineer. Because they are in the middle of what is happening at the workplace, they are predestined to identify health and safety problems in their areas of activity and help find solutions. Safety engineers and safety representatives are, by law, required to exchange information on and collaborate in the correction of current OSH issues (AschG §10). However, there is to this day no empirical research verifying the benefits or investigating the challenges of this cooperation. Future research should examine this collaboration with respect to its impact on organizational OSH and safety engineers' organizational inclusion.

3.2 Conclusion and Outlook

The aim of this thesis was to investigate aspects that contribute to or determine safety engineers' inclusion in organizations. Findings about the roles of safety climate, expertise and support by management and organizations have been presented and discussed. At the end of this doctoral thesis I want to give an outlook towards future challenges in safety engineers' work that may concern their organizational inclusion.

The world of work is changing due to demographic change and technological advancements. With it, new challenges arise for safety engineers to consult organizations on the contemporary design of OSH. Demographic change, for example, requires rethinking employees' safety training and instructions. In physically demanding jobs, senior workers are at a greater risk of injuries because of increasing physical weakness. Accordingly, older workers tend to have fewer but more severe accidents, whereas younger employees tend to have more minor accidents (Smith, Jordan, & Wallace, 2016). With an aging workforce, this relationship becomes increasingly relevant. However, safety engineers are currently not educated on the divers demands of different demographic groups and how to design appropriate safety trainings. To protect workers and to uphold safety engineers' expertise, this must be addressed in their general education, but also added to further training courses.

Increasing technologization and digitalization of workplaces, often subsumed under the expression Work 4.0 (*Arbeit 4.0*), come with their own specific challenges for occupational safety. For example, with the introduction of digital assistance systems and robots in manufacturing industries, advocates for the design of humane working conditions become increasingly important (Gerdenitsch, Bunner, & Tscheligi, 2018). The increasing use of digital assistance systems raises questions, for example, about the acceptance of possible side effects occurring from its application, e.g., cybersickness, or about possible safety concerns arising from workers wearing exoskeletons that enhance their physical strengths. With the growing collaboration between workers and robots, safety concerns about new risks and errors emerge that may come from working in increasingly automated production systems. Also, there is the question whether physical contact between robots and humans should be allowed and if so, at what point should it be considered a hazard (Gerdenitsch et al., 2018).

The conclusions of these debates will change the work of safety engineers substantially. With these issues, another question arises: What will safety engineers do in a future world of work where manufacturing is fully automated? Integrating safety in the design of technologized and digitalized workplaces is essential and safety engineers must involve themselves in these discussions. Scientific research about how they can adapt to and support organizations in implementing new technologies will help maintain safety and health at work and keep safety engineers relevant.

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5 Reprints of Publications

To increase readability, tables and figures were placed within the running text.

5.1 Perceived Organizational Support and Perceived Safety Climate

Bunner, J., Prem, R., & Korunka, C. (submitted). Perceived Organizational Support and Perceived Safety Climate from the Perspective of Safety Engineers: Testing Reciprocal Causality using a Cross-Lagged Panel Design. Manuscript submitted for publication on April 15th, 2019.

Perceived Organizational Support and Perceived Safety Climate from the Perspective of Safety Engineers: Testing Reciprocal Causality using a Cross-Lagged Panel Design

Johanna Bunner[1], Roman Prem[2], and Christian Korunka[1]

Authors' Notes:

[1]Department of Applied Psychology: Work, Education, Economy, Faculty of Psychology, University of Vienna, Vienna, Austria

[2]Work and Organizational Psychology, Institute of Psychology, University of Graz, Graz, Austria

Correspondence concerning this article should be addressed to Johanna Bunner, Department of Applied Psychology: Work, Education, Economy, Faculty of Psychology, University of Vienna, 1010 Vienna, Austria. E-mail: johanna.bunner@univie.ac.at

Abstract

The objective of this study was to determine the reciprocal relationship between safety engineers' perceived organizational support (POS) and perceived safety climate. Safety engineers are most effective when they perceive support from management and employees and they also attribute most of their success to support from the organization. Their work directly improves the safety climate, and organizations with a high safety climate show a higher value for the safety engineer. The direction of this relationship is, however, unclear. Using a sample of 162 safety engineers, we conducted a cross-lagged panel study over one year to examine whether safety engineers' POS improves their perceived safety climate and/or whether safety engineers' perceived safety climate also increases their POS over time. Data was collected at two points and, after testing for measurement invariance, a cross-lagged SEM was conducted to analyze the reciprocal relationship. Our findings demonstrate that safety engineers' POS was positively related to perceived safety climate over time. Perceived safety climate, however, did not contribute to safety engineers' POS. The theoretical and practical implications of the results are discussed along with the study's strengths and limitations.

Keywords: safety professional, safety manager, safety practitioner, safety culture, organizational level, POS

Introduction

Safety engineers play an integral part in the maintenance and advancement of occupational safety and health (OSH) in most advanced market economies as they consult employers, employees, and work councils on OSH topics and the design of humane working conditions (Braunger, Korunka, Kubicek, Frank, & Lueger, 2015; McGlothlin, 2006). The fundamental effectiveness of organizational safety performance requires the involvement of safety engineers because they have a positive effect on OSH (Milgate, Innes, & O'Loughlin, 2002). Several studies have found that safety engineers' work improved OSH outcomes such as injury rates and safety climate (Nielsen, 2014; Robinson & Smallman, 2013; Walters & Nichols, 2006).

The effectiveness of safety engineers is, however, dependent on the motivation and readiness of management to engage in OSH practices (Walters & Nichols, 2006; Walters, Nichols, Connor, Tasiran, & Cam, 2005) and most safety engineers attribute their success directly to the organizational support they receive (Lawrence, 2008b). Furthermore, safety engineers that are supported by management, employees, and other organizational entities have been found to work more effectively and are more successful in implementing OSH measures (Ollé-Espluga et al., 2014). Up to now, existing research has mainly been focused on interviews and cross-sectional studies, but none has investigated the direct link between organizational support for safety engineers and its effect on safety climate over time.

Safety climate describes the shared perceptions of employees regarding safety procedures and the overall importance of safety over production in their organization. It is a strong predictor of safety behavior and safety outcomes such as accidents and injuries (Beus, McCord, & Zohar, 2016; Christian, Bradley, Wallace, & Burke, 2009; Griffin & Curcuruto, 2016; Nahrgang, Morgeson, & Hofmann, 2011; Zohar, 2010, 2014). Organizations with a high priority for safety are more likely to assign resources to the protection of their employees and foster safety programs (Zohar, 2014). The willingness to invest in safety seems to extend to the safety engineer. For example, in organizations with a high management commitment to health and safety - one key aspect of safety climate - safety engineers appear to be better supported with resources such as time to conduct OSH activities and improve safety practices (Provan, Dekker, & Rae, 2017; Walters & Nichols, 2006). Furthermore, safety engineers working in organizations with good safety performance records are employed in higher ranking positions (Mearns & Flin, 1999). In contrast, safety engineers in organizations with a poor safety climate have a lower status (Zohar, 1980). So far, the relationship between aspects of safety climate and organizational support for safety engineers has mostly been examined in the form of literature reviews and case studies. No quantitative study, however, has yet explored the causal relationship between safety climate and safety engineers' organizational support.

This study aims to determine whether safety engineers' perceived organizational support (POS) influences their perception of organizational safety climate and whether, in turn, safety engineers' perceived safety climate impacts their POS over time. Most research on safety engineers and POS has been cross-sectional or qualitative and, so far, there have been no attempts to investigate the direction of the relationship between safety engineers' POS and their perceived safety climate over time. We therefore contribute to the existing literature by applying a cross-lagged panel design to investigate the role of safety engineers' POS as means to improve safety climate and, simultaneously in consequence of safety climate. We hope to shed light on the determining factors for safety engineers' support in organizations and the underlying mechanisms of their impact on occupational safety.

Safety engineers' perception of safety climate

In the European Union (EU), safety engineers' tasks and organizational inclusion are largely regulated by the OSH Framework Directive 89/391/EEC (European Council, 1989). Their tasks include the consultation of employers, employees, and work councils, the provision of technical expertise, the briefing and training of employees, analyzing the organization, recommending improvements, documenting safety incidents, supplying (legal) information, and designing safety systems (Braunger et al., 2015). Safety engineers' expertise on occupational safety allows them to assess organizational safety climate (Braunger et al., 2015; Bunner, Prem, & Korunka, 2018; Zohar, 1980). Safety climate, however, is defined as the shared perceptions of employees regarding the priority of safety over production (Griffin & Curcuruto, 2016; Hofmann, Burke, & Zohar, 2017; Zohar, 1980, 2010, 2014). This study measures safety climate from the perspective of one safety engineer per organization, thus basing the measurement of safety climate on an individual perception rather than an aggregated measure. Safety engineers' assessment of organizational safety climate is not identical to aggregated employee evaluations. It is, however, comparable and positively correlated with that of employees and even managers (Bunner et al., 2018; Nordlöf, Wijk, & Lindberg, 2012; Zohar, 1980). Therefore, safety engineers' expertise enables them to make an educated assessment of organizational safety climate factors. Considering that the safety climate assessments in this study are based on individual perceptions, we refer to them as safety engineers' perceived safety climate.

The role of perceived organizational support

Even though safety engineers' work has a direct positive impact on safety climate and OSH practices (Nielsen, 2014; Robinson & Smallman, 2013; Walters & Nichols, 2006), they attribute most of their success to organizational support (Lawrence, 2008a). The theory of organizational support (Eisenberger et al., 1986; Rhoades & Eisenberger, 2002) is based on social exchange and proposes that employees develop beliefs about the extent to which the organization values their contribution and cares about their well-being. Employees who perceive organizational support gain access to resources that facilitate their work. Obtaining these resources motivates employees to reciprocate by showing higher performance and being more committed to their work in the organization. Overall, POS increases positive outcomes for the organization (Kurtessis et al., 2017; Rhoades & Eisenberger, 2002; Riggle, Edmondson, & Hansen, 2009).

In line with social exchange theory (Blau, 1964), safety engineers that feel supported by their management and other organizational entities such as works councils or workers are more effective in completing their tasks (Walters & Nichols, 2006; Walters et al., 2005) and more successful in taking preventative actions and addressing health issues (Ollé-Espluga et al., 2014). Additionally, POS has been found to directly affect certain aspects of safety climate in that it is positively associated with safety communication, safety teamwork, safety training and management values about safety (Credo, Armenakis, Feild, & Young, 2010; Fariba, Hossein, & Siamak, 2011; Hofmann & Morgeson, 1999; Tong, Rasiah, Tong, & Lai, 2015). In particular, management styles that are focused on support and participation are linked to a greater safety commitment (DeJoy, Della, Vandenberg, & Wilson, 2010; Tucker, Chmiel, Turner, Hershcovis, & Stride, 2008). Therefore, we expect safety engineers' POS to increase their perceived safety climate over time (see Figure 1).

H1. Safety engineers' POS is positively related to their perceived safety climate over time.

The role of safety climate

Safety climate has been found to improve the position and working conditions of safety engineers. It is positively associated with a higher status of safety engineers (Zohar, 1980) and some aspects of safety climate, e.g., the importance of safety to management, lead to better support of and more resources for safety engineers (Provan et al., 2017; Walters & Nichols, 2006). Furthermore, safety engineers' personal and organizational resources benefit from high safety climate. In particular, resources such as work equipment, relevant information, and staff support for safety engineers continuously increase over time when organizations have a high safety climate (Winterfeld, Trimpop, & Forschungsgemeinschaft Sifa-Langzeitstudie, 2012). In addition, safety engineers working in organizations with certified OSH systems which have been found to have a high safety climate, reported higher organizational and personal support than their colleagues in organizations without them (Winterfeld et al., 2012).

The empirical connection between any form of organizational climate and POS has so far only been made by Wang and Hsieh (2013), who found that instrumental climate, caring climate, and independence climate were all significantly related to POS. Their research shows that the predominating climate in an organization strongly determines employees' POS. Furthermore, safety engineers highly value OSH topics because they strongly identify with their work (Winterfeld et al., 2012). Having congruent values with the organization one works for increases POS (Kurtessis et al., 2017). Additionally, people are of higher value to an organization and gain its support more easily to the extent that they help the organization achieve its goals (Quinn, 1988). Following social exchange theory (Blau, 1964), organizations are expected to acknowledge safety engineers' contribution to safety climate by supporting them in return. Therefore, it is coherent for organizations with a high importance for safety, i.e., a high safety climate, to support their safety engineers. As displayed in Figure 1, safety climate is expected to increase safety engineers' POS over time.

H2. Safety engineer's perceived safety climate is positively related to their POS over time.

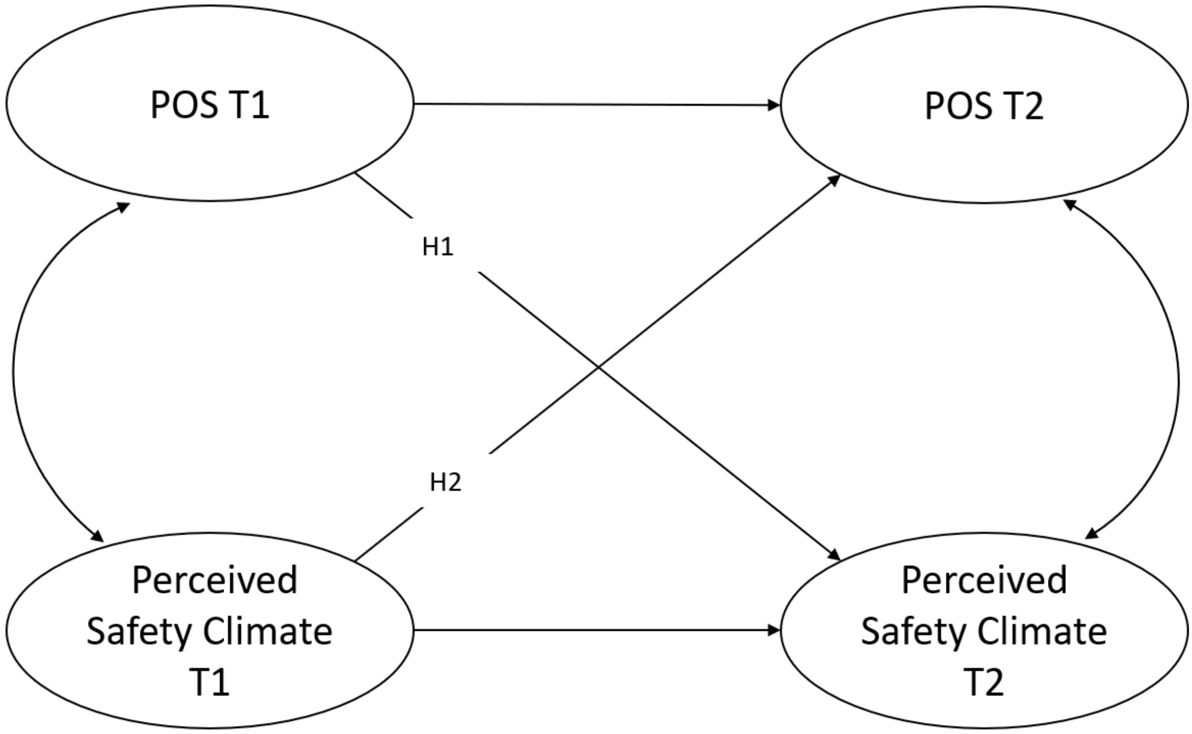

Figure 1. Conceptual model of the study. POS = Perceived organizational support. T1 = Time 1. T2 = Time 2.

Method

Study design and data collection

Two waves of survey data were collected among Austrian safety engineers as part of a larger project in cooperation with the Austrian Workers' Compensation Board (AUVA). Safety engineers were invited via e-mail to participate in two online questionnaires with a 12-month time lag. We determined the time lag of this study based on theoretical considerations. Research on longitudinal safety climate studies shows that it is both a leading and lagging indicator of safety incidents that occur within one year before and after safety climate assessment (Payne, Bergman, Rodríguez, Beus, & Henning, 2010). Safety climate also impacts employee safety motivation and behavior up to two years later (Neal & Griffin, 2006). As social exchange relationships are characterized by their emphasis on long-term gains (Shore, Tetrick, Lynch, & Barksdale, 2006) and most empirical evidence pointed toward longer time spans, we decided to test our hypotheses with a time lag of one year.

Regular e-mail reminders were sent out to encourage participation and an incentive system was set up. Additionally, the study was advertised on analog and digital media channels of the AUVA and Austrian Safety Experts Association (VÖSI). For every completed questionnaire, the project donated 1€ to an Austrian Charity and, in addition, safety engineers that completed both surveys received a copy of the project report. Participants entered an individual code at the beginning of each questionnaire that was identical for the first and the second wave of the study and allowed for anonymous matching of the questionnaires for data analysis.

Sample description

The first wave (T1), collected in 2016, included 374 safety engineers and the second wave (T2), collected in 2017, included 299 safety engineers. Overall, data of 162 participants could be matched for T1 and T2, accounting for 43.3% of the sample size of the first wave. Of the 162 safety engineers, 138 (85.2%) were male and eight (4.9%) female. On average, they were 50.6 years old (*SD* = 8.7). Overall, 13.0% had completed an apprenticeship training, 13.0% had finished technical school, and 14.4 % held a high school diploma. Another 32.9 % completed school for higher technical education and 26.4 % held a university degree. The average tenure in their respective job as safety engineers was 11.8 years (*SD* = 7.6) and, on average, they had worked for their respective company for 9.4 years (*SD* = 7.1). More than half of the participants (56.2%) held the position of an in-house employed safety expert. The other participants (43.8%) provided their services externally. In comparison with previous studies with Austrian safety engineers (Braunger et al., 2015; Bunner et al., 2018; Seubert, Peißl, Hopfgartner, Sachse, & Glaser, 2016), the sample can be considered representative regarding safety engineers' age, gender, educational status, and position.

Measures

Perceived organizational support was measured using six items based on the short scale of the POS survey (Eisenberger et al., 1986). According to Rhoades and Eisenberger

(2002) the use of a short version of the POS scale is feasible because it is unidimensional and as long as both facets of the definition of POS, valuation of employees' contribution, and care about employees' well-being are included. An example item for the organization's valuation of the employee's contribution is "The organization takes pride in my accomplishments at work" and an example item for the organization's care about employee's well-being is "The organization cares about my general satisfaction at work." Items were to be answered on a seven-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Perceived safety climate was measured using the safety climate questionnaire by Braunger, Korunka, Kubicek, Frank, and Lueger (2015) that was specifically designed for safety engineers. The ten items measuring the factors management values, safety practices, safety communication, safety training, and safety equipment were to be answered on a five-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An example item for safety communication is "The goals, measures, and facilities concerning workplace safety are public or made available to all employees in the organization."

The following *control variables* were included in the analyses: Safety engineers' employment position (in-house expert vs. externally employed consultant) and company size. Both safety engineers' employment position and company size have been found to impact their performance, the specific tasks they carry out, and their organizational inclusion (Hale, 1995; Hale et al., 2005; Winterfeld et al., 2012). Company size was measured in number of employees in four groups (see Table 1). Safety engineers that worked in companies with less than 11 employees were excluded from the sample as they only consult their company every other year.

All measures were administered in German. When translating the original English measures into German, we followed the steps recommended by Sousa and Rojjanasrirat, (2011) for blind back-translation with native speakers. Before launching the questionnaire, its comprehensibility was discussed with a focus group of safety engineers.

Data analysis

Structural equation modeling (SEM) with Mplus 8 (Muthén & Muthén, 1998-2017) was used to analyze the data. All hypotheses were tested using standardized variables. As recommended by Becker (2005), we tested our model with and without control variables. Before testing the cross-lagged structural model, confirmatory factor analyses (CFA) were performed to test construct validity and measurement invariance across the waves. We tested the hypothesized four-factor model and compared its fit to one- and two-factor alternative models. Subsequently, we tested the measurement invariance (or measurement equivalence) of the resulting model to show that comparisons of our variables are valid across time (Cheung & Lau, 2012; Cheung & Rensvold, 2002; Little, 2013; Putnick & Bornstein, 2016).

Results

Confirmatory factor and measurement invariance analyses

We performed CFA to compare the measurement models and to examine the distinctiveness of the four variables (safety climate and POS each at T1 and T2). The results indicated that the theorized four-factor model provided a good fit with the data (χ^2 = 362.89, df = 192, CFI = 0.92, TLI = 0.91, RMSEA = 0.07, SRMR = 0.06) and fitted significantly better than the two-factor model with all POS items on one factor and safety climate items on another factor (χ^2 = 755.61, df = 208, CFI = 0.74, TLI = 0.72, RMSEA = 0.12, SRMR = 0.08, $\Delta\chi^2$ = 379.58, p < .001), the two-factor model with all T1-items on one factor and all T2-items on another factor (χ^2 = 822.24, df = 208, CFI = 0.72, TLI = 0.68, RMSEA = 0.14, SRMR = 0.11, $\Delta\chi^2$ = 446.58, p < .001), or the single factor model (χ^2 = 1014.53, df = 209, CFI = 0.63, TLI = 0.59, RMSEA = 0.15, SRMR = 0.11, $\Delta\chi^2$ = 638.50, p < .001).

As recommended by Cheung and Lau (2012), we tested for configural and metric measurement invariance, as we were interested in comparing construct variances and covariances and path coefficients across time. We did not test for scalar or residual variance because the estimation of construct variances and covariances or path coefficients does not involve item means and item intercepts (Cheung, 2008; Cheung & Lau, 2012; Little, 2013). The model of configural variance showed a satisfactory fit (χ^2 = 306.45, df = 190, CFI = 0.94, TLI = 0.94, RMSEA = 0.06, SRMR = 0.06, McDonald's NCI = .69). Thus, configural measurement invariance was assumed. In the next step, corresponding factor loadings were constrained to be equal across time to provide evidence of construct level metric invariance. The metric invariance model also provided a good fit with the data (χ^2 = 324.32, df = 199, CFI = 0.94, TLI = 0.93, RMSEA = 0.06, SRMR = 0.07, McDonald's NCI = .67, ΔCFI = 0.001, ΔMcDonald's NCI = 0.002). When establishing measurement invariance, ΔCFI and ΔMcDonald's NCI values are to be preferred to chi-square tests or the chi-square likelihood ratio tests. While chi-square-based tests of overall model fit are highly sensitive to sample size which leads to the rejection of the null-hypothesis of measurement invariance, alternative fit indices AFIs are less strongly affected by sample size. Furthermore, ΔCFI and ΔMcDonald's NCI have been found to be more powerful indicators when sample sizes are equal across groups (Cheung, 2008; Cheung & Lau, 2012; Cheung & Rensvold, 2002; Meade, Johnson, & Braddy, 2008). As our model comparisons met the criteria of the cutoff value for ΔCFI ≤ .002 and ΔMcDonald's NCI ≤ .02 (Cheung, 2008; Meade et al., 2008), metric invariance was accepted.

Given these results, the theorized four-factor model was superior in fit to all the alternative models and, in addition, showed satisfactory metric invariance. Therefore, the variables were examined as distinct constructs that measured the same across time.

Descriptive Statistics

Internal consistencies were calculated using McDonald's Omega which, in comparison with Cronbach's Alpha, has less risk of overestimation or underestimation of reliability (Dunn, Baguley, & Brunsden, 2014). Reliability values were satisfactory for safety climate at T1, McDonald's ϖ = .84, 95% bootstrapped CI [.79; .87], safety climate at T2, McDonald's ϖ = .83, 95% bootstrapped CI [.78; .87], POS at T1, McDonald's ϖ = .91, 95% bootstrapped

CI [.89; .93], and POS at T2, McDonald's ϖ = .91, 95% bootstrapped CI [.89; .93]. Safety engineers' employment position at T1 correlated positively with POS at T2. Company size was uncorrelated with any of the main variables. As expected, safety climate and POS were highly correlated with each other and themselves at the same time and across time. The means, standard deviations, correlations, and internal consistencies for all variables are provided in Table 1.

Table 1.
Descriptive statistics, correlation coefficients, and internal consistencies (McDonald's ϖ).

	Measures	*M*	*SD*	1	2	3	4	5	6
1	$_{T1}$Employment position	1.44	.49	-					
2	$_{T1}$Company size	3.52	.55	-.41**	-				
3	$_{T1}$Safety Climate	4.12	.66	-.07	.14	(.84)			
4	$_{T1}$Perceived Organizational Support	5.27	1.09	.08	-.00	.48**	(.91)		
5	$_{T2}$Safety Climate	4.07	.63	-.06	.12	.53**	.38**	(.83)	
6	$_{T2}$Perceived Organizational Support	5.18	1.06	.19*	-.05	.36**	.69**	.50**	(.91)

Note: *N* = 162. T1 = Time 1. T2= Time 2. **p* < .05. ***p* < .01. Employment position: 1 = internal, 2 = external. Company size: 1 = 1 - 10 employees, 2 = 11 - 50 employees, 3 = 51 - 250 employees, 4 = over 250 employees.

Hypotheses testing

We tested all hypotheses simultaneously in a SEM, controlling for company size and safety engineers' employment position. The control variables, employment position and company size, were unrelated to either outcome variable in the overall SEM. As recommended by Becker (2005), analyses were repeated without control variables, but interpretation of the hypothesis remained identical.

The results of hypotheses testing are displayed in Figure 2. Hypothesis 1 proposed that POS is positively related to safety climate over time. As expected, POS had a significant positive relationship with safety climate over time while controlling for safety climate at T1 (β = .205, $p < .001$). Thus, hypothesis 1 was supported, indicating that safety engineers' POS predicts their perceived safety climate.

Hypothesis 2 proposed a positive relationship between safety climate and POS over time. However, safety climate did not show a significant relationship with POS over time while controlling for POS at T1 (β = .024, $p = .96$). Thus, hypothesis 2 was rejected.

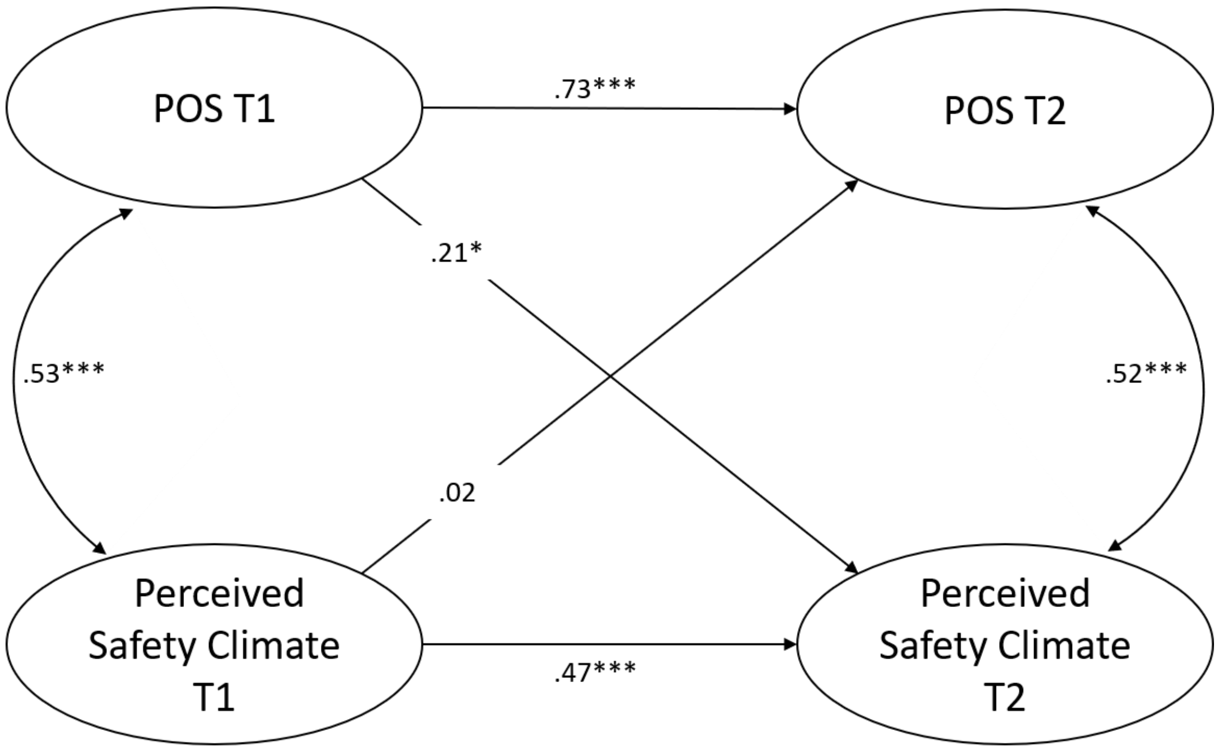

Figure 2. Final simplified, longitudinal cross-lagged model of POS and perceived safety climate across time. Control variables are omitted for visual clarity.
Note: *$p < .05$. ***$p < .001$. POS = Perceived organizational support.
T1 = Time 1. T2 =Time 2.

Discussion

The objective of this study was to test the reciprocal relationship between safety engineers' POS and their perception of safety climate and safety engineers' perception of safety climate and their POS. Based on organizational support theory (Eisenberger et al., 1986), we assumed that over time, safety engineers' POS would increase their perceived safety climate. By drawing from social exchange theory (Blau, 1964), we proposed that safety engineers' perceived safety climate would increase their POS. To test our hypotheses, we subjected 162 safety engineers to two online questionnaires with a one-year time lag. The findings indicate that safety engineers' POS predicted their perceived safety climate. Their perceived safety climate, however, did not predict POS. Therefore, no simultaneous reciprocal relationship between the variables can be reported.

POS and perceived safety climate

In line with our first hypothesis, we found that safety engineers' POS increased safety climate over the course of one year. The more organizational support safety engineers perceive, the higher they evaluate their organizations' safety climate in the following year. This result is in line with the notion that POS is related to outcomes helpful to the organization and plays an important role in the employee-organization relationship (Kurtessis et al., 2017). Additionally, research from Hofmann and Morgeson (1999) showed that the way employees perceive organizational support for a certain cause impacts how well they support this cause. This is supported by social exchange theory, affirming that "as one party acts in ways that benefits another party, an implicit obligation for future reciprocity is created" (Blau, 1964; Cropanzano & Mitchell, 2005). Thus, organizations that support their safety engineer seem to also contribute to their own safety climate by providing their safety engineers with resources, allowing them to improve the organizations' safety climate.

Perceived safety climate and POS

Contrary to our prediction, safety engineers' perception of safety climate was not significantly related to their POS over time. This can be explained in two ways. First, positive exchange relationships between the organization and POS are characterized by the organization's intent to aid, as opposed to accidentally help, the employee. Furthermore, the resources provided by the organization need to appear to benefit the employee more than the organization (Kurtessis et al., 2017). Although organizations with a high safety climate invest more resources in OSH, it is possible that these resources are not always directed at the safety engineer. In some cases, the investment in specific OSH measures might even take resources away from the safety engineer, thus reducing their POS.

Second, even though most empirical evidence shows the significant impact of safety engineers' performance on safety climate (Nielsen, 2014; Winterfeld et al., 2012), one study highlights that safety engineers' advice has no measurable impact on the safety climate within organizations (Wadsworth & Smith, 2009). In this light, it is possible that in organizations, only specific safety tasks are attributed to the safety engineers' accomplishments rather than attributing the overall safety climate to the safety engineers' success. Following social exchange theory, organizations failing to acknowledge safety engineers' actions as beneficial to their safety climate will also not recognize an implicit obligation of future reciprocity. Thus, they will not perceive the need to support their safety engineers.

Strengths and Limitations

A strength of this study is the fully cross-lagged panel design that allowed us to address the reciprocal relationship between the POS and safety climate over the span of one year. To strengthen the significance of our analyses, we used measurement invariance testing to show that we measured distinct constructs across time. Furthermore, as the investigation of safety engineers' work takes place at the organizational level, this study provides insight into the long-term mechanisms of safety engineers' inclusion in over 160 organizations.

A few limitations are also present. We acknowledge that we cannot affirm a causal relationship between our variables, as in a strict sense causal statements can only be based on experimental designs (Hamaker, Kuiper, & Grasman, 2015). In the context of safety engineers, however, experimental research designs seem rather futile. By applying a cross-lagged panel design we were able to establish the following conditions necessary for causation: empirical association and time order of our variables. Additionally, we explained the mechanism by which POS and safety climate are related in the context of safety engineers' inclusion in organizations; both are conditions necessary to specify the causal relationship between two variables (Campbell & Cook, 1979).

As this study was based on self-assessment, common method variance may be a concern. However, the CFA demonstrated that all constructs could be separated empirically, and measurement invariance testing confirmed that we measured distinct constructs across time. Furthermore, temporal, proximal, and psychological separation of constructs are effective ways to prevent common method bias and all three were incorporated in our study design (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff, MacKenzie, & Podsakoff, 2012; Rindfleisch, Malter, Ganesan, & Moorman, 2008). Temporal separation, however, may create issues with intervening variables (Podsakoff et al., 2003, 2012). To address this, we controlled for safety engineers' position and company size. Neither control variable was significantly related to the outcome variables in the SEM and, therefore, had no impact on the overall model (Becker, 2005).

Safety climate is usually assessed by employees and then aggregated to the group or organizational level (Neal & Griffin, 2006; Zohar, 1980, 2000). Research regarding safety engineers' inclusion in organizations, however, takes place at the organizational level as their work affects the overall safety of the organization they work for. Because safety engineers are experts at the assessment of OSH issues, they have a better representation of the tasks within their area of expertise . Unsurprisingly, safety engineers' ratings of organizational-level safety correlate highly with employees' aggregated perceptions of safety climate (Zohar, 1980). Therefore, research with a focus on safety engineers' perceived safety climate is becoming increasingly accepted (Braunger et al., 2015; Bunner et al., 2018; Nordlöf, Wiitavaara, Högberg, & Westerling, 2017; Nordlöf et al., 2012).

The safety engineers in this study are representative of the demographic characteristics of Austrian safety engineers such as age, gender, tenure, educational status, and position (Braunger et al., 2015; Bunner et al., 2018; Seubert et al., 2016). As the responsibilities and assignments of safety engineers' working in the EU are regulated by the OSH Framework Directive 89/391/EEC (European Council, 1989; Hale et al., 2005), the results of this study should be generalizable to safety engineers working in the EU. However, researchers must be careful when transferring results to other legal and cultural contexts because there are various descriptions and definitions of people working as experts in safety (Brun & Loiselle, 2002; Hill, 2006).

Practical implications

Over time, safety climate increases in organizations in which safety engineers feel supported. Support may come in classical forms such as praise and approval, pay, job enrichment, and information on or influence over organizational policies (Eisenberger et al., 1986). Support specifically tailored to safety engineers may also include material resources, access to at least the manufacturing areas of the organization and, of course, the possibility of frequent and regular exchange with members of the organizations.

Organizational support strongly influences safety engineers' willingness to cooperatively work with and for the organization in a goal-oriented manner, which is essential for the organizations' achievement of OSH-related goals (Winterfeld et al., 2012). As the goal-oriented cooperation of safety engineers may include dealing with conflicts about the best way to approach safety issues, organizational support should include organizational representatives listening to the safety engineer and respecting different assessments. Disputes should be considered a chance rather than an obstacle and used to constructively dissolve issues. Organizations should, therefore, foster an environment that values the open raising of concerns, enabling safety engineers to be supported and rewarded for expressing differing viewpoints (Provan et al., 2017).

As organizational support for safety engineers is of immense importance and a high safety climate appears to be insufficient to achieve said support, the question remains how safety engineers may gain organizational support. Blair (2004) suggested that safety managers may overcome a lack of management commitment and support by presenting a convincing cost/benefit analysis to the corporation's management. This research is supported by Provan et al., (2017) who found that safety engineers are most influential when they communicate effectively using their expert knowledge to persuade management. Furthermore, Chang, Chen, and Wu (2012) found that a lack of communication skills can hinder the transfer of safety knowledge and skills and, thus, decrease employer or management support of safety programs. Additionally, when safety engineers are backed by workers and worker councils, it facilitates the implementation of new safety measures (Ollé-Espluga et al., 2014).

Conclusion

The aim of this study was to determine the cross-lagged reciprocal relationship between safety engineers' POS and safety climate. The findings indicate that high safety climate is an insufficient guarantee of organizational support of safety engineers over the course of one year. Safety engineers' POS, however, is highly relevant for upholding a positive safety climate over time. This study adds to the existing literature twofold. First, by applying a longitudinal study design we expanded the body of research on safety engineers, the majority of which has been qualitative or cross-sectional. We also heeded the call for more longitudinal studies on POS. Secondly, we significantly added to the discussion regarding the factors influencing safety engineers' successful inclusion in organizations, enabling them to perform their work and, thus, improve occupational safety.

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5.2 How Work Intensification Relates to Organization-Level Safety Performance

Bunner, J., Prem, R., & Korunka, C. (2018). How Work Intensification Relates to Organization-Level Safety Performance: The Mediating Roles of Safety Climate, Safety Motivation, and Safety Knowledge. *Frontiers in Psychology*, *9*, 2575. https://doi.org/10.3389/fpsyg.2018.02575

How Work Intensification relates to Organization-Level Safety Performance: The Mediating Roles of Safety Climate, Safety Motivation, and Safety Knowledge

Johanna Bunner[1]*, Roman Prem[1], Christian Korunka[1]

Authors' Note:

[1]Department of Applied Psychology: Work, Education, Economy, Faculty of Psychology, University of Vienna, Vienna, Austria

Correspondence concerning this article should be addressed to Johanna Bunner, Department of Applied Psychology: Work, Education, Economy, Faculty of Psychology, University of Vienna, 1010 Vienna, Austria. E-mail: johanna.bunner@univie.ac.at

Abstract

Recent changes in the world of work have led to increased job demands with subsequent effects on occupational safety. Although work intensification has been linked to detrimental safety behavior and more accidents, there is so far no sufficient explanation for this relationship. This paper investigates the mediating roles of safety climate, safety motivation, and safety knowledge in the relationships of work intensification with components of safety performance at an organizational level. Safety engineers and managers from 122 Austrian high-accident companies participated in a cross-sectional survey. In line with our hypotheses, work intensification negatively related to both components of safety performance: safety compliance and safety participation. The results of a serial multiple mediation analysis further revealed safety climate and safety motivation to be serial mediators of the relationship between work intensification and safety performance. Unexpectedly, safety knowledge and safety climate only serially mediated the relationship between work intensification and safety compliance, but not the relationship between work intensification and safety participation. This study provides evidence for the detrimental effect of work intensification on safety performance across organizations. Additionally, this study offers an explanation as to how work intensification affects safety performance, enabling practitioners to protect their occupational safety procedures and policies from work intensification.

Keywords: safety professionals, safety engineers, managers, serial mediation, high-accident

Introduction

The intensification of work has been one of the most significant changes in the world of work since the 1980s (EASHW, 2007). The acceleration of economic and technological development through new technologies (Rosa, 2003) both requires and enables companies to be more efficient in the production of goods and in the delivery of services. Due to increased economic pressure, fewer employees must do more work more frequently in less time. Although automation and digitalization facilitate faster decision processes and shorter production cycles, halts in production owing to maintenance, human error, or unforeseen events threaten output goals and can generate high expenses for companies. This increases the pressure on employees to work at a higher speed (Green, 2004) and/ or reduce their breaks (Roberts, 2007). Ultimately, this culminates in work intensification which, in addition to work and time pressure, requires employees to continuously invest more work effort to complete more work in less time (Green & McIntosh, 2001).

Empirical evidence suggests that work intensification has adverse effects on occupational safety and health. On an individual level, several studies have found that common job demands such as work overload and time pressure encourage unsafe work practices (Hansez & Chmiel, 2010; Hofmann & Stetzer, 1996; Mullen, 2004; Slappendel, Laird, Kawachi, Marshall, & Cryer, 1993). Work intensification, however, is different from such job demands and refers to the process of continuously increasing job demands that have to be attended to in shorter time (Green, 2004; Green & McIntosh, 2001; Kubicek, Paškvan, & Korunka, 2015). Although it has been argued that there is insufficient statistical data to prove the causal negative or positive effects of work intensification on health and well-being in the workplace (EASHW, 2007), recent findings suggest that work intensification adversely affects individual occupational safety (Akamangwa, 2016; Koukoulaki, 2010; Papadopoulos, Georgiadou, Papazoglou, & Michaliou, 2010; Walters & Wadworth, 2017).

As work intensification stems from societal developments leading to organizational adjustments (Green, 2004), its impact has been found across a variety of organizations such as hospitals, hotels, nursing homes, offices and construction sites as well as in manufacturing productions (EASHW, 2007; Kubicek, Korunka, & Ulferts, 2013; Kubicek et al., 2015; Mullen, 2004; Oxenbridge & Moensted, 2011; Paškvan, Kubicek, Prem, & Korunka, 2016). To our knowledge, there are no studies yet that have explored how work intensification affects safety performance across several organizations. Therefore, the present study investigates the effects of work intensification on safety performance at the organizational level. To explain the relationship of work intensification and safety performance across organizations, we draw on the model of safety performance (Griffin & Neal, 2000; Neal & Griffin, 2002, 2004), which has been tested at the organizational level in a study based on expert evaluations (Braunger, Korunka, Kubicek, Frank, & Lueger, 2015). It describes the effect of safety climate on safety performance by considering the mediating roles of safety motivation and safety knowledge. We assume that the negative relationship of work intensification with safety performance, consisting of safety compliance and safety participation, can be explained via its adverse impact on safety climate. Based on the model of safety performance, we will test serial indirect effects between work intensification and safety performance via safety climate and consequently both, safety motivation and safety knowledge at the organizational level.

The present study contributes to the literature on safety performance in two ways. First, we demonstrate that the effect of work intensification on safety performance can be found across a variety of organizations. This finding indicates that the detrimental effects of work intensification may be a challenge of societal origin rather than due to organizations' failure. Second, drawing on the model of safety performance allows us to reveal how the relationship of work intensification with the components of safety performance can be explained via safety climate and the determinants of safety performance. This furthers the understanding of the mechanisms of work intensification at an organizational level.

Work intensification and safety performance

Work intensification refers to the increasing amount of effort an employee must invest during the working day that oftentimes results from increased economic pressure and other societal changes (Green, 2004; Green & McIntosh, 2001). In contrast to time pressure, resulting from high quantitative workload at a specific point in time, work intensification refers to increasing levels of quantitative workload over time. In other words, work intensification is characterized by an increased need to complete more tasks within one working day, work at a heightened speed, perform different tasks simultaneously, and/or reduce idle time (Kubicek, Korunka, Paškvan, Prem, & Gerdenitsch, 2014; Kubicek et al., 2015).

When production output is at risk, employees are often expected to work faster rather than safe (Paté-Cornell, 1990; Zohar, 2008). Thus, work intensification contributes to the safety-production conflict, which is a persistent topic in occupational safety research. This manifests in employees trading quality for quantity of work (Amabile, Conti, Coon, Lazenby, & Herron, 1996), to meet production goals. Especially in the production sector, work intensification is associated with a decline in occupational safety and a rise in musculoskeletal disorders and other psychosocial risks (EASHW, 2007). Additionally, work intensification leads to the use of unsafe working methods and consequently also more injuries (Oxenbridge & Moensted, 2011), because employees who experience work intensification are more likely to by-pass and block safety systems of machineries to work faster and maintain production rates (EASHW., 2007; Koukoulaki, 2010). These negative safety behaviors, driven by work intensification, are indicators of poor safety performance.

Safety performance can be broadly defined as actions or behaviors that individuals carry out in their jobs to ensure their individual health and safety as well as that of their surrounding environment (Burke, Sarpy, Tesluk, & Smith-Crowe, 2002). It plays a crucial role in maintaining a safe work environment as it has been shown to predict workplace injuries (Christian, Bradley, Wallace, & Burke, 2009; Neal & Griffin, 2006) and accordingly, higher levels of safety performance are associated with fewer occupational injuries (Clarke, 2013).The distinction between safety compliance and safety participation as components of safety performance was first conceptualized by Neal and Griffin (2002). Safety compliance refers to generally mandated core activities carried out by individuals to maintain their personal workplace safety such as wearing personal protective equipment or complying with safety procedures at work. In contrast, safety participation describes individuals' behavior that contributes to developing a safe work environment. These behaviors include, for example, participation in voluntary safety activities, the attendance of safety meetings, and helping coworkers with safety-related issues. Safety participation, in contrast to safety compliance, does not immediately contribute to the individuals' safety but rather to the overall safety of the workplace (Griffin & Curcuruto, 2016; Neal & Griffin, 2002, 2006).

Individuals engage in safety compliant behavior because it is required of them but also to protect themselves from accidents and injuries. Work intensification, however, might undermine this behavior. Meta-analytic evidence suggests that work intensification as a result of down-sizing can be expected to have negative effects on occupational injury and safety compliance (Quinlan & Bohle, 2009). High levels of work intensification result in workarounds, such as bypassing or neutralizing the safety systems of machinery and the negligence of other protective equipment. This occurs because disregarding safety rules may be the only way for employees to sustain heightened work speed and maintain production rates (Askenazy, 2001; Burchell, 2006; Cavazza & Serpe, 2009; EASHW, 2007). Thus, when work intensification is high, complying with safety regulations may require greater effort than non-compliance (Tregaskis, Daniels, Glover, Butler, & Meyer, 2013). Overall, findings suggest that work intensification is associated with lower levels of safety compliance.

Work intensification might also compromise employees' participation in safety behavior contributing to a safe work environment. As work intensification increases, a decline in safe work behavior as well as training and information regarding safety can be observed (Koukoulaki, 2010; Papadopoulos et al., 2010). With tightly scheduled production, the time for workers to attend safety meetings are cut short, as they must fulfill production goals. Additionally, when workers learn that adverse safety behavior is the most efficient way to reach production goals, they will most likely refrain from telling each other off for not working safely and thus not participate in creating a safe work environment. Additionally, work intensification has been linked to poor communication at work, leading to a subsequent loss of values and respect for colleagues (EASHW, 2007) and to occupational violence, harassment, and bullying (EFILWC, 2002; Quinlan & Bohle, 2009). Working in an environment of bullying and harassment may impair mental health with detrimental consequences such as anxiety, dysphoria, and reduced self-confidence or even a decrease in organizational commitment (Giorgi et al., 2016; Nielsen & Einarsen, 2012). Thus, poor communication may also reduce instances of workers helping each other to work safely or investing in the company's safety voluntarily. Overall, it can be expected that work intensification is negatively related to both safety compliance and safety participation. Thus, we propose the following relationships:

H1. Work intensification is negatively related to the components of safety performance, i.e., (a) safety compliance and (b) safety participation.

The roles of safety climate, safety motivation, and safety knowledge

Safety climate describes perceptions of safety in the work environment regarding the priority of safety during production processes involving physical or health risks (Zohar, 2000, 2014) that are shared within an organization (Griffin & Neal, 2000). The role of organizational safety climate has been investigated extensively and literature shows that it significantly affects employees' motivation to work safely, their execution of compliant and participative safety behavior, and safety outcomes such as accidents and injuries (e.g., Christian et al., 2009; Nahrgang, Morgeson, & Hofmann, 2011). Especially in the context of the model of safety performance, safety climate plays a significant role. The priority of safety policies, procedures and practices in the form of safety climate informs employees to what extent their workplace supports and rewards safety compliant or engaging behavior and thus, drives their motivation to behave safely and sustain their safety knowledge (Braunger et al., 2015; Neal & Griffin, 2006; Neal, Griffin, & Hart, 2000; Zohar, 2014).

On a conceptual level, safety climate is a second-order factor that is derived from the following first-order factors: safety practices, management values, safety equipment, safety training, and safety communication (Braunger et al., 2015; Griffin & Neal, 2000; Neal & Griffin, 2004). In the subsequent section, we argue that work intensification negatively affects the first-order factors of safety climate and consequently, negatively relates to safety climate.

Detrimental effects of work intensification on safety practices often remain unnoticed because work intensification stems from structural and organizational changes of work such as more flexible organization structures and the reduction of the workforce(Cascio, 2003). Thus, organizations overlook that safety practices and OSH (occupational safety and health) workplace standards are negatively affected by work intensification (Quinlan & Bohle, 2009; Walters & Wadworth, 2017). Work intensification also has adverse effects on safety climate in that it is negatively correlated with employees' perception of the organizations' safety concerns (Cavazza & Serpe, 2009). Management values and managerial commitment toward safety are a crucial aspect of safety climate that influence it strongly (Zohar, 2008). Additionally, work intensification has been found to cause poor communication and a low social climate at work (EASHW, 2007) which may affect safety communication. Because safety communication has no direct and visible contribution to the organizations output, it may seem futile to exhaust organizational resources on it, when those are direly needed to reach production goals. Likewise, safety training requires financial, temporal and human resources. Work intensification, however, necessitates that fewer employees accomplish more work in less time, thus, cutting resources for other activities scarce. Unsurprisingly, work intensification is often accompanied by a reduction in permanent staff and an increase in contract workers who receive fewer instructions and less training (Koukoulaki, 2010; Papadopoulos et al., 2010). Lastly, when work demands and production speed increase and there is no leeway in production schedules, employees refuse to wear their personal protective equipment if it hinders them to work more efficiently (Ahmed, Azhar, Farooqui, & Panthi, 2015; Turner, Chmiel, & Walls, 2005) or slows down their work speed (Forst et al., 2006). The extent to which an organization tolerates improperly adjusted safety devices and invests into employees' personal safety equipment contributes to the level of safety climate in that organization (Zohar, 2014). As work intensification appears to be negatively associated with each of the five aspects of safety climate, we assume that it is also negatively related to safety climate.

According to the model of safety performance (Griffin and Neal, 2000; Neal et al., 2000; Neal and Griffin, 2002, 2004, 2006) safety climate affects both, safety motivation and safety knowledge. These determinants of safety performance, in turn, are related to both, safety compliance and safety participation. The relationship between the antecedents, determinants, and components of safety performance has been well researched and confirmed (e.g. Braunger et al., 2015; Christian et al., 2009; Clarke, 2000; Griffin & Curcuruto, 2016; Griffin & Neal, 2000; Neal & Griffin, 2002, 2004, 2006; Neal et al., 2000).

Safety motivation can be described as an individual’s willingness to participate in safety activities and to comply with safe working practices. It has been conceptualized as a key determinant of safety compliance and safety participation across a range of industrial and organizational contexts (Griffin and Curcuruto, 2016). Griffin and Neal (2000) assumed that safety climate as a distal factor of safety performance has an indirect effect on safety compliance and safety participation by influencing employees’ safety motivation. The effect of safety climate on safety performance through safety motivation can be explained by both expectancy-valence-theory (Vroom, 1964) and social exchange theory (Blau, 1964). According to expectancy-valence-theory, the level of safety climate determines which safety behaviors are reinforced. Thus, a positive safety climate reinforces expectancy-value perceptions of safety behaviors (Parker, Bindl, & Strauss, 2010) and motivates employees to execute the valued behaviors (Zohar, 2010). Additionally, in line with social exchange theory (Blau, 1964), when employees perceive that the organization supports and cares about their well-being, they will reciprocate by enacting behaviors that benefit the organization. Thus, safety motivation should lead to safety behaviors that keep the individual worker safe but also contribute to a safe work environment. Therefore, we assume the following relationship (see Figure 1):

H2. The negative relationship of work intensification with the components of safety performance, i.e., (a) safety compliance and (b) safety participation, is serially mediated by safety climate followed by safety motivation.

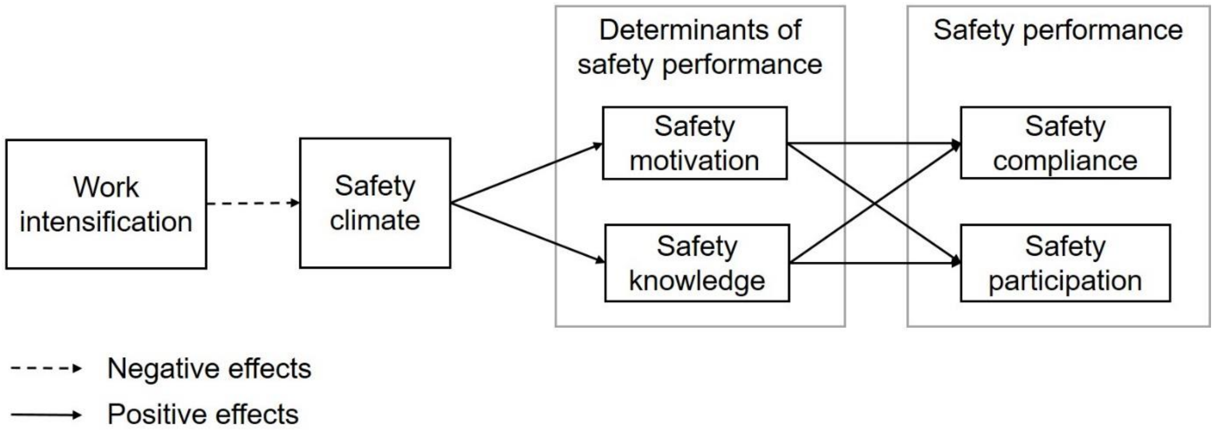

Figure 1. Conceptual model of the study.

Safety knowledge refers to an individual's knowledge and skills of how to comply with safety regulations or participate in safety activities in order to stay safe (Neal and Griffin, 2002). Safety climate may influence safety performance through safety knowledge because relevant knowledge and skills are required to carry out safe work behaviors. An employee without sufficient knowledge of how to comply with safety regulations or participate in safety activities will not be able to perform these actions (Neal and Griffin, 2002). Through the level of safety climate they perceive, employees are informed about the emphasis the organization puts on said knowledge and skills of how to work safely (Zohar, 2014). Thus, we assume the following relationship (see Figure 1):

H3. The negative relationship of work intensification with the components of safety performance, i.e., (a) safety compliance and (b) safety participation, is serially mediated by safety climate followed by safety knowledge.

Investigating the relationship of work intensification and safety performance at the organizational level

Work intensification impacts the individuals' health and safety. However, it stems from societal changes and its detrimental effects have been found in numerous organizations. Thus, we assume it also has an impact at the organizational level that is manifested in organizational safety climate. As safety climate is a specific form of organizational climate (Neal et al., 2000) it may be impacted by work intensification which stems from societal developments and leads to organizational changes (Green, 2004; Green and McIntosh, 2001). This assumption is supported by findings from Lindell and Brandt (2000) that showed how organizational climate is affected by environmental context variables.

Testing this assumption with data from multiple organizations allows for a higher variance. While employee data is often aggregated to explore the organizational level, this approach seems unfit when aiming for data collection across many organizations. For this intention, a currently very encouraging approach in safety research is to utilize safety expert and manager perspectives (Braunger et al., 2015; Nordlöf, Wiitavaara, Högberg, & Westerling, 2017; Nordlöf, Wijk, & Lindberg, 2012). Experts, such as safety engineers, have a better representation of tasks within their area of expertise and they encode new information more efficiently that allows them access to information and knowledge relevant to the demands of action in current situations and tasks. Accordingly, safety engineers' ratings of organizational-level safety correlate highly with employees' aggregated perceptions of safety climate (Zohar, 1980). In the field of occupational health and safety, however, both managers and safety professionals are apt to evaluate changes in work demands and aspects of occupational safety. Previous research has shown that even though their perceptions may differ on how pronounced certain work and safety situations are, they still positively correlate as managers and safety experts agree on the most important work and safety issues and thus, their prioritization (Nordlöf et al., 2012, 2017).

Method

Study design

Data was collected during consulting sessions that the Austrian Workers' Compensation Board (Allgemeine Unfallversicherungsanstalt; AUVA) provided free of charge to high-accident companies. In a cross-sectional design, safety engineers and managers were asked to anonymously answer an online-questionnaire during the consultation. Complementary data regarding company size and sector according to NACE classification (EUROSTAT, 2008) was provided by the AUVA. This study was carried out in accordance with the recommendations of the American Psychological Association (2010). The procedure and materials of this study have not undergone examination by an ethics committee, as the measures and procedures followed the protocols of standard survey study research in applied psychology and we did not touch sensitive topics (like e.g., sexual orientation). Our protocol fully complied with the standards of the university where it was conducted. These standards include strict guidelines to store potentially identifying information like e-mail addresses separately from the focal measures. Individuals interested in participating in our study were informed about the general aims and the protocol of the study before their participation. At the beginning of the online questionnaire participants were informed about the confidentiality of the study and their voluntary participation. They had the option to quit the survey at any time. To start survey participation, they had to tick a box on the landing page of the online questionnaire, stating they had understood and agreed with the conditions of the survey.

Description of respondents

Safety engineers and managers were chosen because their expert evaluation provides an organizational perspective of working and safety conditions in each organization. Respondents were asked to state their age and tenure in the organization. Safety engineers also stated whether they provided their services externally or were employed as in-house experts. Managers were asked about their position in the company. The sample consisted of 51.6% safety engineers, most of them were employed as in-house experts. The managers had an average tenure of 10.7 years in different management positions, supervising 77 employees on average. Table 1 provides more detailed descriptions of the respondents.

Table 1
Description of respondents' role, age, employment status or position.

		n	%
Respondents' role		122	
	Safety engineers	63	51.6
	Managers	59	48.4
Age	21- 30 yrs	6	5.3
	31- 40 yrs	20	17.7
	41- 50 yrs	55	48.7
	Above 51 yrs	32	28.3
	Missing	9	
Safety engineers' status	In-house	35	55.6
	External	28	44.4
	Missing	1	
Managers' position	CEO	15	25.4
	Site manager	8	13.5
	Production manager	10	17.0
	HR manager	10	17.0
	Division manager (other)	14	23.7
	Group managers	2	3.4
			M
Organizational tenure	Safety engineers		11.3 yrs
	Managers		10.7 yrs

Sample and data collection

Although the occurrence of workplace accidents in the European Union and Austria has been decreasing during the last 20 years, there are still high-accident companies. They appear to be especially challenged with balancing the competing goals of productivity and safety (Paté-Cornell, 1990; Zohar, 2000) and thus, comprise an attractive sample when investigating the impact of detrimental working conditions on occupational safety. In Austria, a company is considered high-accident when it can be listed among the 1000 companies with the highest accident-per-employee-rate in any given year. These high-accident companies are offered optional free consultations by the AUVA. From January 2016 to December 2016 we were able to conduct a survey in 122 of these companies receiving a free consultation. Either a safety engineer or a manager representing their company during the consultation completed the complementary questionnaire of this study. During data collection, the AUVA-headquarter sent out monthly reminders to their regional managers with the request to encourage consultants to promote study participation during the consultations. At the beginning of the consultation, participants were invited to voluntarily answer the questionnaire and ensured that their data would be processed anonymously.

Access to the online questionnaire required log-in with the companies' insurance number which was later also used to match the descriptive company data. Most of the organizations had between 51 to 250 employees and the biggest sectors were the manufacturing of goods and construction. A detailed overview of the companies' sectors and number of employees is provided in Table 2. Table 2 also contains the distribution of the sectors and sizes of all high-accident companies of 2015. The sample's distribution of sectors is representative for manufacturing of goods and construction. The distribution of our samples' company sizes are not representative of the high-accident companies of 2015. However, the accident-per-employee rate of the sample is representative for Austrian high-accident-companies of the same year. The sample's mean accident-per-employee rate was 0.67 reportable accidents-per-employee in 2015 with a range from 0.06 to 2.18. The accident-per-employee rate for all Austrian high-accident companies in 2015 was 0.60 and ranged from 0.16 to 2.36 accidents-per-employee.

Table 2.
Description of companies' sizes and sectors.

		Sample (N =122)		High-accident companies 2015
		n	%	%
Size	1-50 employee(s)	0	0.0	0.0
	51-250 employees	89	72.9	47.2
	251 and more employees	33	27.1	52.8
Sector	Manufacturing of goods	54	44.3	40.3
	Construction	26	21.3	28.2
	Trade and maintenance	7	5.7	11.3
	Traffic and warehousing	5	4.1	7.2
	Agriculture, forestry, fishery	4	3.3	0.7
	Water supply, sewage and waste disposal, removal of pollution	4	3.3	1.9
	Other sectors	22	18.0	10.4

Measures

In advance, the questionnaire was discussed with a focus group of managers and safety engineers to ensure equal comprehensibility for all respondents. All measures were administered in German.

Work intensification

Work intensification was measured using the intensification of job demands scale by Kubicek et al. (2015). In this scale, an impersonal formulation of items is used to measure perceived changes in job demands. Because we measured at an organizational level, the original items had to be slightly adapted to facilitate judgement of work intensification at the organizational level. One example is the adaptation from "In the past two years…it is increasingly harder to take time for breaks" to "In the past two years…it is increasingly harder for the employees of this organization to take time for breaks." The response format was a five-point Likert-scale ranging from 1 (not at all) to 5 (completely).

Safety climate, safety motivation, safety knowledge, safety compliance, and safety participation

Safety climate, safety motivation, safety knowledge, safety compliance, and safety participation were assessed using the safety climate questionnaire by Braunger et al. (2015). This questionnaire was designed specifically for safety engineers to give their expert evaluation on how they perceive organizational safety climate as well as the determinants and components of safety performance, allowing for the collection of data across many organizations. The discussion in the focus group served to ensure managers' comprehensibility and evaluative competencies of these items. All items were answered on a five-point Likert-scale with the alternatives ranging from 1 (strongly disagree) to 5 (strongly agree).

Safety climate was assessed using a ten item-questionnaire with two items each measuring the first-order factors management values, safety practices, safety communication, safety training, and safety equipment. Safety engineers and managers were asked how they evaluated the organization regarding those aspects. An example item for safety communication is "The goals, measures, and facilities concerning workplace safety are public or made available to all employees in the organization."

Safety motivation was assessed with two items referring to the employees' willingness to comply with safety regulations. The items were "The employees in this organization try to minimize the danger of accident in their workplaces." and "Workplace safety has high importance by the employees of this organization.".

Safety knowledge was assessed with two items asking about employees' knowledge of safety procedures and practices. The items were "The employees in this organization know about the hazards in their workplaces." and "The employees in this organization know how they can work safely."

Safety compliance was assessed with two items relating to employees' main activities for maintaining their individual safety. The items were "The employees in this organization always work according to safety rules, even under time pressures." and "The employees in this organization always wear the protective equipment or clothing.".

Safety participation was assessed with two items that referred to the employees' behavior that contributes to a safety-supporting environment. The items were "The employees in this organization take part in the development and implementation of initiatives within workplace safety." and "The employees in this organization voluntarily attend safety trainings.".

Control variables

We controlled for number of employees per organization and the respondents' role (safety engineer or manager). There is empirical evidence that safety engineers and managers agree on general improvements in the field of work environment management, an effect that can also be found over time (Nordlöf et al., 2012; Swedish Work Environment Authority, 2006, 2008). Some literature, however, indicates that safety engineers and managers perceive the company's priority for work and safety environment management moderately different (Forth, Bewley, & Bryson, 2006; Nordlöf et al., 2012). As there is no conclusive empirical evidence that managers and safety engineers agree in their description of safety and working conditions or employee behavior, we decided to include the professional role of the respondents as a control variable in the model.

Data analysis

Figure 1 illustrates the proposed relationships between the variables. All hypotheses were tested using standardized variables. We tested our hypotheses simultaneously using Structural Equation Modeling (SEM) in Mplus 7.4 (Muthén & Muthén, 1998-2015). Safety climate was included as a latent variable measured by five indicators: management values, safety training, safety communication, safety practices, and safety equipment. All other variables in the model were included as manifest variables. With SEM, multiple complex relationships between a set of variables can be analyzed simultaneously. Moreover, a variable can be both, a dependent variable in one relationship and a predictor variable in another relationship at the same time (i.e., a mediator). In serial mediation, a specified direction of causal flow is assumed in which the mediators are linked. The presumed direction of the flow is usually based on theoretical justification and decided by the researcher (Hayes, 2017). Mplus tests all possible variable combinations for the specific ordering and, as a result, provides all direct and indirect effects for the tested model. Because the distribution of serial indirect effects is skewed in most cases, we obtained bootstrapped 95% bias-corrected confidence intervals (CI) based on 10,000 draws. As recommended by Becker (2005), we tested our model with and without control variables.

Results

Descriptive Statistics

The internal consistencies were satisfactory for work intensification, safety climate, safety motivation, and safety knowledge ($\alpha \geq .83$). Reliabilities for safety compliance and safety participation were found to be acceptable ($\alpha \geq .72$). Most variables were correlated with each other, except for the company size, which only correlated with the respondents' role, and work intensification with safety motivation. The means, standard deviations, correlations, and internal consistencies (Cronbach's α) for all variables are provided in Table 3.

Hypotheses testing

We tested all hypotheses simultaneously in a SEM controlling for the number of employees and the respondents' role within the respective organization. Analyses were repeated without control variables, but interpretation of the hypothesis stayed identical. The model showed a good fit with $\chi 2 = 63.2$, df = 33, RMSEA = .08 [.05; .12], CFI = .95, SRMR = .04, TLI = .91.

The control variables had relationships with some of the variables. The number of employees was positively related to safety climate $\beta = .21$, 95% CI [.04; -.33] and negatively to safety knowledge $\beta = -.18$, 95% CI [-.29; -.05]. The respondent's role was negatively related to safety climate $\beta = -.27$, 95% CI [-.44; -.09] and safety motivation $\beta = -.22$, 95% CI [-.37; -

.06]. Work intensification was directly negatively related to safety climate, safety knowledge and safety compliance. Safety climate was directly positively related to safety motivation, safety knowledge, safety compliance and safety participation. Safety motivation was positively related to both, safety compliance and participation, whereas safety knowledge was not significantly related to safety participation and only showed a positive significant relationship to safety compliance with $p < .10$. Figure 2 illustrates the estimates for the direct and total effects from the SEM.

Hypotheses 1ab proposed negative relationships between work intensification and safety compliance as well as between work intensification and safety participation. Consistent with Hypotheses 1a and 1b, work intensification had a significant negative relationship with safety compliance $\beta = -.33$, 95% CI [-.47; -.15] as well as safety participation $\beta = -.22$, 95% CI [-.37; -.05]. Thus, Hypotheses 1a and 1b were supported.

Hypotheses 2ab predicted indirect serial effects of work intensification via safety climate and safety motivation on the two outcomes, safety compliance and safety participation. As the confidence interval of the indirect of work intensification via safety climate and safety motivation on safety compliance did not include zero, Hypothesis 2a was supported. There was also a significant indirect effect of work intensification via safety climate and safety motivation on safety participation. Thus, Hypothesis 2b was supported as well. Hypotheses 3ab predicted serial indirect effects of work intensification via safety climate and safety knowledge on safety compliance and safety participation. Even though safety knowledge was only significantly related to safety compliance within a 90% bias-corrected CI $\beta = .134$, 90% CI [.01; .257], the indirect effect was significant, Hypothesis 3a was supported. Hypothesis 3b, however, had to be rejected, because safety knowledge did not show a significant relationship with safety participation and consequently, the estimate of the respective serial indirect effect was not significantly different from zero. Table 4 provides an overview of the standardized indirect and total effects of the analyses for all hypotheses.

Table 3.
Descriptive statistics, correlation coefficients, and internal consistencies for all variables (N = 122).

	Measure	M	SD	1	2	3	4	5	6	7	8
1.	No. of employees	183.60	203.86								
2.	Respondents' role	1.48	0.50	**-.19**							
3.	Work intensification	1.89	0.75	.09	**-.18**	(.89)					
4.	Safety climate	4.26	0.57	.12	**.26**	**-.28**	(.89)				
5.	Safety motivation	4.03	0.77	.03	**.36**	-.12	**.56**	(.87)			
6.	Safety knowledge	4.27	0.65	-.15	**.31**	**-.38**	**.53**	**.57**	(.83)		
7.	Safety compliance	3.83	0.77	-.08	**.39**	**-.39**	**.69**	**.70**	**.66**	(.72)	
8.	Safety participation	3.68	0.89	-.06	**.32**	**-.27**	**.63**	**.56**	**.42**	**.62**	(.72)

Note. Correlation coefficients significant with p < .01, two-tailed, are shown in boldface.
Cronbach's α are shown in the diagonal in parentheses. Respondent's role: 1 = safety engineer, 2 = manager.

Table 4.
Standardized indirect and total effects of main effects and mediation analyses.

Estimate		Bias-corrected bootstrap 95% confidence interval	
		LL	UL
Total effects			
H1a: WI → SCo	**-.33**	-.477	-.158
H1b: WI → SP	**-.22**	-.372	-.047
Indirect effects			
H2a: WI → SC → SM→SCo	**-.05**	-.199	-.012
H2b: WI → SC → SM→SP	**-.02**	-.059	-.003
H3a: WI → SC → SK→SCo	**-.04**	-.104	-.010
H3b: WI → SC → SK→SP	.02	-.002	.070

Note. Significant effects are shown in boldface.WI = work intensification. SC = safety climate. SM = safety motivation. SK = safety knowledge. SCo = safety compliance. SP = safety participation.

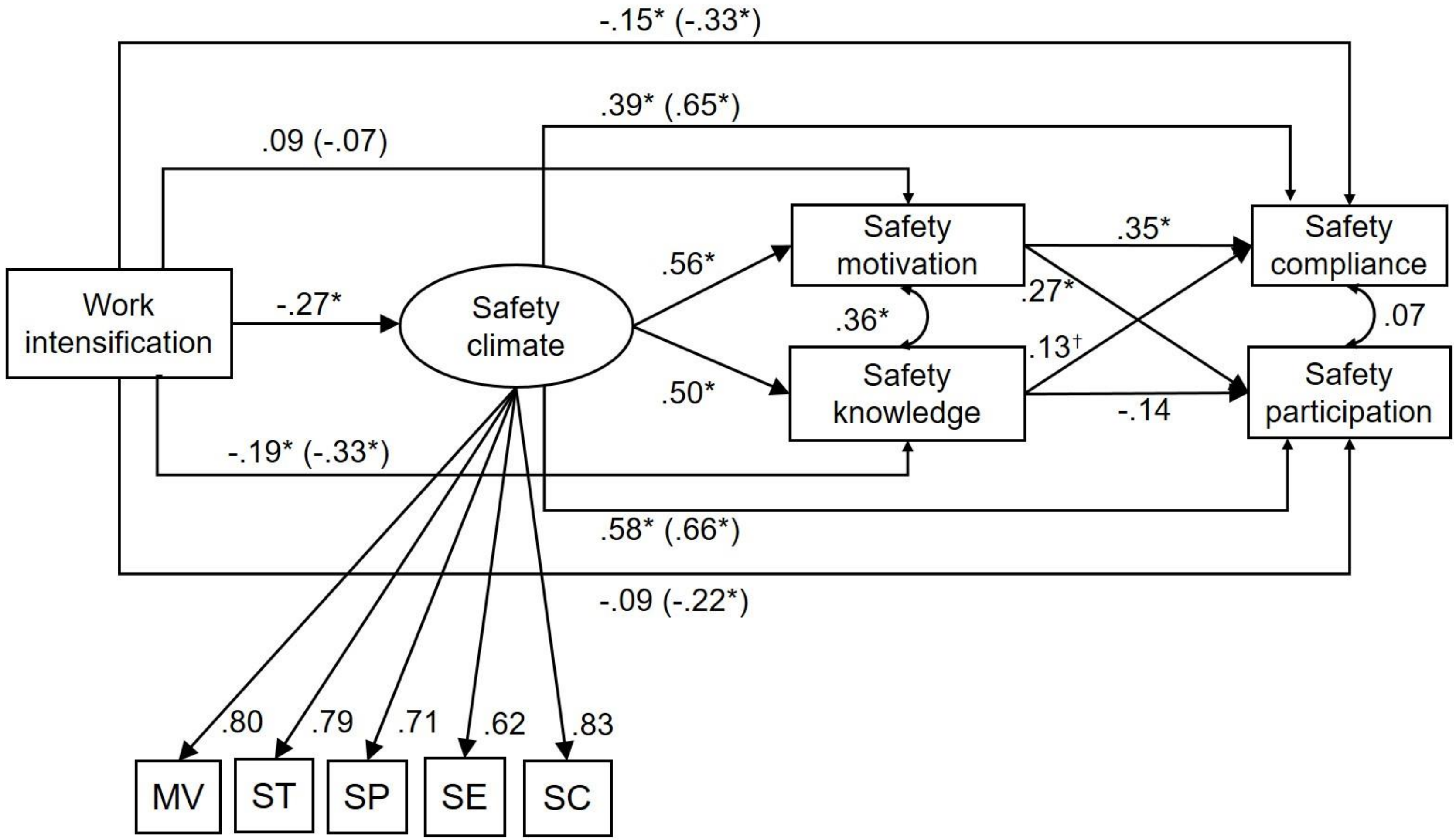

Figure 2. Standardized estimates and total effects from Structural Equation Modeling.
Note: †*p* < .10. **p* < .05. Total effects are displayed in parentheses. For visual clarity control variables are omitted.
MV = management values, ST = safety training, SP = safety practices, SE = safety equipment, SC = safety communication.

Discussion

In this study, we proposed a relationship between work intensification and safety performance at the organizational level that we explained based on the model of safety performance (Griffin and Neal, 2000; Neal et al., 2000). We tested our hypotheses based on data provided by either safety engineers or managers from 122 high-risk organizations.

Work intensification and safety performance

In line with our hypotheses building on previous studies (EASHW, 2007; Quinlan and Bohle, 2009; Tregaskis et al., 2013), we found that work intensification was negatively related to safety compliance and safety participation at the organizational level. To our knowledge, this is the first study to provide empirical evidence for the relationship between work intensification and safety participation at the organizational level. These findings suggest that work intensification not only compromises individual safety behavior but also the safety of work environments within an organization. Using the perspective of one representative per organization to assess levels of work intensification and safety performance allowed us to show the negative impact of work intensification across high-risk organizations of different sizes and sectors. This may lead to the conclusion that work intensification as a societal issue has detrimental effects on occupational safety that expand beyond the scope of individual safety behavior or the safety measures of single organizations.

The role of safety climate, safety motivation and safety knowledge

We used Structural Equation Modeling to test our assumption that the negative relationship of work intensification with safety performance can be explained through the model of safety performance (Neal et al., 2000; Neal and Griffin, 2002, 2004). By drawing from this model, we incorporated safety climate as a first stage mediator and safety motivation and safety knowledge as second stage mediators in the relationship between work intensification and safety performance. Examining these relationships from an organizational level allowed us to theoretically account for the fact that work intensification stems from structural and organizational changes of work (Cascio, 2003). These assumptions were largely supported in our study.

As expected, work intensification was strongly related to safety climate. The results suggest that work intensification not only directly negatively affects safety performance but also indirectly affects it through worsening the organizations' safety climate. Safety climate, in turn, directly and indirectly affects safety performance. These findings are consistent with the notion that safety climate is an indicator of production over safety; a low safety climate meaning that there is a higher focus on production (Zohar, 2014). On a broader level, it is important to recognize that safety climate is a specific form of organizational climate (Zohar, 1980). With work intensification resulting from organizational and structural changes (Cascio, 2003), other forms of organizational climate may also be affected by work intensification. Future research could examine adverse effects of work intensification on different types of climate, such as absence or ethical climate.

As shown in previous studies (Braunger et al., 2015; Griffin and Neal, 2000; Neal et al., 2000), safety climate affects safety compliance and participation through a positive impact on safety motivation. In our study, we could show that this association persists at an organizational level when work intensification was added as a predictor. In this relationship, the role of safety climate is essential. Although work intensification had a direct negative effect on safety climate, it had no direct effect on safety motivation. This indicates that workload and time pressure in the form of work intensification do not lead to employees seeming less motivated in their efforts to minimize the danger of their work or think of safety as unimportant. Instead, changes in organizational safety climate strongly affect safety motivation. Accordingly, safety motivation showed a direct positive relationship with both safety compliance and safety participation. Thus, understanding what motivates employees to work safely is of utmost importance when striving to reinforce safety compliant and participative behaviors.

Safety knowledge and safety climate acted as serial mediators in the relationship of work intensification and safety compliance but not in the relationship of work intensification and safety participation. In one of their earlier studies, Griffin and Neal (2000) found that safety knowledge was more strongly related to safety compliance than safety participation. They argued that it was more important for an individual to know how to work safely to comply with safety rules than it was for their involvement in participatory activities. In line with these assumptions, safety knowledge was not significantly related with safety participation in our analysis. However, it should be noted that both variables shared a positive and significant zero-order correlation. Their relationship only became non-significant in the more complex model of our analyses when other variables predicting safety participation were included.

We also unexpectedly found that work intensification had a strong negative association with safety knowledge that was not explained through safety climate. This association can be explained by previous research which has shown that an increase in work intensity is often accompanied by a decrease in communication, training and information regarding safety (Koukoulaki, 2010; Papadopoulos et al., 2010) which reduces the safety knowledge among employees. Additionally, antecedents and byproducts of work intensification, such as downsizing and restructuring or tightened production schedules and increased workload, may also contribute to a loss of institutional safety knowledge. When managers or experienced workers leave the company without being replaced, it is possible that crucial safety information is being lost. Also, when employees must take on more and new tasks to compensate for a reduced workforce, they might not be provided with sufficient safety information to carry out all of their tasks safely (Sauter et al., 2002).

Strengths and limitations

This study utilized the evaluation of one safety engineer or manager per organization rather than measuring employee perceptions on work intensification and occupational safety. This can be considered both, a strength as well as a limitation. In contrast to the conventional method of aggregating individual data to the group and organizational levels, having organizational representatives or experts evaluate organizational conditions and characteristics can provide some advantages. First, picking the appropriate experts for their study can produce more unbiased information. We chose safety engineers and managers for their relevant insight into organizational work and safety practices. With safety engineers, for example, it can be assumed that they base the organizational evaluation on their specific expertise and as such, provide an impartial assessment (Braunger et al., 2015; Fernández-Muñiz, Montes-Peón, & Vázquez-Ordás, 2009; Wu, Liu, & Lu, 2007). Second, it is more efficient and thus, economical if just one representative per organization is required for the evaluation. For instance, employing multiple participants to gather data about an organization might be possible in large companies, however, this approach is more difficult when surveying smaller ones (Rindfleisch, Malter, Ganesan, & Moorman, 2008). Thus, the approach allows researchers to investigate the development and pattern of a widespread phenomenon over numerous companies.

Even though literature has found that the perspectives of safety professionals and managers positively correlate and they generally agree on the most important work and safety topics, some research argues that safety engineers and managers perceive their organization's priority for work and safety through different lenses (Forth et al., 2006; Nordlöf et al., 2012, 2017). Following the recommendations of Becker (2005) on how to handle statistical control variables in organizational research, we included the respondents' role as a control variable to account for the different perspectives and because it was correlated with the dependent variables safety compliance and safety performance. Furthermore, we tested the hypothesized model with and without control variables and although the respondents' role was positively related to safety climate and safety motivation, model results were essentially the same. Therefore, in this study, the respondents' role can be ruled out as a confounding variable.

Of course, using expert evaluations is a limited approach, as it, for example, is not appropriate for assessing an individual's perceptions, beliefs, judgments, or feelings (Podsakoff, MacKenzie, & Podsakoff, 2012). We measured how safety engineers and managers perceived employees' safety motivation and safety knowledge. Naturally, neither safety engineers nor managers can read employees' minds to assess their degree of safety knowledge or motivation. Therefore, safety motivation items were phrased in a descriptive way asking to report observable behavior rather than requesting participants to speculate about employees' intentions or degree of suspected motivation. Both, safety engineers and managers are mainly responsible for employees' safety instructions and trainings, thus for the transmission of safety knowledge (Braunger, Frank, Korunka, & Lueger, 2009; Braunger et al., 2015). Therefore, they are eligible to judge the employees' state of safety knowledge. Additionally, we controlled for the respondents' position to account for possible different perspectives.

The measures in our study showed as good as, if not better, internal consistencies compared to the original publications (Braunger et al., 2015; Kubicek et al., 2015). This can be attributed to the conceptualization of our constructs. All items were phrased descriptively and thus, in a way a third person with insight into the organization could provide their evaluation. Work intensification as well as safety climate is related to developments in organizational structures and practices that are observable from an outside perspective. Because work intensification relates to objective rather than subjective changes in job demands (Kubicek et al., 2015), it is apt to be assessed by experts at an organizational level. Investigating numerous organizations in one study enabled us to develop a broad perspective on the occurrence of work intensification across in high-accident organizations. This also holds true in the context of occupational safety. While safety climate refers to shared perceptions of the priority of safety within one organization, this value of safety is deducted from observable safety measures and actions. The actions set to create safety climate are of utmost importance as they strongly indicate the relevance of safety within the organization (Zohar, 2014). As such, our safety climate measure relates to organizational safety policies and procedures that affect safety behavior; both are observable from an outside perspective.

Our study can only reveal associations between work intensification, safety climate, safety motivation, safety knowledge, and safety performance due to its cross-sectional design. To show the causal relationships between these constructs, a longitudinal design is necessary. Longitudinal studies could determine whether work intensification reduces safety performance over time and determine the long-term roles of safety climate, safety knowledge, and safety motivation play in this model. It would be advisable for future research to incorporate four measurement points in their study designs to test causal effects in the serial mediations and to avoid common method (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff et al., 2012).

While our sample is representative for Austrian high-accident organizations regarding their sectors and accident-employee-ratio, it is not representative regarding the number of employees. In our analyses, however, we controlled for the number of employees. Yet, it remains unclear whether these results can be replicated in less accident-prone organizations. Future researchers should investigate whether our outcomes are valid in countries with similar legal embedding of organizations and design of OSH structures.

Practical implications

The results have important practical implications for organizations. When work intensification increases, organizations may have to expect two kinds of adverse consequences regarding safety. First, on an individual level, employees' safety performance may decrease because of intensified working conditions, enhancing the risk of accidents and injuries. Especially behaviors that contribute to a safe work environment may decrease owing to work and time pressure, worsening employees' cohesion, and overall safety. Secondly, managers must be made aware of these risks and be actively responsible for creating an environment where safe work behavior is incentivized, as their safety values are a driver for positive safety climate.

Additionally, our results indicate that work intensification also negatively affects safety climate and safety knowledge. In an environment where production is more important than safety, time and other resources for significant safety activities may be cut short. Organizations need to be aware that work intensification has detrimental effects on occupational safety practices and procedures. They may prevent this deterioration by a) taking countermeasures to uphold a positive level of safety climate and b) providing their employees with the necessary resources to enable them to safely conduct their work. From our results, it can be argued that it may be especially effective to invest in employees' safety knowledge as it is directly affected by work intensification. Promising measures to counteract the detrimental effects of work intensification include safety instructions, training, and clear communication of practices and procedures. Especially in highly intensified work environments, these trainings should be administered in frequent, short intervals to enhance employees' familiarity with new safety strategies. This is important because work teams are prone to return to less effective strategies that they are more familiar with when time pressure is high (Lehner, Seyed-Solorforough, O'Connor, Sak, & Mullin, 1997). Naturally, even short regular trainings of employees are time and cost intensive. Current research suggests that training supervisors' safety awareness is a very effective and resource efficient way of incentivizing employees to work safely. Supervisors and managers act as multipliers in their teams and through their role behavior motivate employees to work safely (Luria, 2016). Especially in organizations with high work intensification, sending supervisors to train rather than a whole team might be a more cost-sensitive option.

Employees may experience work intensification because organizations are laying off their colleagues or replace them with contract workers to cut costs. Organizations also employ such strategies when trying to survive during economic crises. Amid recession, resources are shifted away from OSH measures because organizations are focused on restructuring and downsizing (ILO: International Labour Organization, 2013, p. 20; Jhang, 2018). While the detrimental effects of crises (or the fear thereof) on mental and physical health of employees are well researched (Giorgi, Arcangeli, Mucci, & Cupelli, 2015; Mucci, Giorgi, Roncaioli, Fiz Perez, & Arcangeli, 2016), it appears that empirical research findings on the causal links between recession and higher levels of occupational accidents are inconclusive (de la Fuente et al., 2014; ILO, 2013). Nevertheless, crises have been found to increase the workload for OSH professionals, especially under the light of recruitment freezes for OSH staff. Additionally, priorities are shifted away from OSH, resulting in negative management attitudes towards OSH which negatively impacts safety culture (ILO, 2013, p. 20; Jhang, 2018). Therefore, it is thinkable that economic crises also compromise safety climate, safety motivation and safety knowledge of workers at an organizational level because it leads to similar reactions across organizations. Managers signaling low importance of safety during crises impair their safety climate and thus, decrease their employees' motivation to work safely. Furthermore, minimizing OSH measures reduces safety training which results in lower safety knowledge among employees. In turn, employees with little safety knowledge and motivation will behave less safely. While the effects of economic crises on safety climate and safety behavior have not been thoroughly researched, there is reason to suspect that they are similar to those of work intensification.

It is essential that worker safety is always a priority for organizations, and they invest sufficient resources in preventative measures. To protect their employees from work intensification and its detrimental consequences, organizations may stop laying off employees to cut costs temporarily, replacing them with contract workers. Furthermore, keeping experienced employees in the company will protect safety standards and facilitate the training of newer employees. Organizations may also keep their employees safe and healthy by protecting their break times and keeping work teams at a size that allows for a manageable workload.

Conclusion

This study showed that work intensification negatively relates to safety compliance and safety participation at the organizational level. Additionally, it shows how these relationships are mediated by safety climate and safety motivation and that safety climate and safety knowledge also mediate the relationship between work intensification and safety compliance. Thus, this study makes two contributions to the literature. First, it is the first study to show a direct negative relationship between work intensification and safety performance. In addition, it provides evidence for the detrimental effect of work intensification on safety performance at an organizational level, showing that work intensification is a challenge of societal origin rather than organizations' failure. Second, this is the first study to offer an explanation as to how work intensification affects safety behavior. By drawing from the model of safety performance, we further the understanding of the mechanisms behind the extensive effects work intensification has on occupational safety. Additionally, this study expands research on expert perspectives by entirely utilizing the perspective of safety engineers and managers to evaluate work intensification and organizational safety variables.

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5.3 How do Safety Engineers improve their Job Performance?

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How do safety engineers improve their job performance? The roles of influence tactics, expert power, and management support

Johanna Bunner[1], Roman Prem[2], and Christian Korunka[1]

Authors' Note

[1]Department of Applied Psychology: Work, Education, Economy, Faculty of Psychology, University of Vienna, Vienna, Austria.

[2]Work and Organizational Psychology, Institute of Psychology, University of Graz, Graz, Austria

Correspondence concerning this article should be addressed to Johanna Bunner, Department of Applied Psychology: Work, Education, Economy, Faculty of Psychology, University of Vienna, 1010 Vienna, Austria. E-mail: johanna.bunner@univie.ac.at

Abstract

Non-technical skills are of increasing importance for safety engineers to perform their job of improving occupational health and safety. In their position as expert consultants, they work closely with managers and management support is important for them to successfully perform their job. This study investigates how safety engineers' rational and hard influence tactics impact their management support and in turn, their individual task proficiency (ITP). It further examines the moderating role of safety engineers' expert power in this context. Using an online questionnaire, survey data was collected from 251 safety engineers from Austria. Rational influence tactics are positively related to ITP via management support, whereas hard influence tactics are not. Safety engineers' expert power moderates the relationship between influence tactics and management support and, consequently ITP. High expert status strengthens the positive relationship of rational influence tactics on ITP via management support. For hard influence tactics, low expert power supports the negative relationship of upward appeal and pressure on ITP via management support. Safety engineers should rely on rational persuasion when cooperating with management to obtain support and improve their own performance. This study connects the effect of influence tactics in the context of safety engineers' work performance with Organizational Support Theory. It demonstrates that safety engineers' influence tactics are related to work role performance through management support and that these relationships are moderated by expert power.

Keywords: rational persuasion, upward appeal, pressure, individual task proficiency, safety professionals, safety managers, Organizational Support Theory

Introduction

Modern technical safety systems have become increasingly reliable and the chance of injuries due to technical failure has been reduced considerably. In fact, up to 80% of accidents in the industrial sector can be traced back to human factors (Flin, O'Connor, & Crichton, 2008; Helmreich, 2000; Reason, 1990). To complement the technical expertise of workers, managers, and especially safety engineers, safety research has started to focus on non-technical skills such as teamwork and communication (Blair, 1999; Flin et al., 2008).

Safety engineers are consultants whose expertise is characterized by high technical skills in occupational health and safety (OHS). Their job requires them to consult employers, employees, and work councils on OHS topics and the design of humane working conditions. Their tasks also include the provision of technical expertise, the briefing and training of employees, diagnosing the organization, recommending improvements, documenting safety incidents, supplying (legal) information, and designing safety systems (Braunger, Korunka, Kubicek, Frank, & Lueger, 2015; European Council, 1989), allowing for different role enactments such as the administrator, the workshop inspector, the problem solver, or the craft expert (Harris, Bendix Olsen, & Walker, 2012). This indicates that safety engineers have high technical and legal skills; however, their non-technical skills may be insufficient. Considering their communication with managers in particular, safety engineers have been found to be lacking social skills and fail to argue for OHS measures with regard to organizational resources or economic considerations (Blair, 1999, 2013; Winterfeld, Trimpop, & Forschungsgemeinschaft Sifa-Langzeitstudie, 2012). Safety engineer trainings in the EU also contribute to this problem because they currently do not include non-technical skills such as communication in their curricula (European Council, 1989; SFK-VO, 1995). This lack of communication skills is problematic for two reasons. First, managers control the budget and ultimately approve or disapprove of OHS measures, including judgments on expected cost-benefit outcomes in their decisions (Clarke, 2000; Winterfeld et al., 2012) – here, safety professionals need to be able to provide rational arguments. Second, safety engineers' most successful way of gaining management support for improving OHS is through direct communication with managers as safety engineers are not authorized to issue directives (Blair, 2013; Chang, Chen, & Wu, 2012; Winterfeld et al., 2012). Therefore, they need to become aware of how their interactions with managers influence their chances of gaining management support.

Even though the importance of non-technical skills of safety engineers has been pointed out before, academic research has mostly neglected this topic (Blair, 1999, 2013; Winterfeld et al., 2012). This study aims to fill this gap by examining the impact of safety engineers' use of influence tactics in combination with their expertise through the application of Organizational Support Theory (OST; Eisenberger et al., 1986). More precisely, it investigates the effects of influence tactics on management support and the consequential effect on safety professionals' work performance. Additionally, the study acknowledges safety engineers' expertise by considering the role of expert power in combination with influence tactics on their impact on management support. With this approach, the study aims to shed light on how and when safety engineers' communication styles with managers are successful.

Influence tactics

Influence tactics are means to achieve one's goals in an organizational setting and are used to change the behavior of a target, e.g., an expert trying to persuade a manager to support a change project (Kipnis, Schmidt, & Wilkinson, 1980). Influence tactics are, therefore, effective when they provoke a change in attitude or action within the target. These changes can occur via three different processes: compliance, internalization, and personal identification (Kelman, 1958; Yukl, 2013). Compliant targets follow a request because they expect to receive a reward or avoid a punishment controlled by the agent. Their motivation to comply is purely instrumental and they only invest the effort necessary to receive the reward or avoid the punishment. Targets that have internalized an agent's request are loyal to the request presented but not to the agent presenting it. The request meets the target's underlying values and beliefs and they become intrinsically committed to supporting it. Personal identification is based on the target's relationship with the agent. The target imitates the agent's behavior and attitudes to please them because the target desires the agent's acceptance and esteem. By following the agent's request, the target can maintain a relationship in which they receive approval and acceptance. The three influence processes are qualitatively different from each other and more than one process can occur at a time (Kelman, 1958; Yukl, 2013).

This is in line with the finding that individuals do not necessarily use the same influence tactics in every situation and likewise, different individuals may choose different influence strategies when faced with similar situations (Higgins, Judge, & Ferris, 2003). Accordingly, different soft, rational, and hard influence tactics elicit different reactions within the target (Falbe & Yukl, 1992; Kipnis & Schmidt, 1985), thus impacting the agent – target relationship. For example, rational tactics lead to positive outcomes such as support from management, commitment, and high performance ratings from supervisors. In contrast, hard tactics trigger negative reactions such as reactance, mistrust, or reduced performance and effectivity ratings from management. Furthermore, although each tactic can be applied on its own, combining, for example two soft tactics, or a soft tactic and rationality, is more effective than any single tactic or a combination of hard tactics (Blickle, 2003, 2004; Falbe & Yukl, 1992; Kipnis & Schmidt, 1988; Yukl et al., 1995; Yukl & Tracey, 1992).

The mechanisms of management support may be explained with Organizational Support Theory (OST; Eisenberger et al., 1986). OST is based on Social Exchange Theory (Blau, 1964) and proposes that employees develop a general perception concerning the extent to which the organization values their contributions and cares about their well-being. Accordingly, employees also develop perceptions concerning the degree to which supervisors value their contributions and care about their well-being, so called perceived supervisor support (Kottke & Sharafinski, 1988). Support from managers creates the felt obligation in employees to help them reach their goals in return, i.e., the need to reciprocate the perceived support

(Eisenberger et al., 1986; Rhoades & Eisenberger, 2002; Stinglhamber & Vandenberghe, 2003). In fact, perceived supervisor or management support has been found to enhance the performance of standard job activities and increased in-role performance (Becker & Kernan, 2003; Bhanthumnavin, 2003; Shanock & Eisenberger, 2006).

Safety engineers' standard job activities require technical skills and an overall understanding of organizational workings but also non-technical skills in the direct exchange and consultation of employees and employers. A concept that integrates all these aspects is that of work role performance (Griffin, Neal, & Parker, 2007). Work roles comprise the entire set of performance responsibilities associated with an individual's employment. Work roles expand existing models of work performance by classifying role behaviors on the individual, team, and organizational level and differentiate between proficiency, adaptivity, and proactivity. In particular, individual task proficiency (ITP) refers to behaviors that can be formalized and describes the degree to which employees meet the known expectations and requirements of their role as an individual (Griffin et al., 2007). For safety engineers, this includes core tasks of the consultation of employers and employees on technical and legal safety details, hazard identification, documentation of safety practices, and accidents and the negotiation of new or improved preventative measures (Braunger et al., 2015; Hale et al., 2005).

Management support as a mediator between influence tactics and ITP

We propose that influence tactics impact safety engineers' ITP through management support. The influence tactic used by the safety engineers will affect the degree of management support they perceive. Following OST (Eisenberger et al., 1986) management support then impacts their performance. In general, management support provides safety engineers with task-oriented support such as determining the amount of merit pay or providing necessary resources for them to carry out their job. But management support also indicates relations-oriented resources such as informal feedback on job performance or improved networking opportunities. Thus, management support is essential for safety engineers' job performance (Shanock & Eisenberger, 2006; Walters & Nichols, 2006; Winterfeld et al., 2012).

As managers often consider safety measures as costly and unnecessary (Clarke, 2000), safety engineers have to develop efficient ways of convincing them to support their projects. Rational persuasion is characterized by the agent using logical arguments and factual evidence to persuade the target to agree with a proposal or the viability of a request (Blickle, 2004; Kipnis & Schmidt, 1985; Kipnis et al., 1980; Yukl & Falbe, 1990; Yukl et al., 1995). It is successful because it signals that the agent's requests are free from emotions and personal interests, which meets the expectations bureaucratic organizations have toward their employees (Kieser, 1999). Rationality is considered the most effective tactic for achieving goals because it supplies targets with facts and logical arguments which renews their informational power and it has positive effects on important management perceptions, evaluations and trust (Lee et al., 2017; Yukl, 2013). In fact, using rational persuasion increases the target liking the agent and supervisors feel that employees who use rational influence are more similar to them (Kolodinsky, Treadway, & Ferris, 2007). In their meta-analysis, Lee et al. (2017) found that rational persuasion was significantly positively related to relations-oriented outcomes. Thus, we assume that safety engineers using rational persuasion tactics on their managers also report higher support by them and, in turn, increased ITP.

H1a. Rational persuasion exhibits a positive indirect relationship with ITP via management support.

Hard influence tactics such as pressure and upward appeal are also ways safety engineers rely on to establish management support for their agenda. Pressure is a hard influence tactic and considered to be rather ineffective in achieving one's goals (Yukl & Tracey, 1992). Pressure tactics require the use of demands, threats, or intimidation to convince the target person to comply with a request or to support a proposal. Accordingly, pressure is considered the least effective influence tactic and rarely creates a favorable relationship between agent and target (Falbe & Yukl, 1992; Tepper, 2000; Tepper et al., 1998; Yukl, 2013). It has been found to predict mistrust, reactance, and reduced effectivity (Blickle, 2003, 2004; Kipnis & Schmidt, 1988; Yukl & Tracey, 1992; Yukl et al., 1995) and is significantly negatively related to relations-oriented outcomes (Lee et al., 2017). As management support is positively related to an increase in employee performance (Becker & Kernan, 2003; Bhanthumnavin, 2003; Shanock & Eisenberger, 2006), a decrease in management support should reduce individual work role performance. In summary, safety engineers pressuring their managers should report lower management support and, in turn, reduced ITP.

Upward appeal is an influence tactic based on the hierarchical system of an organization. Agents appeal to higher positioned organizational members when their own formal power within the organizational hierarchy is too low to persuade their target (Brass & Burkhardt, 1993). With the approval of the higher positioned organizational member, the target is essentially forced to comply with the request (Blickle, 2004; Kipnis & Schmidt, 1985; Kipnis et al., 1980; Yukl & Falbe, 1990; Yukl et al., 1995). Upward appeal is an ineffective influence tactic in developing good relationships between the agent and the target because on the one hand, it signals a loss of standing within a target person's group (Lee et al., 2017; Tepper et al., 1998). On the other hand, undermining a target's authority will lead to negative attitudes and behavior toward the agent. This, in turn is negatively related to target-rated job performance and effectivity, increases resistance among the target and is potentially detrimental towards relation-oriented outcomes in general (Blickle, 2003, 2004; Lee et al., 2017; Tepper et al., 1998; Yukl & Tracey, 1992). Therefore, safety engineers using upward appeal as an influence tactic should report lower management support and, in turn, reduced ITP.

H1bc. Hard influence tactics, i.e., pressure (b) and upward appeal (c) exhibit a negative indirect relationship with ITP via management support.

Expert power as a moderator between influence tactics and management support

Influence tactics are most likely to work when the agent possesses an appropriate power base for the use of the chosen influence tactic (Yukl & Tracey, 1992). Power bases are the resources an agent has available to influence a target to comply with the agent's request or objective. Power bases are different from influence tactics in that they refer to the agent's potential power and not the actual use of power (French & Raven, 1959; Raven, Schwarzwald, & Koslowsky, 1998). Although power bases may provide the frame for some influence tactics being more likely to be used by the target than others, targets are not restricted in their use of influence tactics by their power bases (Elias, 2008; Lines, 2007). In fact, there is an empirical distinction to be made because, for example, compliance can occur because of the powers that are actually used, and the power bases assumed to be available to the agent (Raven et al., 1998), thus, allowing for an interaction between influence tactic and power base.

Expert power refers to the perception that a person has special knowledge or expertise in a specific area. It is a personal power source and based on the credibility of the agent (French & Raven, 1959; Raven, 2008). Expert power is limited to the agent's area of expertise – overstepping this area will diminish the expert power (French & Raven, 1959; Steensma & van Milligen, 2003). Safety engineers are experts in workplace safety because of their professional OHS training. They are explicitly employed for their technical skills and their competencies are limited to this area as they are not authorized to consult on other topics or to issue directives. Expert power, however, is based on targets' perceptions of agents' expertise in relevant domains. An agent having superior knowledge will not possess expert power unless organizational members notice and value this knowledge. Because of this, experts have to seek and create situations in which their knowledge becomes visible to other organizational members, so that their expertise is available to them as a power base (Lines, 2007).

Agents are especially effective in their influence attempts when they have the appropriate power base of their influence tactic (Yukl & Tracey, 1992). Rational persuasion is supported by expert power in that it acts as a push factor for the influence tactic (Steensma & Van Millingen, 2003; Yukl & Tracey, 1992). Targets are more likely to accept influence attempts from agents with expert power because experts' suggestions are assumed to be conducive to success (Lines, 2007). For example, managers are more likely to follow consultants' advice because they perceive them as possessing high expertise in their respective field (Elias, 2008). Therefore, safety engineers with high expert power that use rational persuasion, should report higher management support than safety engineers with low expert power.

H2a. Expert power moderates the positive relationship of rational persuasion and management support in such a way that the relationship is amplified as a function of expert power.

Hard influence tactics are more successful in combination with high position power. This, however, cannot be applied to safety engineers because they have a staff position that leaves them without the authority to issue directives, even though they are at eye level with managers. However, safety engineers may hold high expert power and agents with high power have been found to be preferred exchange partners to agents with low power (Thye, 2000). Expert power is also one of the most important reasons for individuals to carry out requests made by an agent, presumably because expert consultation is generally considered to be beneficial (Lines, 2007; Yukl & Falbe, 1991). Therefore, the "push" effect of expert power (Steensma & Van Millingen, 2003) should act as a buffer on the negative consequences of hard influence tactics in the relationship of safety engineers and managers. The use of hard influence tactics is expected to reduce management support because hard influence tactics violate social norms and encourage resistance and mistrust (e.g., Yukl & Tracey 1992; Raven, 1993). This negative relationship is expected to prevail when safety engineers' expert power is low. When, however, safety engineers' expert power is high, the negative effect of hard influence tactics on management support will be buffered.

H2bc. Expert power moderates the negative relationship of hard influence tactics, i.e., (b) pressure and (c) upward appeal and management support in such a way that the relationship is attenuated as a function of expert power.

The moderated mediation of expert power and management support

Thus far, it is expected that rational and hard influence tactics impact ITP through management support and that rational and hard influence tactics impact management support regarding expert power. Consequently, the interaction of influence tactics and expert power should influence ITP through management support (see Figure 1).

H3a. The indirect relationship of rational persuasion with ITP via management support is moderated (enhanced) by expert power.

H3bc. The indirect relationship of hard influence tactics, i.e. (b) pressure and (c) upward appeal with ITP via management support is moderated (attenuated) by expert power.

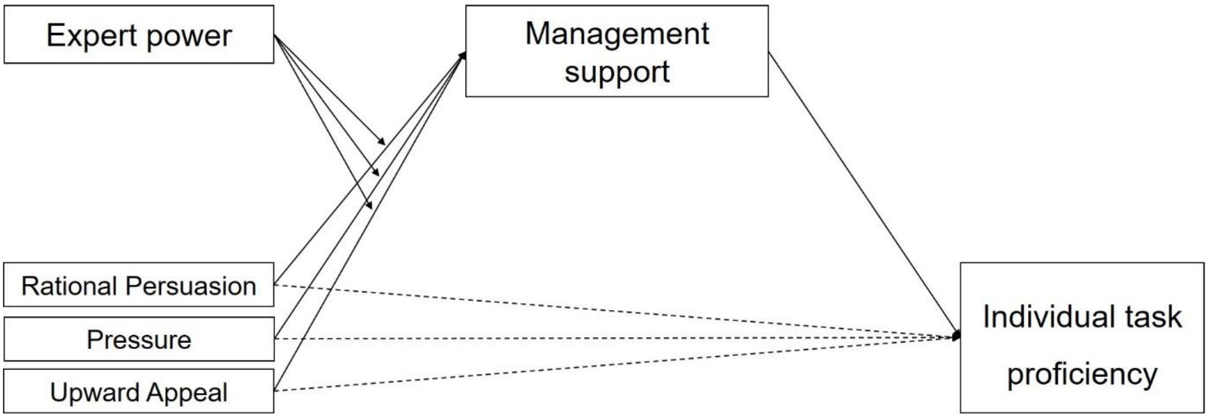

Figure 1. Proposed relationships of the moderated mediation model of influence tactics on individual task proficiency with the mediating role of management support and the moderating role of expert power.

Method

Sample and procedure

Data was collected among Austrian safety engineers using an online questionnaire. Participants were invited via e-mail and additionally, the study was advertised in cooperation with Austrian safety institutions and associations. Two e-mail reminders were sent out after one week and after two weeks to encourage participation. An incentive system was set up, whereby the project donated 1€ to the Austrian Handicapped Sports Association for every completed questionnaire. As the exact number of safety engineers in Austria is unknown, a return rate cannot be calculated. Overall, 251 questionnaires were completed, which is comparable with previous studies (Braunger et al., 2015; Seubert, Peißl, Hopfgartner, Sachse, & Glaser, 2016). The questionnaire started with a filter to ensure only working safety engineers could answer. Safety engineers that provided their services as external consultants were asked to answer the questionnaire with only one of the organizations they serviced in mind.

Out of the 251 safety engineers, five refused to state their age and gender. Out of the remaining 246 safety engineers, 93.5% (n = 230) were male and the average age was 49.3 years (SD = 9.1). Of the respondents, 1.2% had completed junior high, 11.4% had completed apprenticeship training, 12.2% had finished technical school, and 14.6% held a high school diploma. Another 32.9% completed school for higher technical education and 27.6% held a university degree. The average tenure in their respective job as safety engineers was 10.6 years (SD = 7.6). The position of an in-house employed expert was held by 53.8% and 46.2% provided their services externally. In comparison with previous studies on Austrian safety engineers (Braunger et al., 2015; Seubert et al., 2016), the sample can be considered representative regarding safety engineers' age, gender, educational status, and position.

Measures

The influence tactics' rational persuasion, pressure and upward appeal were measured using 4-item subscales for each from the intra-organizational influence tactics scale (Blickle, 2003; Blickle & Gönner, 1999). On a seven-point Likert scale ranging from 1 (*never*) to 7 (*always*), safety engineers indicated how frequently they used the different tactics to influence their manager. An example for *rational persuasion* is "I explain to my manager in detail the reason(s) for my request." An example item for *pressure* is "I openly stand against my manager." An example for *upward appeal* is "I officially turn to managers in a higher position."

Management support was measured using an adapted version of the 8-item short scale of the survey of perceived organizational support (Eisenberger et al., 1986) that included the two facets of the definition of perceived organizational support, valuation of employees' contribution and care about employees' well-being. Three adaptions were made. First, for internal safety engineers the expression "The organization" was replaced with the expression "My manager." Second, for external safety engineers the expression "The organization" was replaced with the expression "My contact person in management position." Third, the instructions for the scale included the request to answer the items with the manager in mind with whom they mainly worked on OHS topics in their organization. Items concerning how safety engineers perceived support from their manager regarding their work and well-being were to be answered on a seven-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). An example item is "My manager/ my contact person in management position takes pride in my accomplishments at work."

Expert power was measured using an adapted version of the 4-item subscale by Raven et al. (1998). In the original version, employees rate their supervisors' expert power. For this study, safety engineers were asked to evaluate reasons that may have led people in the organization to trust in a solution suggested by them despite the initial refusal to implement the solution. An example item is "People in this organization were under the impression that I knew the best way to do the job." Items were to be answered on a seven-point Likert scale from 1 (*certainly not a reason*) to 7 (*certainly a reason*).

Individual task proficiency was measured using the 3-item subscale of the work role performance scale by Griffin et al. (2007). Safety engineers were asked to rate how often they had carried out a certain work behavior over the past month on a scale ranging from 1 (*very little*) to 5 (*a great deal*). An example item is "Carried out the core parts of my job well.".

Control Variables

Safety engineers' employment position (in-house expert vs. externally employed consultant) was used as a control variable as it has been found to have a great impact on their cooperation with managers and certain aspects of their performance (Winterfeld et al., 2012). Further, we included tenure of the safety engineer as a control variable to account for differences in experience.

All measures were administered in German. Originally, English measures were translated forward into German and then back into English using native speakers. Additionally, before launching the questionnaire its comprehensibility was discussed with a focus group of safety engineers.

Data Analysis

Figure 1 illustrates the proposed relationships between the variables. A series of confirmatory factor analyses (CFA) were ran in Mplus 7.4 (Muthén & Muthén, 1998 - 2015) to test construct validity. The fit of the hypothesized six-factor model was compared to one-, four-, and five-factor alternative models. As negatively worded items may be a source of common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), the errors of the reversed items were correlated as recommended by Billiet and McClendon (2000). All hypotheses were tested using grand mean-centered variables. Three moderated mediation models were calculated using the SPSS macro PROCESS v3.0 (Hayes, 2017). To control for confounding, the independent variables of the model that were not tested for the main effects were entered as covariates (Yzerbyt, Muller, & Judd, 2004). All indirect effects were subjected to follow-up bootstrap analyses with 10,000 bootstrap samples and calculated 95% bias-corrected confidence intervals (CI). CIs that did not encompass zero were considered significant. As recommended by Becker (2005) we only included those control variables that were correlated with the dependent variables in the final models to avoid artificial reduction of power. Moreover, we also tested our models without control variables to check whether the obtained results were robust.

Results

Confirmatory factor analyses

We run CFA to compare the measurement models and to examine the distinctiveness of the six variables rational persuasion, pressure, upward appeal, expert power, management support, and individual task proficiency. The results indicated that the theorized six-factor model provided a good fit with the data (χ^2 = 468.01, df = 281, CFI = .95, TLI = .94, RMSEA = .05, SRMR = .06) and fitted significantly better than the best fitting five-factor model (χ^2 = 617.63, df = 286, CFI = .90, TLI = .89, RMSEA = .07, SRMR = .07, $\Delta\chi^2$ = 149.61, $p < .001$), the four-factor model with the three influence tactics combined in one factor (χ^2 = 946.85, df = 290, CFI = .82, TLI = .79, RMSEA = .09, SRMR = .10, $\Delta\chi^2$ = 478,84, $p < .001$), or the single factor model (χ^2 = 228.13, df = 296, CFI = .45, TLI = .39, RMSEA = .16, SRMR = .17. $\Delta\chi^2$ = 1820.11, $p < .001$). Given these results, the theorized six-factor model was superior in fit to all the alternative models, and therefore, these variables were examined as distinct constructs.

Descriptive statistics and correlations

Table 1 provides the means, standard deviations, correlations, and internal consistencies for all variables. Internal consistencies were satisfactory for pressure and good for rational persuasion, upward appeal, management support, expert power, and ITP. Safety engineers' position was positively correlated with tenure, management support, expert power, and ITP. Tenure was negatively correlated with pressure and upward appeal but positively correlated with expert power. Rational persuasion was the most frequently used influence tactic, whereas pressure was the least frequently used. All influence tactics were positively correlated with each other and expert power. Only rational persuasion was also positively correlated with management support and ITP.

Table 1.

Means, standard deviations, intercorrelations, and Cronbach's α.

		Mean	*SD*	1	2	3	4	5	6	7	
1.	Position	1.46	0.49	-							
2.	Tenure	10.58	7.61	.29**	-						
3.	Rational persuasion	5.94	1.07	.05	.02	(.87)					
4.	Pressure	2.69	1.14	-.11	-.14*	.27**	(.75)				
5.	Upward appeal	4.13	1.85	-.07	-.13*	.21**	.40**	(.81)			
6.	Management support	5.51	1.17	.24**	.06	.24**	-.06	-.06	(.87)		
7.	Expert power	5.18	1.48	.14*	.15*	.46**	.22**	.20**	.36**	(.88)	
8.	Individual task proficiency	4.51	0.51	.15*	-.08	.37**	.05	.04	.25**	.15*	(.85)

*Note***:** α-coefficients are presented in the diagonal. *$p < .05$; **$p < .01$. Safety engineers' position: 1= internal, 2 = external

Hypotheses testing

We tested all hypotheses controlling for safety engineers' position (internally employed or external consultant). Tenure was excluded as a control variable because it was uncorrelated with the dependent variables (see Table 1), rendering it an impotent control variable. Analyses were also repeated without the control variable, but pattern of results did not change in any way that would affect the conclusion we drew regarding our hypotheses (Becker, 2005).

Hypothesis 1 predicted that management support would mediate the relationship between (a) rational persuasion, (b) pressure, (c) upward appeal, and ITP. As shown in Table 2, rational persuasion had a positive relationship with management support and, in turn, management support had a positive relationship with ITP (see Table 2, model 1). The indirect effects of the mediation analyses demonstrated that management support did mediate the relationship of rational persuasion and ITP $\beta = .02$, 95% bootstrapped CI [0.003, 0.05], thus supporting hypothesis H1a. Pressure (H1b) had a significant negative relationship with management support (see Table 2, model 2). The indirect effects of the mediation analyses, however, were not significant for pressure $\beta = -.01$, 95% bootstrapped CI [-.02, .001], thus, hypothesis H1b was rejected. Upward appeal (H1c) did not have a significant relationship with management support (see Table 2, model 3). Therefore, the indirect effects of the mediation analyses were not significant for upward appeal β = -.003, 95% bootstrapped CI [-0.01, 0.002] and hypothesis H1c was rejected.

Table 2.
Effects of hierarchical regression analyses for mediation and moderation analyses.

Variables	Model 1 Management Support	Model 2 Management Support	Model 3 Management Support	Model 1-3 Individual Task Proficiency	Individual Task Proficiency
R^2	.25***	.26***	.24***	.18***	.16***
Control variable					
Position	.21*	.27	.13	.14*	.13**
Independent/ Covariate					
Rational Persuasion (RAP)	.34***	.24*	.19*	.17***	.38***
Pressure (PRE)	-.10	-.13*	-.11	-.02	-.03
Upward Appeal (UPA)	-.06	-.06	-.07	-.01	-.02
Mediator					
Management Support				.06*	
Moderator					
Expert Power (EXP)	.29***	.34***	.34***		
Interactions					
RAP x EXP	.10***				
PRE x EXP		.15***			
UPA x EXP			.08***		

Note. Predictor model 1: RAP, predictor model 2: PRE, predictor model 3: UPA. **p* < .05; ***p* < .01; ****p*< .001.

Hypothesis 2 proposed that expert power would moderate the relationship between (a) rational persuasion, (b) pressure, (c) upward appeal, and management support. In line with hypothesis 2a-c, the interaction terms that predicted management support were significant for all three influence tactics. Figure 2 illustrates the interactions of the influence tactics with expert power. Expert power strengthened the relationship between rational persuasion and management support. As expert power increases, the slope relating management support to rational persuasion becomes more strongly positive. The simple slopes are β = .19, 95% CI [.05; .33] at -1 SD, β = .34, 95% CI [.17; .50] at the mean and β = .49, 95% CI [.28; .70] at +1 SD of expert power. As further can be seen in Figure 2, expert status also mitigated the relationship of both pressure and upward appeal with management support. As expert power increases, the slope relating management support to pressure becomes less negative. Simple slope analysis demonstrated that the relationship between pressure and management support decreases significantly at low (β = -.36, 95% CI [-.53; -.19]) and mean (β = -.13, 95% CI [-.26; -.01]) levels of expert power but not at high levels of expert power (β = .09, 95% CI [-.07; .24]). The relationship between upward appeal and management support significantly decreases at low levels of expert power (β = -.19, 95% CI [-.29; -.08]) but not at mean (β = -.07, 95% CI [-.15; .01]) or high levels (β = .05, 95% CI [-.05; .15]).

According to Hypotheses 3a-c, the indirect effects of influence tactics on ITP via management support would be contingent upon expert power. To test these predictions, the interaction terms from models one, two, and three (shown in Table 2) were again interpreted and the indices of moderated mediation for the serial indirect relationships calculated. As is evident in Table 3, the relationship between rational persuasion and ITP via management support is strengthened at all levels of expert power. The relationship between pressure and ITP via management support seems to worsen at low and average levels of expert power. Similarly, the relationship between upward appeal ITP via management support is mitigated at low levels of expert power (see Table 3). Overall, the results strongly support hypotheses H2a-c and H3a-c.

Table 3.
Indices of moderated mediation and specific indirect relationships at low, average, and high levels of expert power.

Indirect effects	Index of moderated mediation	Level of expert power		
		Low (-1 SD)	Average	High (+1 SD)
RAP → MS → ITP	.006*	.012*	.021*	.031*
PRE → MS → ITP	.009*	-.023*	-.009*	.006
UPA → MS → ITP	.005*	-.012*	.004	.003

Note: RAP= Rational Persuasion, PRE = Pressure, UPA = Upward Appeal, MS = Management support, ITP = Individual task proficiency. *p < .05.

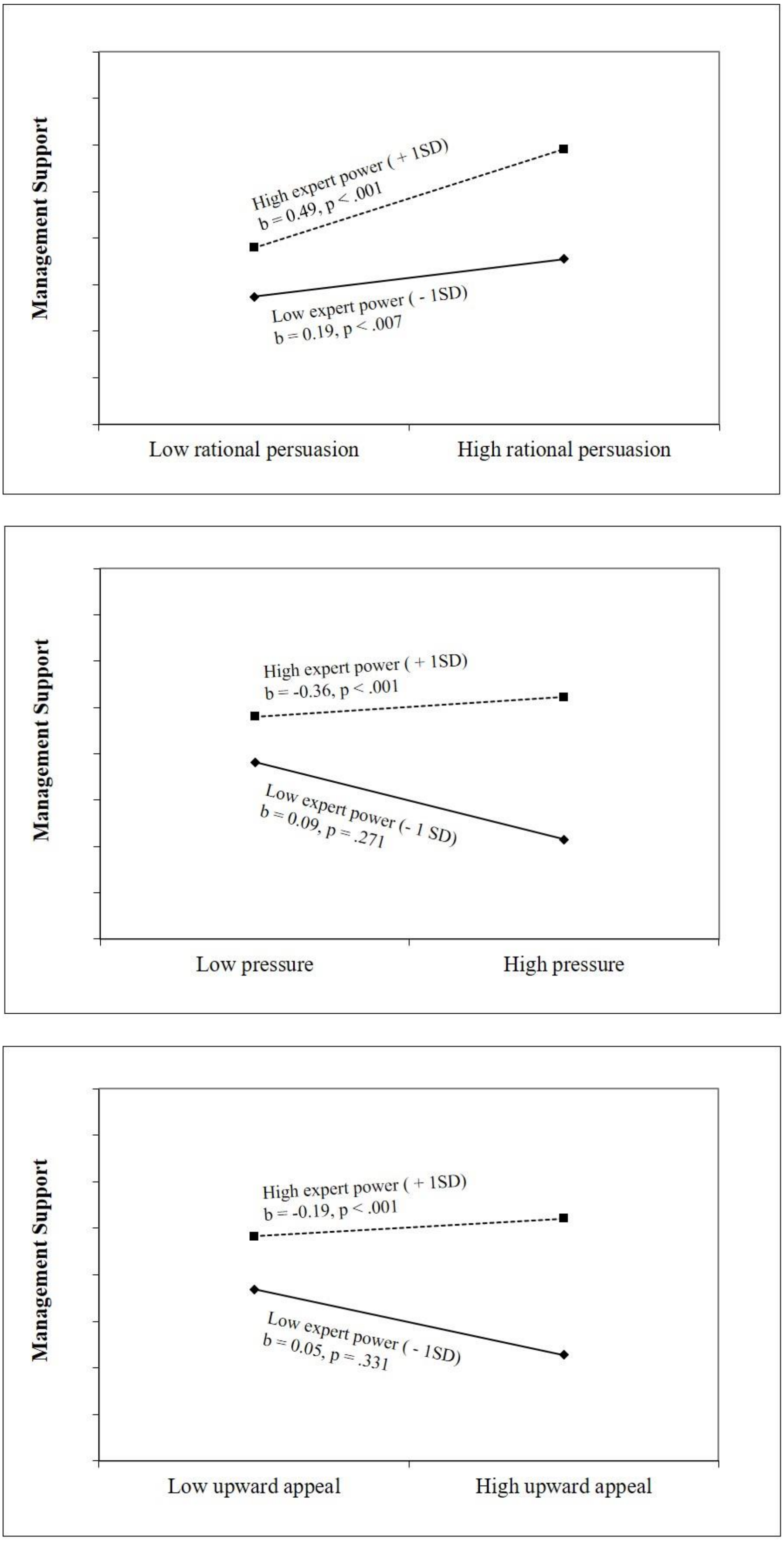

Figure 2. Interaction diagrams showing moderation effects of expert power in relationships of influence tactics with management support as well as simple slopes ± 1 SD from average levels of the predictors and expert power.

Discussion

This study demonstrated how safety engineers' rational persuasion tactic impacted their ITP through management support. Furthermore, the results of the moderated mediation demonstrated that safety engineers' expert power moderated this relationship by enhancing the positive effects of rational persuasion. At the same time, expert power reduced negative effects of pressure and upward appeal on management support and, consequently, on ITP.

Theoretical implications

Consistent with the literature (e.g., Blickle, 2003, 2004), this study found that rational influence tactics positively affected management support. As expected, management support was also positively related to ITP, and the relationship between rational persuasion and ITP was mediated by management support. This result indicates that safety engineers' rational arguments eventually reflect on part of their job performance. Considering the role of safety engineers' expertise in this relationship, the findings suggest that expert power moderated the relationship of rational persuasion and management support in a way that high expert power strengthened the positive relationship of rational persuasion and management support. The interaction between rational persuasion and expert power is supported by previous findings (Steensma & Van Millingen, 2003; Yukl & Tracey, 1992). However, these studies have not considered these effects to reflect on performance. Thus, the results add to the existing literature by demonstrating that rational persuasion leads to increased performance through management support, and this relationship is strengthened with increasing expert power.

Pressure and upward appeal had no direct negative relationship with management support. Therefore, against expectations, management support did not mediate the relationship between hard influence tactics and ITP. Pressure and upward appeal are most commonly used in downward influence attempts (e.g., a manager influencing a subordinate) (e.g., Yukl & Falbe, 1990), which might be the reason why they were not significantly related to management support. Safety engineers' influence attempts on managers are more likely to be lateral, i.e., on eye-level, and upward influence attempts depending on the safety engineers' organizational standing. Indeed, when including expert power as a moderator, it moderated the relationship between pressure and management support, and upward appeal and management support. For pressure and upward appeal, low expert power led to negative outcomes on management support. In turn, high expert power negated that effect, though the effect differed for upward appeal and pressure. Upward appeal only had a negative effect on management support and, in turn, on performance when expert power was low. When expert power had average or high levels, the negative relationship ceased. Pressure, however, had a negative effect on performance through management support when expert power was low or average. In reverse, high expert power protected safety engineers from harming their relationship with management and their own performance using pressure tactics. Therefore, the results contribute to the existing literature by demonstrating that high expert power acts as a buffer for the negative consequences of pressure and upward appeal in social exchange relationships.

Practical implications

Non-technical skills are vital for safety professionals to push the implementation or improvement of OHS measures forward. The training of safety engineers' non-technical skills has been an ongoing debate in applied research and the practical field (Blair, 1999, 2004). Safety engineers have received intense technical and legal training; however, managers have complained that safety engineers lack sufficient communication, teamwork skills, and business language (Blair, 1999, 2004; Winterfeld et al., 2012). By focusing on influence tactics and expert power, this study offers starting points for the inclusion of non-technical skills in safety engineers' training.

Rational persuasion fosters a positive relationship with the management and is thus followed by high performance. Rational persuasion was the most frequently and successfully used tactic by safety engineers in this study. This can be attributed to its logical and factual nature that makes it like the management and economic language that managers are looking for in safety engineers. In the context of safety, rational and cost-benefit arguments are especially important because OHS measures usually result in high expenses upon their implementation and in their maintenance (Clarke, 2000). Thus, safety engineers' non-technical skills should be strengthened with respect to their ability to provide rational arguments focused on the economic considerations of OHS measures.

However, safety engineers must also raise, sometimes vehemently, managers' awareness when safety regulations are violated. In this study, applying pressure or disregarding the management had no immediate negative effect on management support or performance; this is beneficial in situations where safety engineers must be strict. When safety engineers' expert power was low, however, pressure and upward appeal had negative effects on their support by management and their performance. In fact, it seems that high expertise can protect safety engineers from the negative effects of upward appeal and pressure. To some extent, it may be more acceptable for safety engineers to use upward appeal rather than pressure because high and average expert power diminished the negative effects of upward appeal, whereas only high expert power diminished the negative effects of pressure. It may be more acceptable for safety engineers to cooperate with higher level management because certain executive decisions are made at a higher level. On the contrary, pressuring managers may not be perceived as a professional necessity or task but rather as a personal attack, thus reflecting negatively on the safety engineer's performance, unless the safety engineer's expert power is high. Therefore, safety engineers need to be aware of the repercussions the use of hard influence tactics may have on both their management by support and their performance. Hence, it seems advisable for safety engineers to rely strongly on rational persuasion. Hard influence tactics, however, are best administered when safety engineers are certain that they are considered experts in that organization.

Strengths, limitations, and future research

A few limitations associated with this study need to be mentioned. First, although the theoretical framework is derived from causal relationships among the variables, the cross-sectional nature of the data limits us in establishing causal relationships. Future research should test the causal effects in the moderated mediation model with three measurement points. Second, this study was based on self-reports only. Thus, there may be concerns about common method variance. The CFA, however, demonstrated that all constructs could be separated empirically. Future research might include objective measures or management ratings to further reduce concerns about common method bias (Podsakoff et al., 2003). Third, safety engineers are a very specific occupational group; therefore, the results have high practical relevance for the safety context. However, the specificity of the sample might raise concerns about the generalizability of the results. Despite this, the study's strong theoretical framework allows for generalization to the broader context of expert consultants (Kubr, 2002).

Management support measured with the adapted scale from Eisenberger et al. (1986) focuses on how the safety engineers perceive the extent to which their managers value their contribution and care about their well-being. As such it is a relations-oriented measure that can be affected by influence tactics. In the context of safety engineers, task-oriented forms of support might also be of relevance as their work directly contributes to the improvement of occupational safety (Nielsen, 2014; Winterfeld et al., 2012). Future research should therefore also investigate the influence tactics that help or hinder safety engineers in obtaining instrumental support.

Safety engineers' employment position has been found to have a great impact on their cooperation with managers and certain aspects of their performance (Winterfeld et al., 2012). Therefore, it was statistically controlled for in this study. This may be an explanation for the small effect sizes. In the mediation models, safety engineers' employment position had a weak positive significant relationship with ITP. This effect, however, vanished in moderated mediation models, thus strengthening the study's results.

Conclusion

Overall, this study adds to the understanding of how and when safety engineers' influence tactics impact their performance through management support and expert power. By combining the impact of influence tactics with OST this study demonstrated that the way safety engineers communicate with managers indirectly affects their own performance through the management's support. In that relationship, expert power exerts a positive influence.

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6 German Abstract

Sicherheitsfachkräfte tragen zum betrieblichen Sicherheits- und Gesundheitsschutz bei, indem sie Unternehmen und Beschäftigte bei der Gestaltung menschengerechter Arbeit beraten. Ihre Wirksamkeit wird stark von ihrer organisationalen Einbindung beeinflusst. Diese Einbindung ist jedoch schwierig, da Unternehmen zwar gesetzlich verpflichtet sind, Sicherheitsfachkräfte einzustellen, aber diese nicht unbedingt als notwendig erachten. In dieser kumulativen Dissertation erweitere ich den Wissensstand über Sicherheitsfachkräfte, indem ich untersuche, welche Faktoren zu ihrer organisationalen Einbindung beitragen. In drei Studien untersuche ich die Rolle des Sicherheitsklimas, der Expertise der Sicherheitsfachkräfte und der Unterstützung durch Manager sowie Organisationen hinsichtlich der betrieblichen Einbindung der Sicherheitsfachkräfte aus verschiedenen Perspektiven.

Die erste Studie befasst sich mit der Frage, wie sich organisatorische und individuelle Ebenen der Einbindung von Sicherheitsfachkräfte zueinander verhalten. Daher wird die wechselseitige, kausale Beziehung zwischen dem Sicherheitsklima und der wahrgenommenen organisationalen Unterstützung der Sicherheitsfachkräfte in einer Längsschnittstudie untersucht. Die zweite Studie nutzt die Expertenbewertungen der Sicherheitsfachkräfte sowie Managerperspektiven, um den Zusammenhang zwischen Arbeitsintensivierung und Sicherheitsverhalten durch Sicherheitsklima, Sicherheitsmotivation und Sicherheitswissen auf organisationaler Ebene zu erklären. Was die Einbeziehung von Sicherheitsfachkräften betrifft, so geht diese Studie auf den Unterschied zwischen den Perspektiven der Sicherheitsfachkräfte und des Managers ein. Die dritte Studie untersucht, welche Einflusstaktiken von Sicherheitsfachkräften am erfolgreichsten sind, um Managementunterstützung zu erhalten und dadurch die eigene Leistung zu verbessern. Ein besonderes Augenmerk liegt auf der Rolle der Expertise in Form von Expertenmacht von Sicherheitsfachkräften, die mit ihren Einflussversuchen interagiert.

Insgesamt beleuchtet die vorliegende Dissertation, wie das Sicherheitsklima, die Expertise der Sicherheitsfachkräfte und ihre Unterstützung durch das Management und die Organisation zu ihrer organisatorischen Einbindung und damit zu ihrer Effektivität beitragen. Es werden Implikationen sowohl für das wissenschaftliche Wissen als auch konkret für die Arbeit und Ausbildung von Sicherheitsfachkräften diskutiert.