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Improving safety climate and behavior through a multifaceted intervention: Results from a field experiment

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ABSTRACT

Interventions aimed at increasing priority for employee safety could lead to better safety climate and safety behavior of employees. However, current studies reporting on safety climate interventions lack diversity in contexts and settings, they focus mainly on supervisors and do not take into account the implementation process of the intervention. We aim to add to the safety literature by testing the effects of a multifaceted safety climate intervention using a field experimental design. We analyzed data of 520 health care employees in five organizations and studied the effects of the implementation process. Results showed that safety climate and behavior scores were significantly higher at post-intervention among the intervention group as compared to the control group, while there were no differences pre-intervention. Results also showed that within the intervention group, employees who experienced more positive changes to work procedures and positive attitudes and actions of their supervisor towards the intervention experienced higher post-intervention safety climate and safety behavior. This study presents a new, multifaceted safety climate intervention strategy that can be useful for improving safety climate and safety behavior. It also shows the importance of the implementation process when conducting safety climate interventions.

1. Introduction

The occupational health and safety literature has identified many factors that contribute to health and safety in the workplace (Hofmann et al., 2017). One of the factors that received a lot of attention is the safety climate concept. Several studies have shown that safety climate plays an important role in workplace health and safety outcomes of employees, mainly through its influence on safety behavior (Christian et al., 2009; Clarke, 2010). Given the amount of correlational evidence regarding the relationship between safety climate and safety behavior, the number of intervention studies is surprising. Yet intervention studies are important for establishing causal relationships between safety climate and safety behavior, studying the improvement and implementation of changes in safety climate and a better collaboration between researchers and practitioners to increase our understanding of the safety climate concept in theory and practice (Kristensen, 2005).

Indeed, a handful of studies have tested the effects of an intervention on employees' perceptions of safety climate and safety outcomes such as safety behavior, safety knowledge, safety violations, and safety leadership (Zohar, 2002; Zohar and Luria, 2003; Zohar and Polachek, 2014; Nielsen, 2014; Mullen and Kelloway, 2009; Von Thiele Schwarz et al., 2016; Kines et al., 2010; Naveh and Katz-Navon, 2015). Nevertheless, these studies leave three important gaps in our knowledge on safety climate improvement.

First, the interventions in these studies were primarily focused on changing supervisory interaction with employees, which is in line with the emphasis that is placed on the pivotal role of direct supervisors in relation to safety climate (Zohar, 2002; Zohar and Luria, 2003). However, notwithstanding this importance, the influence of other safety agents such as (co)workers and senior managers has also been stressed in the safety literature (Chiaburu and Harrison, 2008; McGonagle et al., 2014; Zohar, 2014). Over the years, research has examined the multifaceted nature of the safety climate concept and proved that it references multiple levels in the organizational hierarchy (e.g. Zohar and Luria, 2005), including senior management and coworkers (Yule et al., 2006; Brondino et al., 2012). However, senior managers' priority for safety and coworkers safety norms have not (or only marginally) been included in safety climate interventions.

Second, the current safety climate intervention studies were mostly located in industrial settings (such as metal processing, construction,

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and manufacturing) with a focus on physical accidents and hazards. As the targets of safety climate perceptions are context-dependent (Zohar, 2010), these interventions may not provide the most optimal leverage points for safety climate improvement in other organizational contexts (for instance self-managing teams, emphasis on teamwork) and types of safety risks and hazards (for instance psychological health and safety risks). Since health and safety issues are relevant to a wide range of organizations and industries, it is important to investigate the effects of safety climate interventions across various settings.

The third gap is that previous safety climate intervention studies were mainly concerned with the effects of the intervention itself on safety outcomes, ignoring the implementation process of the intervention and its influence on the intervention effects. Addressing the conditions under which interventions are likely to be most effective is needed to achieve more valid evaluations of safety climate interventions (Pedersen et al., 2012; Nielsen, 2013). Authors such as Randall and colleagues (Randall et al., 2009; Randall and Nielsen, 2012) argue that including information on the implementation process could provide some protection against the threat of Type III error. That is, concluding the intervention is ineffective when it is in fact the faulty implementation that leads to failure (Dobson and Cook, 1980).

This paper aims to fill these gaps by testing the effects of a multifaceted safety climate intervention and its implementation process in the health care sector. The multifaceted safety climate intervention incorporates different safety climate agents to improve safety climate and safety behavior, including senior managers, supervisors, and employees. We must note that our safety climate intervention is not focused on patient safety climate, but on employee safety climate in health care (that is, the climate concerning health and safety of health care employees). Unless stated otherwise, the term 'safety climate' in our study thus always refers to employee safety and not to patient safety. The study is guided by two main research questions: (1) "*Does a multifaceted safety climate intervention improve safety climate and safety behavior?*" and (2) "*Under which conditions does a multifaceted safety climate intervention improve safety climate and behavior?*" To answer these questions, we conducted a field experiment with a pretest-posttest control group design among 520 employees working in five health care organizations.

1.1. Improving safety climate

Safety climate refers to the perceptions employees have of the policies, procedures and practices concerning safety within the organization (Zohar, 1980). In one of the first papers on safety climate, Zohar (1980) points to the informative function of the concept regarding the relative importance of safety versus other competing task domains (such as productivity or cost-reduction). The safety climate concept therefore reflects the priority of employee health and safety compared to other priorities within the organization (Zohar, 2008). Thus, an intervention to improve safety climate should explicitly signal to employees that workplace health and safety is a priority in the organization and that behaviors that improve this are expected. Despite the fact that many researchers follow Zohar's (1980, 2008) conceptualization of safety climate, there is not much consensus on the clarification of the concept in terms of its operationalization or dimensionality (Flin et al., 2000; Zohar and Luria, 2005). This makes it difficult to pinpoint specific intervention targets that will demonstrate the priority of health and safety over other demands. However, some common themes within the literature have emerged (Flin et al., 2000; Bronkhorst et al., 2015), which provide important leverage points that can be used to improve safety climate perceptions. We will discuss three of these common themes.

1.1.1. Senior management priority for safety

One of the key dimensions of safety climate is management commitment to safety (Flin et al., 2000). As organizations are hierarchical in structure, employees will form perceptions of management commitment at multiple organizational levels. Zohar and Luria (2005) argue that safety climate can be meaningfully constructed at the group level and at the organizational level, so as to reflect supervisors' and senior management's influence on safety. The role of senior management in establishing organizational priorities and allocating resources is one of the reasons this safety agent is generally acknowledged as the main influencer of safety climate (Flin et al., 2000; Bosak et al., 2013). By using their power over time, money and people, senior managers are able to show the relative importance of safety within the organization. However, there are only a handful of studies including senior management in their safety climate intervention. Zohar and Luria (2003) for instance include higher-level managers by providing them with summary information about safety-related interaction between supervisors and employees, and instructed them to share this information with subordinate supervisors. The intervention tested by Nielsen (2014) included the CEO in staff meetings where he informed employees about the company's safety status. Similarly, Naveh and Katz-Navon (2015) asked senior management to send a support letter to all employees backing the organization's vision about safety. In all three studies, senior management's priority for safety is demonstrated through a top-down, one-sided information exchange.

A different approach to modify senior management priority for safety has been developed in the related field of patient safety climate through so-called 'Leadership WalkRounds' or management safety rounds. These were first introduced in 1999 by the Institute for Healthcare Improvement and conceptualized by Frankel et al. (2003) as a tool to improve management commitment to safety by providing an informal method for senior managers to talk about patient safety issues with employees. In contrast to the way senior management was included in the safety climate interventions described above, leadership safety rounds provide two-way interaction between senior managers and employees. This facilitates a learning process and increases employees' participation opportunities (Luria and Morag, 2012). Empirical research has shown that leadership safety rounds have positive effects on patient safety climate and reinforces patient safety as a priority within the organization (Singer and Tucker, 2014; Thomas et al., 2005). To our knowledge, there is only one study that investigated leadership rounds for employee safety, namely Luria and Morag (2012). They examined the introduction of a 'safety management by walking around' intervention using a case study method. Although the authors did not study its effects on safety climate, their results showed that safety rounds increased and improved interaction between managers and employees about safety. Based on their experience, these authors argue that "such an intervention should highlight for employees the importance of the safety facet relative to other organizational facets" (2012: 256). Attempts to increase perceived senior management priority for safety by introducing safety rounds thus seem promising.

1.1.2. Supervisor commitment to safety

Supervisors play a pivotal role in showing employees the priority of safety, as they inform them on the kinds of behavior that are valued and supported in the workplace (Zohar, 2002). The daily interaction between employees and management is therefore considered as one of the building blocks of safety climate. Not surprisingly, most of the safety climate intervention studies are primarily focused on increasing perceptions of supervisor commitment to safety. Zohar (2002), Zohar and Luria (2003), Zohar and Polachek (2014), and Kines et al. (2010) all tested whether providing coaching and feedback information to supervisors on their daily messages improved employees' perceptions of the priority of safety. Overall, the results from these studies showed that the coaching and feedback changed the type of messages employees perceived from their supervisors (i.e. more safety-related messages), which is indicative of a modified priority for safety. In turn, this resulted in changes in safety climate and other safety outcomes such as safety behavior and safety audit levels.

Another extensively researched topic that has been linked to supervisor commitment to safety is transformational leadership (Pilbeam et al., 2016). Safety-specific transformational leadership (SSTL) is a leadership style focused on enhancing workplace safety, and is, in line with general transformational leadership, composed of idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Barling et al., 2002). Supervisors high in SSTL are expected to demonstrate high priority given to safety through their own behavior, encourage employees to reach high levels of safety, suggest new and innovative ways of reaching safety, and show concern for their employees' health and safety (Barling et al., 2002). In a study situated in a long-term health care organization, Mullen and Kelloway (2009) tested the effects of a SSTL training intervention for supervisors on safety outcomes. The results showed that the leadership training resulted in a significant increase in employee scores on perceptions of safety climate. Other experimental studies on the effects of (general) transformational leadership training confirm these findings (Barling et al., 2002; Zohar, 2002; Von Thiele Schwarz et al., 2016). In conclusion, empirical research clearly indicates that increasing perceived supervisor commitment to safety through coaching, feedback or SSTL training results in overall safety climate improvement.

1.1.3. Group norms and group behavior in relation to safety

Finally, research has shown that employees do not only take cues from supervisors and senior managers with regard to workplace health and safety, but also from their coworkers (Jimmieson et al., 2016). Employees in organizations generally consider themselves as members of groups. The norms developed by these groups contribute to the safety climate perceptions of employees belonging to these groups, and consequently influence their behavior (Fogarty and Shaw, 2010). In their study on perceived safety norms, Fugas et al. (2011) showed that employees' perceptions of coworkers' descriptive safety norms directly influenced their safety behavior, whereas supervisor safety norms did not. They conclude that interventions should explicitly consider the role of coworkers as a source of normative influence. In line with this, Meliá et al. (2008) identified coworkers as a safety agent as important as senior managers and supervisors.

Considering the influence of coworkers as safety agents, Brondino et al. (2012) argued that safety climate interventions should target teams and workgroups to strengthen group norms for safety. Among other things, they suggest the introduction of short safety meetings to discuss safety issues and propose ways to improve safety (Brondino et al., 2012: 1854). A safety intervention tested by Kines et al. (2013) provides an example of this. The authors introduced safety meetings (between employees and led by managers) aimed at increasing "participants' dialogue and ownership of dealing with current safety issues through identifying and discussing safety perceptions, attitudes, what works well (why and how), and what needs improvement" (2013: 94). Unfortunately, Kines et al. did not measure the effects of the intervention on employees' perceptions of safety climate. However, considering the opportunities these types of safety meetings provide to discuss and improve group norms and behavior (and thereby establishing a priority for safety among employees), they might contribute to safety climate improvement.

1.2. A multifaceted approach to safety climate improvement

Given the several leverage points outlined above, a multifaceted intervention approach appears to be the optimal choice to improve safety climate. As Zohar and Luria (2003: 20–21) argue: "the organizational context must be better integrated in intervention programs, taking into consideration that changes taking place at any hierarchical level must be supported by concomitant change at other levels [..]". This suggests that interventions aimed at increasing supervisor commitment to safety should be complemented by interventions that involve senior management and (co)workers. Two examples of this are the studies by Kines et al. (2013) and Nielsen (2014). In their study, Kines et al. (2013) tested the effects on safety perceptions of several intervention activities taking place at different organizational levels (informal safety meetings between workers and management safety coaching). Qualitative findings from interviews with managers and employees indicated that the intervention activities improved attitudes towards safety, and showed signs of safety culture change. Nielsen (2014) also reported the results of an intervention program consisting of activities involving different stakeholders (e.g. safety information provided by CEO, safety staff meetings and safety themed workshops for safety representatives). The results showed significant, positive changes in safety climate perceptions at post-intervention, indicating that using different leverage points to modify employee perceptions is a successful strategy to improve safety climate. Moreover, in a comparison of successful and unsuccessful safety culture interventions, Hale et al. (2010) found that involving all employees across organizational levels (i.e. introducing a multifaceted intervention) in an environment where safety issues are openly discussed is a distinguishing factor. Considering the overlap between safety culture and safety climate, this may also be the case for safety climate interventions.

Following these approaches to safety climate improvement, we developed a multifaceted safety climate intervention program that aims to modify employees' safety climate perceptions through the improvement of employee perceptions of senior management priority, supervisor commitment, and group norms and behavior in relation to health and safety (see Methods section and Appendix A). As the main goal of our intervention program is to improve safety climate perceptions, we first need to examine its effect on safety climate. Hypothesis 1 is as follows:

H1. Compared to a control group of employees, employees who are subject to the multifaceted safety climate intervention will report higher levels of safety climate at post-intervention.

1.3. The effect of safety climate improvement on safety behavior

The main premise of safety climate perceptions is that they inform employees of the priority of safety in the workplace (Zohar, 2010). The relative importance of employee health and safety versus other organizational goals (most often productivity) shows the extent to which safety compliant or enhancing behavior is supported and rewarded at the workplace. In their model of safety behavior, Griffin and Neal (2000) make a distinction between two types of behavior: safety compliance and safety participation. Safety compliance describes the core activities that need to be carried out by employees to ensure safety rules and regulations are followed (in health care this for instance includes using patient-lifting devices or adhering to incident reporting procedures). Safety participation refers to behaviors that do not directly contribute to an individual's personal safety, but which do help to develop an environment that supports safety (for instance helping others with patient-handling or voluntarily attending safety meetings). Based on expectancy-valence theory (Vroom, 1964), the safety climate literature states that workers will be motivated to show safety compliant or participative behavior if they believe that these behaviors will lead to valued outcomes (Zohar, 2008). As our multifaceted safety climate intervention includes activities that place emphasis on the importance and value of safety in several ways, the relative priority of this subject will –presumably- increase. As a result, employees will perceive that behaving healthy and safely during work time is valued by the organization. We therefore expect that, in addition to its effect on safety climate, the safety intervention program will also improve safety behavior among the intervention teams.

H2. Compared to a control group of employees, employees who are subject to the multifaceted safety climate intervention program will report higher levels of safety behavior at post-intervention.

1.4. The effect of the safety climate implementation process

The study of interventions in organizational settings is inherently difficult and complex (Biron and Karanika-Murray, 2014). In contrast to experiments taking place under controlled circumstances, organizational intervention studies are conducted in a natural setting where many factors are not under the researchers' control. Participants may not use materials, resources or procedures recommended by the researchers, or they may not use it as planned (Murta et al., 2007). To truly determine whether an intervention has had the desired impact on the outcomes under study, it is therefore crucial to understand the implementation process by which the intervention is delivered (Egan et al., 2009). This also applies to safety climate intervention studies, where the success of activities aimed at changing employees' perceptions of the priority for safety also depends on, for example, motivation of managers to introduce changes and the possibilities for learning within the organization (Hale et al., 2010).

Several researchers have outlined how different characteristics of the implementation process and the intervention context may influence the impact of a health and safety intervention. These for instance include employee involvement in the planning and content of the intervention, readiness for change, and employee mental models (Nielsen and Randall, 2013; Nielsen et al., 2015; Biron and Karanika-Murray, 2014). In this study we focus on two aspects of the implementation process: changes made to procedures as a consequence of the intervention, and supervisors' attitudes and actions towards the intervention.

The importance of employee participation in organizational interventions is widely known. However, some scholars state that, especially in the case of health and safety interventions, overall exposure to intervention activities alone does not result in positive intervention outcomes. They argue that the perceptions of employees of the impact of the intervention on changes in their work situation might be more important (Hasson et al., 2014; Randall et al., 2009). Hasson et al. (2014) for examples showed that employees who reported that the intervention activities had a positive impact on their work showed significantly more improvements in the outcomes as compared to those who perceived no or a negative impact. In a study that evaluated the process of teamwork implementation, Nielsen and Randall (2012) found that in order to be successful, the intervention had to involve changes to work procedures. Thus, interventions are more effective when employees experience that they bring about changes in their daily work. This implies that, regardless of the content of the intervention, the success of an intervention depends upon the extent to which it gives rise to actual changes to daily work practices and procedures (Nielsen and Abildgaard, 2013). Following this line of reasoning, our multifaceted safety climate intervention will improve safety climate and –behavior more effectively, if employees report that the intervention activities actually changed work procedures.

H3. The extent to which employees report changes in work procedures brought about by the safety climate intervention will be positively related to safety climate and safety behavior at post-intervention.

Another important aspect of the implementation process is the role that supervisors play in shaping interventions. The social interaction between supervisors and their employees determines the impact of an intervention, as supervisors influence the way their employees perceive an intervention and whether or not they decide to participate in the intervention activities. This makes supervisors powerful actors in the implementation process: they can either 'make or break' an intervention (Nielsen, 2017). Randall et al. (2005) for instance found that supervisors actively resisted the implementation of changes by not communicating the intervention to their employees. A few years later, Randall et al. (2009) tested the effect of supervisors' attitudes and actions towards a team working intervention and found that the positive outcomes of the intervention were mainly driven by the attitudes and behavior of the supervisor, which involved positive communication about the intervention, active involvement of employees, and sharing information. Apparently, the more positive the values, attitudes and behaviors of the supervisor towards the intervention are, the greater the likelihood that employees will actively engage in the intervention themselves (Nielsen, 2013). Given the fact that, in most cases, supervisors are responsible for day-to-day intervention implementation (Kompier et al., 2000), their influence on intervention outcomes should not be underestimated. The supervisor plays an important role in our multifaceted safety climate intervention, not only because they are the ones to show an increase in commitment to safety, but also because they influence employees' choice to participate in intervention activities aimed at increasing senior management priority for safety and group norms and behavior. We therefore expect that the effectiveness of our multifaceted safety climate intervention is related to supervisors' attitudes and actions towards the intervention.

H4. The extent to which employees report that their supervisor shows positive attitudes and actions towards the safety climate intervention will be positively related to safety climate and safety behavior at post-intervention.

2. Methods

2.1. Design and participants

The study was conducted in five Dutch health care organizations: two organizations providing care for disabled people, one organization providing mental health care, one home health care organization and one hospital. The project was designed as a quasi-experimental field study with pre-intervention (T1) and post-intervention (T2) measurements and comparison groups (intervention- versus control group). The ethics committee of the Erasmus School for Social and Behavioural Sciences declared that the methods of data collection and data analyses were in line with all ethical norms and values for this type of research. The study was pre-registered in the Dutch Trial Register with number NTR5391.[1]

Entire teams of employees were selected to participate in the study either as a control or intervention team to prevent contamination of the control group resulting from an exchange of information between control- and intervention employees working closely together in the same team (Cook and Campbell, 1979). Four out of five organizations agreed with random assignment of teams to control- or intervention group. In one organization, supervisors were asked whether they were interested to let their employees participate in a health and safety intervention. Although the employees in this organization were not randomly assigned, we did not find any significant differences between employees participating in the control or intervention group in pre-intervention safety climate and safety behavior scores, nor did we find significant differences in work- and background characteristics (see also Results section).

[1] In this article, we present the results directly after the intervention (post-intervention, shown as T1 in the register). In line with good practices for pre-registration and promoting an open research culture (Nosek et al., 2015), we indicate which reported outcomes were in line with the pre-registration and which were not. The primary outcome was improvement of safety climate scores directly post-intervention. This is in line with the pre-registration. A secondary outcome was that we also expected improvement of safety knowledge score at post-intervention. However, we did not find these results for safety knowledge ($F(1, 513) = 0.01$, $p > .05$) and for safety motivation ($F(1, 513) = 0.20$, $p > .05$). Another secondary outcome was the intervention effect on safety behavior. We expected this result to be present only at the first follow-up measurement six months after post-intervention (so not directly post-intervention). As we already saw results directly post-intervention, we decided to report them here. Lastly, we did not hypothesize the impact of the implementation process in the pre-registration (hypotheses 3 and 4 in this study). We decided to include these effects due to enhanced insights we gained during the intervention.

A total of 1323 employees working in 91 teams participated in the study, of which 45 teams (630 employees and 37 supervisors) were assigned to the control group and 46 teams (693 employees and 37 supervisors) to the intervention group. All employees in both groups were invited to complete an online survey during a five-week period before the start of the intervention program, which lasted for six months. They were asked to fill in another online survey directly after the program finished. All 1323 employees were invited for pre- and post-intervention surveys. In the end, we were able to match 520 employees who completed both pre- and post-intervention surveys (39.3% response rate). From these 520 employees, 258 employees belonged to the intervention group and 262 employees belonged to the control group.

All participating teams consisted of employees providing direct care to patients or clients, which resulted in the exclusion of administrative, technical or supporting teams. Supervisors assigned to the intervention group could not supervise an intervention team and a control team simultaneously. Employees in the control group did not participate in the intervention program and carried out their work as usual. To prevent that employees and supervisors in the control group became aware of their control group status, all communication about the intervention program was exclusively directed at employees and supervisors assigned to the intervention group.

2.2. The safety climate intervention

Based on safety climate literature we developed a six-month intervention program that consisted of three activities that intervened through the three leverage points outlined above. The interventions included (1) the introduction of senior management safety rounds, (2) safety-leadership (SSTL) training for supervisors, and (3) the use of an online discussion platform for team members ('Synmind') to give their opinion on health and safety issues followed by regular team-meetings to discuss the online results. The intervention phase lasted for six months and was composed of three consecutive rounds with different themes, each lasting two months. In each round, the three intervention activities were carried out. To help plan and monitor the intervention activities, a local project manager was appointed at each of the participating organizations. An overview of the safety climate intervention activities, rounds and themes is presented in Fig. 1. A survey was administered to all employees in the intervention- and control group before and directly after the intervention. For a detailed description of each intervention activity see Appendix A.

2.3. Measures

All items were translated to Dutch and tested in a pilot group of five health care employees. Feedback was given on the terms used, wording and relevance of the items for their daily work tasks. All items were measured on a five-point Likert scale, ranging from a low score of 1 (strongly disagree) to a high score of 5 (strongly agree). Appendix B shows an overview of the items used for each measure.

2.3.1. Safety climate

Safety climate was measured at pre- and post-intervention (T1 and T2) among all employees in the intervention- and control group using an adapted version of the PSC-12 four-factor scale originally developed by Hale et al. (2010) to measure psychosocial safety climate. Two previous studies added a fifth factor to address another important employee safety climate dimension: group norms and behavior concerning employee health and safety (based on coworker safety items developed by Brondino et al., 2012). These two studies showed good internal validity and reliability (Bronkhorst et al., 2015; Bronkhorst and Vermeeren, 2016). Although the scale was originally developed to measure a specific form of safety climate (psychosocial safety climate), we chose to slightly adapt it so we could use it for our wider conceptualization of safety climate including both physical and psychosocial health and safety among employees. For example, words and phrases that refer to 'psychological health' were substituted by 'health and safety' and 'the prevention of stress' was replaced by 'the prevention of health and safety issues'. Cronbach's alpha values for all five subscales were acceptable at both T1 and T2 (ranging from 0.80 to 0.90).

2.3.2. Safety behavior

A six-item scale developed by Neal and Griffin (2006) was used to measure safety behavior in the workplace at pre- and post-intervention (T1 and T2) among all employees in the intervention- and control group. This scale is composed of two factors: safety compliance and safety participation. Each factor was measured by three items. Internal consistency for both subscales was adequate with Cronbach's alpha values of 0.76 and 0.82.

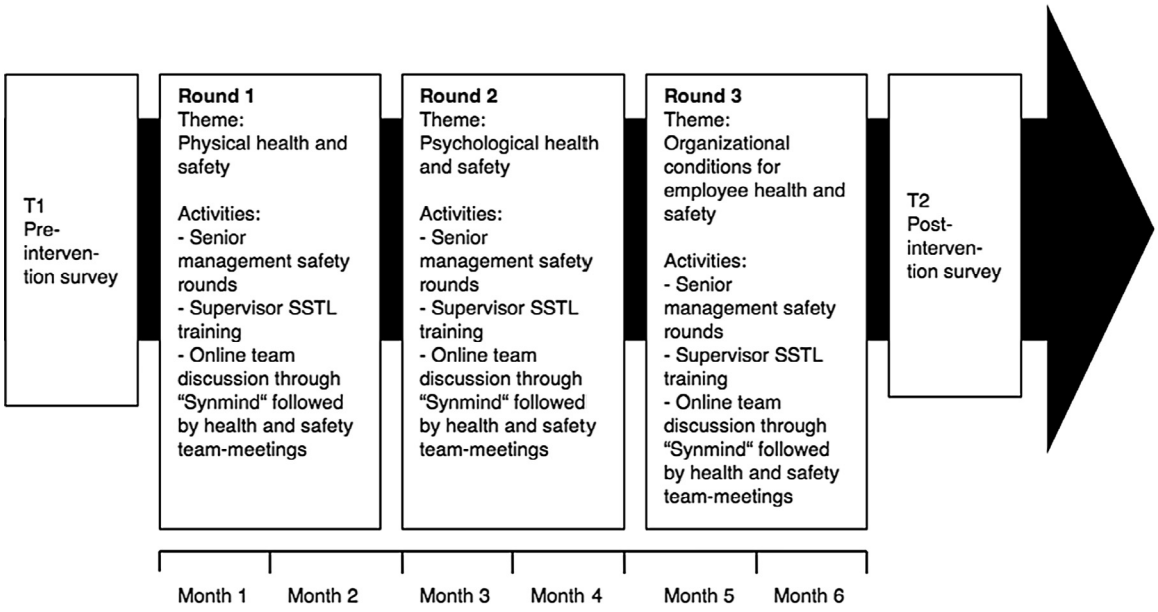

Fig. 1. Overview of the safety climate intervention program.

2.3.3. Changes to procedures

To measure the extent to which the intervention program brought about positive changes in the day-to-day work of employees, we used a five-item scale based on the 'exposure to intended intervention' scale developed Randall et al. (2009). This variable was measured at post-intervention (T2) among intervention group employees only as it concerns a variable on the implementation of the intervention.

2.3.4. Supervisor attitudes and actions

This was measured using five items from the scale developed by Randall et al. (2009). This variable was – like changes to procedures – measured at post-intervention (T2) among intervention group employees only as it concerns a variable on the implementation of the intervention.

2.3.5. Control variables

Five work- and background characteristics were added as control variables: age, gender, organizational tenure, contract hours and educational level. These variables were measured at pre-intervention among all employees in the intervention- and control group.

2.4. Statistical analyses

As safety climate is theoretically considered a group- or organizational level variable (Zohar, 2010), we tested whether aggregation to the team level was appropriate for our data. Inter-rated agreement and reliability measures ($r_{WG(J)}$ and ICC(1,2)) indicated that it was not meaningful to aggregate safety climate perceptions and perform multilevel analyses. Therefore, this study uses individual perceptions of safety climate, commonly referred to as psychological climate (Christian et al., 2009; Clarke, 2010).

To test hypotheses 1 and 2 concerning the effect of the intervention program on safety climate and -behavior we conducted repeated measures multivariate and univariate analyses of covariance (RM MANCOVA and RM ANCOVA) with time (T1 and T2) as a within-person factor and group (control group vs. intervention group) as a between-person factor. Age, gender, organizational tenure, contract hours and educational level were added as covariates.

Next, to test the whether there is a relationship between the implementation process and safety climate and safety behavior at post-intervention (hypotheses 3 and 4), we performed OLS regression analyses with post-intervention measures as the dependent variables and implementation process variables as independent variables, controlling for work- and background characteristics and pre-intervention measures.

3. Results

3.1. Descriptive statistics and preliminary analyses

Table 1 shows the descriptive statistics and correlations for the study variables. We tested the key assumptions before we conducted the analyses to test our hypotheses: the assumption of normality of error terms, homogeneity of variances and regression slopes, and the independence of the independent variable and covariate. All assumptions were met. Independent *t*-tests were conducted to examine whether there were significant differences in work- and background characteristics such as age, gender, organizational tenure, contract hours, or educational level between the two intervention conditions. There were no significant differences in work- and background characteristics between employees assigned to the control- and intervention group.

3.2. Intervention effects on safety climate and safety behavior

The results of the RM (M)ANCOVA's testing the effects of the intervention on safety outcomes are presented in Table 2. Hypothesis 1 predicted that the intervention program would have a positive effect on levels of safety climate for the intervention group compared to the control group. Because the activities that comprise our safety climate intervention are focused on the different dimensions of safety climate, we tested the effect of the intervention program on both the composite safety climate score and the individual safety climate dimension scores. The 2 (time) × 2 (group) MANCOVA of the five safety climate dimensions indicated that there was no significant group effect ($F(5, 509) = 1.95$, ns) or time effect ($F(5, 509) = 0.59$, ns). Yet, there was a significant group × time interaction effect ($F(5, 509) = 4.46$, $p < .01$, *partial* $\eta^2 = 0.04$), showing that the changes in safety climate were different for the two groups. RM ANCOVA's for each safety climate dimension followed up the multivariate results.

The follow up tests revealed significant group × time interactions for the following safety climate dimensions: senior management priority ($F(1, 513) = 8.95$, $p < .01$, *partial* $\eta^2 = 0.02$), group norms ($F(1, 513) = 12.03$, $p < .01$, *partial* $\eta^2 = 0.02$), and communication ($F(1, 513) = 6.51$, $p < .05$, *partial* $\eta^2 = 0.01$), but no significant interaction for the supervisor commitment ($F(1, 513) = 1.12$, ns) and participation ($F(1, 513) = 0.28$, ns) dimensions. The mean scores presented in Table 2 and the interaction plot in Fig. 2 show that the significant interactions for senior management priority, group norms, and communication were due to the control group decreasing from pre-test to post-test scores whilst the intervention group increased from pre-test to post-test. The composite safety climate pre-test and post-test scores show the same pattern with a significant group × time interaction ($F(1, 513) = 8.08$, $p < .01$, *partial* $\eta^2 = 0.02$). Hypothesis 1 is therefore supported by the data.

The results from the 2 (time) × 2 (group) MANCOVA for the safety behavior dimensions showed that there was no main group effect ($F(2, 512) = 2.17$, ns) or time effect ($F(2, 512) = 0.00$, ns), but there was a significant group × time interaction effect ($F(2, 512) = 4.29$, $p < .05$, *partial* $\eta^2 = 0.02$). The univariate analyses that proceeded indicated that this significant interaction was mainly due to the intervention group changing significantly different from the control group when it comes to safety participation ($F(1, 513) = 8.47$, $p < .01$, *partial* $\eta^2 = 0.02$). The changes for the safety compliance dimension were not significantly different for both groups ($F(1, 513) = 1.11$, ns). The composite safety behavior variable also showed a significant group × time interaction effect ($F(1, 513) = 5.36$, $p < .05$, *partial* $\eta^2 = 0.01$). The mean scores in Table 2 and the interaction plot in Fig. 2 show that the significant interactions are due to a decrease in safety behavior scores in the control group and an increase in scores in the intervention group. These findings confirm Hypothesis 2.

3.3. Implementation process effects

Hypotheses 3 and 4 stated that characteristics of the implementation process (that is changes in work procedures brought about by the intervention and supervisor attitudes and actions towards the intervention) are related to post-intervention measures of safety climate and safety behavior. The results are presented in Table 3. The analyses showed that both implementation process variables were significantly associated with post-intervention levels of safety climate, controlled for pre-intervention safety climate levels. When we look at the standardized estimates, we find that the supervisor attitudes variable ($\beta = 0.34$, $p < .01$) has a stronger association with post-intervention safety climate than the changes in procedures variable ($\beta = 0.12$, $p < .05$). For safety behavior, we also found that both implementation process variables were significantly related to the post-intervention measurement. Here we see that, in contrast to safety climate, the changes to procedures variable ($\beta = 0.15$, $p < .05$) has a slightly stronger association with post-intervention safety behavior than supervisor attitudes and actions towards the intervention ($\beta = 0.13$, $p < .05$). Hypotheses 3 and 4 are thus supported by the data.

Table 1
Means, standard deviations and correlations for the study variables.

	Control group Mean (S.D.)	Intervention group Mean (S.D.)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Safety outcomes												
1. Safety climate (T1)	3.36 (0.59)	3.41 (0.59)	(0.93)									
2. Safety climate (T2)	3.28 (0.63)	3.46 (0.50)	0.52**	(0.93)								
3. Safety behavior (T1)	3.29 (0.61)	3.30 (0.63)	0.45**	0.26**	(0.81)							
4. Safety behavior (T2)	3.22 (0.57)	3.36 (0.55)	0.30**	0.46**	0.42**	(0.82)						
Implementation process												
5. Changes to procedures	–	2.82 (0.66)	0.30**	0.42**	0.21**	0.31**	(0.85)					
6. Supervisor attitudes and actions	–	3.23 (0.72)	0.25**	0.50**	0.11	0.24**	0.54**	(0.90)				
Control variables												
7. Gender (1 = female)	0.85 (0.36)	0.83 (0.37)	0.07	0.10*	0.04	−0.02	0.02	0.04	–			
8. Age	44.7 (11.1)	45.7 (11.6)	0.09*	−0.04	0.12**	0.17**	−0.04	−0.12	−0.09*	–		
9. Organizational tenure	4.39 (1.64)	4.34 (1.62)	0.03	−0.01	0.07	0.13**	−0.02	−0.05	0.03	0.51**	–	
10. Contract hours	3.38 (0.59)	3.35 (0.60)	−0.12**	−0.05	0.01	0.05	−0.02	−0.01	−0.26**	−0.06	0.02	–
11. Educational level	4.26 (0.87)	4.21 (0.80)	−0.07	−0.10*	−0.10*	−0.13**	−0.05	0.02	−0.07	−0.19**	−0.02	0.16**

N (variables 1–4, 7–11) = 520 (intervention group (*N* = 258), control group (*N* = 262)).
N (variables 5 and 6) = 258 (intervention group only).
Cronbach's Alpha values are presented on the diagonal.
* $p < .05$.
** $p < .01$.

4. Conclusions and discussion

4.1. Discussion

The current study was guided by two main research questions. The first research question concerned the effectiveness of a multifaceted safety climate intervention for employees' safety climate perceptions and their safety behavior. The data revealed that our intervention including senior management safety rounds, SSTL training of supervisors, and team discussions about employee health and safety significantly improved composite safety climate and safety behavior. Looking at the effects of the intervention on the safety climate dimensions separately, we found significant positive effects for senior management priority, group norms, and communication. Although the SSTL training was specifically aimed at increasing supervisor commitment to safety, we did not find statistically significant improvements for this dimension. One possible explanation for not finding this effect could be that the time lag for evaluation of the intervention was too short to observe SSTL training effects. Donohoe and Kelloway (2014: 216) suggest "three months may be the minimum time frame required for changes in leadership to be implemented consistently, recognized by employees as a change, and to trickle down to affect employee attitudes and behaviors". Since the post-intervention survey was timed only two months after last SSTL training in the third intervention round, the effects might not have been fully achieved. For safety behavior, we found that the intervention significantly improved the safety participation dimension, but the effects on the safety compliance dimension were non-significant. Although this is not in line with previous research indicating that safety climate is linked to safety compliance, a meta-analysis by Clarke (2006) demonstrated that a stronger relationship exists between safety climate and safety participation. That our intervention did not significantly improve safety compliance might be explained by the fact that the three activities that comprised our safety climate intervention primarily contributed to establishing a safety-supportive environment (a safety goal for safety participation; Griffin and Hu, 2013). The safety goal for safety compliance is to ensure employees work in a manner that adheres to organization-specific safety rules and regulations (Griffin and Hu, 2013). As the safety rules and regulations differ considerably between organizations and even between teams, we decided not to focus on the compliance of specific rules and regulations. Future safety climate intervention studies could incorporate safety compliance as a theme to discuss in team safety meetings or in senior management safety rounds.

Instead of modifying safety climate perceptions by using a single leverage point (Zohar, 2002; Zohar and Luria, 2003; Zohar and Polachek, 2014), our field experiment showed that a multifaceted

Table 2
Repeated measures (M)ANCOVA results of the effect of the safety climate intervention on differences in safety climate and safety behavior between control and intervention groups.

	Control group		Intervention group		Group	Time	Group × Time interaction	
	T1 Mean (S.D.)	T2 Mean (S.D.)	T1 Mean (S.D.)	T2 Mean (S.D.)	*F (df)*	*F (df)*	*F (df)*	Partial η^2
Safety climate	**3.36 (0.59)**	**3.28 (0.63)**	**3.41 (0.59)**	**3.46 (0.50)**	**1.95 (5, 509)**	**0.59 (5, 509)**	**4.46** ** **(5, 509)**	**0.04**
Senior management priority	3.13 (0.81)	3.05 (0.83)	3.16 (0.77)	3.28 (0.69)	4.60* (1, 513)	0.01 (1, 513)	8.95** (1, 513)	0.02
Supervisor commitment	3.69 (0.80)	3.56 (0.82)	3.78 (0.72)	3.71 (0.69)	4.72* (1, 153)	0.52 (1, 513)	1.12 (1, 513)	0.00
Group norms and -behavior	3.59 (0.63)	3.49 (0.74)	3.61 (0.70)	3.73 (0.59)	7.27** (1, 153)	0.01 (1, 513)	12.03** (1, 513)	0.02
Communication	3.26 (0.71)	3.18 (0.75)	3.28 (74)	3.35 (0.65)	2.77 (1, 153)	1.56 (1, 513)	6.51* (1, 513)	0.01
Participation	3.12 (0.71)	3.10 (0.72)	3.22 (0.73)	3.23 (0.62)	4.70* (1, 153)	0.02 (1, 513)	0.28 (1, 513)	0.00
Safety behavior	**3.29 (0.61)**	**3.22 (0.57)**	**3.30 (0.63)**	**3.36 (0.55)**	**2.17 (2, 512)**	**0.00 (2, 512)**	**4.29* (2, 512)**	**0.02**
Safety compliance	3.34 (0.68)	3.27 (0.67)	3.42 (0.75)	3.41 (61)	4.27* (1, 513)	0.00 (1, 513)	1.11 (1, 513)	0.00
Safety participation	3.23 (0.73)	3.17 (0.73)	3.18 (0.71)	3.31 (0.66)	0.66 (1. 153)	0.00 (1, 513)	8.47** (1, 513)	0.02

Note: all results are controlled for the influence of differences in age, gender, organizational tenure, contract hours, and educational level.
N = 520 (intervention group (*N* = 258), control group (*N* = 262)).
* $p < .05$.
** $p < .01$.

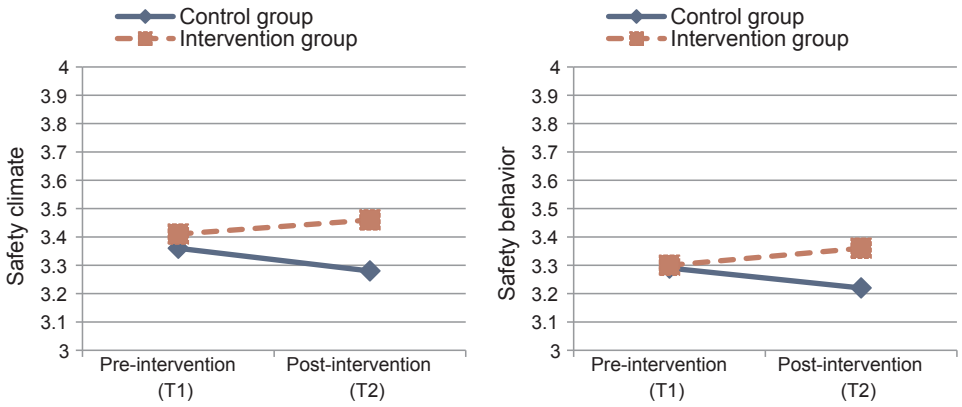

Fig. 2. Plots of the intervention effect (interaction between group and time) on (a) safety climate and (b) safety behavior.

Table 3
OLS regression results of the relationship between the implementation process and post-intervention measures of safety climate and safety behavior.

	Safety climate T2		Safety behavior T2	
	Model 1	Model 2	Model 1	Model 2
Pre-intervention variables				
Safety climate T1	0.53**	0.41**		
Safety behavior T1			0.45**	0.40**
Control variables				
Age	−0.03	0.03	0.06	0.09
Gender (1 = female)	0.07	0.06	−0.03	−0.04
Organizational tenure	−0.04	−0.04	0.02	0.02
Contract hours	0.00	−0.01	0.11	0.11*
Educational level	−0.03	−0.03	−0.11	−0.10
Implementation process variables				
Changes to procedures		0.12*		0.15*
Supervisor attitudes and actions		0.34**		0.13*
ΔR^2		0.15		0.06
F for ΔR^2		34.00**		10.64**
Overall adjusted R^2	0.27	0.43	0.23	0.28

Note: Standardized coefficients (β) are shown.
Assumptions of OLS regression were met.
$N = 258$ (intervention group only).
* $p < .05$.
** $p < .01$.

intervention strategy targeting different levels can be effective. This result is especially important in sectors with a growing interest in self-managing teams, such as the health care and service sector (Van Mierlo et al., 2005). In particular in health care, the shift towards self-managing teams and the professionalization of the nursing profession has emphasized employee autonomy and reduced the authority and responsibilities of the manager (Wynd, 2003). This increases the influence that coworkers have on climate perceptions and behavior. A recent study on hand hygiene climate among nurses by Jimmieson et al. (2016) for instance demonstrated that the perceptions of daily practices of other nurses were more salient cues for shaping behavior than cues from managers or the hospital in general. Interventions based on daily interactions between managers and employees are therefore not as effective in contexts where managers' visibility is low (Luria et al., 2008). This makes the evidence provided by our study on the effectiveness of a multifaceted intervention including group norms and –behavior particularly relevant.

The second research question concerned the conditions under which a multifaceted intervention improves safety climate and –behavior. Our results indicated that two aspects of the implementation process play a role: the extent to which the intervention brought about positive changes to procedures and the extent to which supervisors showed positive attitudes and actions towards the intervention. Besides the main effect of the safety climate intervention itself, our study revealed that the variability in the implementation process was linked to variability in safety outcomes. More specifically, we found that the intervention was more effective for employees in the intervention group that scored higher on perceived changes to procedures and supervisor attitudes and actions. Although we have not fallen prey to a Type III error – concluding the intervention is ineffective when it is in fact the faulty implementation that leads to failure –we have shown that it is important for organizations to take the implementation process seriously. For an intervention to have its most optimal effect on safety climate, attention needs to be paid to the actions and attitudes of supervisors responsible for the implementation. This conclusion is in line with previous research on the importance of the supervisor in intervention implementation (Randall et al., 2009; Nielsen, 2013). For the most effective change in safety behavior, however, the safety climate intervention also needs to result in actual changes to daily practices and procedures that influence employee health and safety. In other words: espoused values must becoming enacted values (Zohar, 2010), or espoused theory becoming theory-in-use (Argyris, 1995; Nielsen and Randall, 2012) in order for a safety climate intervention to optimally improve the safety behavior of employees. We would therefore recommend that future studies take these aspects of the implementation process into account, both in the design and evaluation of safety climate interventions.

4.2. Strengths and limitations

A key methodological strength of this study is that it used a field experimental design – with pretest-posttest design and comparison groups– to study the effects of an intervention. Given the dominance of correlational studies in safety climate research and the paucity of field experimental studies (Zohar, 2014), this can be seen as a useful addition to the literature. However, this study also has a number of weaknesses. Four are in our opinion particularly important.

First, we were unable to make a distinction between the effects of different intervention activities. It would have been valuable to study which of the three types of activities had the largest effect. On the one hand, combining interventions can be useful for practitioners as multiple elements carry higher promise to influence safety climate and behavior. On the other hand, combined intervention strategies make it very difficult to disentangle individual effects (Wassell, 2009:1054). Future studies could try to develop intervention studies using various treatment arms to disentangle individual effects and fruitful combinations.

A second limitation deals with demand effects. Demand effects arise when respondents think they know what the study is looking for and are behaving differently as a result. However, it is unclear whether they would behave in line or against hypotheses (Zizzo, 2010). In the most harmful case, demand effects could result in higher safety climate and

behavior scores in the treatment group which would have been absent if there were no demand effects. However, this is not to be expected, given that we did not find effects on every dimension of the safety climate construct. Moreover, we aimed to reduce demand effects by limiting information on the specific goal and hypotheses of the study and by not being present during the time that participants filled in the survey. However, future studies could try to further diminish such effects by for instance using multisource data (Zohar and Polachek, 2014; Von Thiele Schwarz et al., 2016), adding intervention arms with placebo treatments or using 'filler' activities (Mullen and Kelloway, 2009).

A third limitation considers a possible bias that may have played a role in the lower safety climate scores among employees in the control group. As safety climate is based on perceptions of employees (Zohar, 2010), it could be the case that the administration of surveys without the implementation of any other related activities or changes in the workplace in the control group, may have triggered the unintended perception that employee safety is only regarded as paperwork in the organization (a 'paper exercise', see Goh and Goh, 2016). This bias could possibly provide an explanation for the lower scores on safety climate at post-intervention among the control group employees.

A fourth limitation is that we did not collect qualitative data on the intervention process. In recent years, several researchers have argued that in order to truly understand how, why and under which conditions an intervention works, the study of organizational interventions should employ a mixed method design (Nielsen, 2013; Nielsen and Abildgaard, 2013; Pedersen et al., 2012; Abildgaard et al., 2016). The relevance of collecting qualitative process data lies in its ability to provide a rich, and detailed understanding of the context and mechanisms that influence intervention effectiveness (Abildgaard et al., 2016). By only including aspects measured in the quantitative surveys, there is a risk we may have missed nuanced and complex factors in the organization that also affected the results of our safety climate intervention.

4.3. Conclusions

In conclusion, this study aimed to add to the safety climate literature by developing and testing the effects of a multifaceted safety climate intervention on the climate concerning employee safety and employee safety behavior. The intervention included (1) senior management safety rounds, (2) SSTL leadership training of supervisors, and (3) an online platform for team members to discuss safety issues followed by team-meetings. The results showed that our multifaceted strategy to safety climate improvement resulted in improved safety climate and safety behavior scores for the intervention group compared to the control group. Moreover, the study also revealed that the implementation process should not be overlooked. Activities undertaken to improve safety climate and –behavior are more successful when supervisors show positive actions and attitudes towards the intervention and changes are made to daily procedures relevant to employee health and safety. Based on these results, we can conclude that a multifaceted intervention including attention for its implementation is a useful strategy for safety climate and -behavior improvement.

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Appendix A

A.1. Multifaceted safety climate intervention activities

The safety climate intervention consisted of three activities that were repeated during three rounds with different themes. The first theme was physical health and safety in the workplace. Considering the work and daily tasks of long-term care employees, topics such as physical workload, quantitative work pressure and the use of lifting equipment were discussed. The theme for the second round was psychosocial health and safety. Example topics that were discussed here are qualitative work pressure, work-life balance, aggression and violence from clients, gossiping and interpersonal conflicts. The final round was themed organizational conditions for workplace health and safety. Topics such as the relationship between employee safety and client safety, legal and financial issues relating to safety, and the role of management could be discussed here. We made a protocol for each program activity, which was send to the organization's project manager.

A.1.1. Intervention activity 1: Senior management safety rounds

As part of our safety climate intervention, we introduced senior management safety rounds in each of the organizations to improve employee safety climate through an increase in senior management priority for health and safety as perceived by employees. These safety rounds took the form of bi-monthly meetings between senior managers and employees assigned to the intervention group. During these meetings, employees were encouraged to have an informal conversation with senior managers about health and safety issues. The senior managers that participated in the safety rounds consisted of members of the board or senior line managers. At each organization, the project manager organized the safety rounds, made notes during the rounds and provided support to the senior managers. Safety rounds lasted for about 30–60 min and were conducted in the care setting of the employees. From each intervention team, one to three employees were asked to participate in the meeting. Employees prepared for these meetings by asking other team members (who were not able to join the meeting) which topics they should discuss with senior management. The project managers made notes of the meetings and send these to all members of the team afterwards.

A.1.2. Intervention activity 2: SSTL training for supervisors

Supervisors in the intervention group participated in three half-day sessions aimed at improving their transformational leadership skills in relation to workplace health and safety. The sessions lasted for three hours and were led by professional team coaches familiar with the theory of SSTL. Each session started with a short theoretical discussion of the four dimensions of transformational leadership (inspirational motivation, idealized influence, intellectual stimulation and individualized consideration) followed by roleplaying exercises to practice with communication skills and implementing behaviors consistent with these dimensions. The team coaches asked the supervisors to use their new communication skills and techniques during the safety team-meetings (see intervention activity 3).

A.1.3. Intervention activity 3: Online team discussion through 'Synmind' followed by health and safety team-meetings

The third intervention program activity comprised two sub-activities both aimed at reaching consensus on group norms and group behavior concerning health and safety among employees working together. All intervention team members were invited to participate in an online discussion through the 'Synmind' platform. Synmind is a digital communication platform where health and safety norms can be scored and discussed online. For each round, we programmed six statements that employees scored and discussed. The full list of statements is shown in the table below. Anonymity during the online discussion was guaranteed by the exclusion of participants' names. Employees had two weeks to respond to the statements. After the online discussion period, the results were sent to the supervisors in order for them to prepare the second sub-activity: a face-to-face team meeting during which the entire team discusses the outcome of the online discussion. These meetings were presided by the supervisors, who could implement behaviors and communication skills introduced in the SSTL training sessions (see intervention activity 2).

Round 1 statementsTheme: *Physical health and safety*	Round 2 statementsTheme: *Psychological health and safety*	Round 3 statementsTheme: *Organizational conditions for workplace health and safety*
1. When time pressure is high during work, it is impossible not to go beyond your own physical limits	1. We can tell each other everything in our team without it being discussed with others behind our backs	1. Employee health and safety is as important as patient/client health and safety
2. It is possible to make sure no one in our team experiences excessive physical load, even when we are understaffed	2. If one team member's work pressure is too high, we will address this as a team and resolve it together	2. The procedures we follow to ensure patient/client health and safety are aligned with the procedures we follow to ensure our own health and safety
3. Coworkers in our team inform each other adequately when there are new methods or when there is new equipment available to prevent physical strain in the workplace	3. During busy periods, it is normal to still be engaged in work (physically or mentally) while at home, even though this hinders activities with family/friends	3. Due to recent legislative changes in the health care system, it will become more difficult to ensure employee health and safety
4. A change of work schedules is needed in our team to prevent physical strain in the workplace	4. The prevention of work stress is the responsibility of the employer (organization)	4. Even without additional funding, we can find (new) ways to ensure employee health and safety in the workplace
5. Every member of our team corrects a coworker when they see them lifting or moving incorrectly, irrespective of age or tenure	5. If team members have difficulties carrying out their work because of circumstances in their private life, they should discuss this in the team	5. The management is willing to hear our opinions and make ample use of our experience when making decisions concerning employee health and safety
6. I will not be able to reach my retirement age doing this job if the physical load in my work remains the same	6. The difference between teasing and bullying someone is clear to all members in our team	6. I would recommend my organization as employer to my family and friends

Appendix B

B.1. List of items used in study

Safety climate (based on Hale et al., 2010; Brondino et al., 2012)

Senior management priority for health and safety
1. Employee health and safety is a priority for this organization
2. Senior management considers employee health and safety to be as important as productivity
3. Senior management shows support for physical and mental injury prevention through involvement and commitment

Supervisor commitment to health and safety
4. In the workplace, my supervisor acts quickly to correct problems/issues that affect employees' health and safety
5. My supervisor clearly considers the physical and mental health and safety of employees to be of great importance
6. My supervisor acts decisively when a concern of an employees' physical or mental health or safety status is raised

Group norms and –behavior in relation to health and safety
7. In our workplace, we discuss employee health and safety hazards and incident prevention
8. In our workplace, we care about peers' physical and mental health and safety awareness
9. In our workplace, we remind each other of the rules and regulations regarding employee health and safety

Communication about health and safety
10. There is good communication here about health and safety issues which effect me
11. Information about workplace health and well-being is always brought to my attention in this organization
12. My complaints, remarks and contributions to resolving health and safety concerns in the organization are listened to

Participation and involvement in relation health and safety
13. Participation and consultation in employee health and safety occurs with employees, works councils and health and safety coordinators
14. Employees are encouraged to become involved in employee health and safety matters
15. In my organization, the promotion of employee health and safety involves all levels of the organization

Safety behavior (based on Neal and Griffin, 2006)

Safety compliance

1. I use all the necessary health and safety equipment and follow relevant regulations to prevent physical and mental strain in my job
2. I use the correct procedures and regulations for health and safety when carrying out my job
3. I ensure the highest levels of health safety when I carry out my job

Safety participation

4. I promote the employee health and safety program within the organization
5. I put in extra effort to improve employee health and safety in the workplace
6. I voluntarily carry out tasks or activities that help to improve employee health and safety

Changes to procedures (based on Randall et al., 2009)

1. As a consequence of the implementation of the program activities we openly discuss which methods or procedures we wish to change and which we wish to keep
2. New procedures have been introduced or existing procedures have been changed after the implementation of the program activities
3. Through the implementation of the program activities we finally got to straighten up some bad work methods that we had accepted
4. The implementation of the program activities has made it easier to tackle the changes in the organization
5. I have changed my attitude to the role of my supervisor after the implementation of the program activities

Supervisor attitudes and actions (based on Randall et al., 2009)

1. My supervisor has done a lot to involve employees throughout the activities of the program
2. My supervisor communicated clearly the advantages of the program activities
3. My supervisor shared whatever he/she knew about the implementation of the program activities
4. My supervisor has actively worked towards the implementation of the program activities
5. My supervisor was positive about the implementation of the program activities

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