The role of prosocial and proactive safety behaviors in predicting safety performance

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Abstract

Employees’ engagement in safety is assumed to be a significant contributor to safety performance within the chemical industry. The current study tested this assumption by examining the role of prosocial safety behaviors (e.g., helping others) and proactive safety behaviors (e.g., seeking change) in predicting four safety performance outcomes: micro-accidents, property damage (accidents without injury), near-miss events, and lost-time injuries. Two-wave data collected from 511 employees located in 2 Italian chemical plants revealed that prosocial safety behaviors predicted micro-accidents and property damage, and proactive safety behaviors predicted near-miss events and lost-time injuries. These results suggest that benefits can be gained from distinguishing between prosocial and proactive safety behaviors when seeking to improve safety performance. Organizations may reduce the rate of minor injuries and property damage by increasing helping among employees. However, this approach will be less effective in reducing more serious accidents or increasing near-miss event reporting. More effective in these cases is creating environments in which employees feel able to raise their suggestions and concerns about safety.

Keywords: Chemical; Proactive safety behavior; Prosocial safety behavior; Safety participation.

1.1 Introduction

The importance of human action in the causation of workplace accidents and incidents is well established (e.g., Hale & Glendon, 1987; Seo, 2005; Williamson & Feyer, 1990). Early work illustrated this by showing that unsafe acts were positively related to accident rates (e.g., Reason, 1997), and that compliance with safety procedures was negatively related to near-misses (Goldenhar, Williams & Swanson, 2003). In subsequent research, attention turned to employees' active participation in safety, where it was shown that employees' active engagement in related initiatives resulted in improved safety performance (Hofmann & Morgeson, 1999; Neal & Griffin, 2006). Indeed, research shows that, when compared to safety compliance, safety participation is more effective longer-term at reducing workplace accidents and injuries through the creation of a better context supporting work safety; and that this effect is consistent across work contexts (Clarke 2006; Neal & Griffin, 2006). As a consequence, safety participation has become the focus of much research in a bid to understand how these acts, which are volitional in nature, may be promoted (Christian et al., 2009; Griffin & Neal, 2000; Martinez-Córcoles, Schöbel, Gracia, Tomás & Peiró, 2012; Neal & Griffin, 2006).

Safety participation comprises a number of specific acts, such as helping others, voicing concerns about safety and looking out for the welfare of others (Neal, Griffin & Hart, 2000). Typically these acts are presented in the safety literature as belonging to a single class of behavior, which arguably implies that they are all of equal importance in predicting an organization's safety performance (i.e., injuries, accidents and near-miss events). However, research in non-safety domains has shown that specific acts of participation (as manifested in their general form) are associated with different antecedents and outcomes (e.g., LePine, Erez & Johnson, 2002; McAllister, Kamdar, Morrison & Tumbar, 2007). One implication of this for safety research is that current conceptualizations of safety participation as a single construct may be too simplistic and in danger of missing important differences in how these specific acts relate to different safety performance outcomes.

The current study addresses the possibility of this limitation by looking at the role that two types of safety participation behaviors (prosocial and proactive) play in predicting an organization's safety performance. More specifically, it asks the question of whether safety outcomes, such as accidents and near-miss events, are best predicted by prosocial acts (e.g., helping others) or proactive acts (e.g., raising suggestions for change). Examining these relationships will contribute to the literature in two important ways. First, it will tease apart the effects of different acts of safety participation on safety outcomes and provide organizations with a more detailed understanding of which acts to target in their efforts to improve safety. Second, it will extend current models of safety that concentrate on safety participation as a final outcome (e.g., Clarke & Ward, 2006; Conchie & Donald, 2009; Conchie, Taylor & Donald, 2012) by showing how these acts subsequently relate to the final link in the chain: safety performance outcomes. In the following sections we review research in this area and then present the findings of a longitudinal study that was carried out in the Chemical industry.

1.2 Safety Participation: Prosocial and Proactive Behaviors

Safety participation, as defined by acts such as helping co-workers with safety, seeking to promote the safety program, and making suggestions for change, shares a number of similarities with general organizational behaviors refereed to as acts of citizenship (Organ, 1988; van Dyne & LePine, 1998). Similar to safety participation, organizational citizenship behaviors (OCBs) are voluntary work behaviors that hold a positive value to the organization, but are not recognized by the formal reward system. As such, their omission is not generally understood as punishable (Podsakoff, MacKenzie, Paine & Bachrach, 2000), and they are generally difficult to promote through formal routes.

A number of multi-dimensional models of how OCBs group together have been proposed (e.g., Organ, Podsakoff & MacKenzie, 2006). Prominent among these are models that distinguish between OCBs that are prosocial and those that are proactive (e.g., van Dyne & LePine, 1998). Prosocial behaviors are affiliative in nature and typically manifest as helping colleagues and looking out for their welfare. Essentially, they focus on ensuring safety of the social group and on fostering good social relationships. In contrast, proactive behaviors are challenging in nature and seek to bring about positive change in workplace practices, such as in safety. These behaviors are less focused on social relationships and more focused on system changes. While both sets of behaviors are related by their volitional nature, they are distinct in as far as prosocial behaviors focus on cooperation, and proactive behaviors focus on challenge. For this reason, proactive behaviors carry more risk when they are performed owing to the possibility that they may be regarded as criticism of current (safety) management systems.

The notion that prosocial and proactive behaviors are distinct, yet related, constructs has gained much support in non-safety domains. Studies have shown, for example, that prosocial and proactive behaviors are differentially related to individual and organizational processes. LePine and van Dyne (2001) showed that agreeableness was positively related to prosocial behaviors but negatively related to proactive behaviors. Graham and van Dyne (2006) showed that self-esteem and justice impacted proactive behaviors but not prosocial behaviors. Van Dyne, Kamdar and Joireman (2008) found that role perceptions differentially moderated the effects of leadership on each type of behavior. Namely, when leadership was low, regarding behaviors as part of one's job increased prosocial behaviors, but had no effect on proactive behaviors.

Within the domain of safety, research on OCBs—as they relate specifically to safety—is relatively less advanced and tends to treat these behaviors as a single construct (in much the same way as safety participation research) (Conchie & Donald, 2009; Hofmann, Morgeson & Gerras, 2003; Mearns & Reader, 2008; Turner, Chmiel, & Wall, 2005). However, within constructs of safety citizenship behavior are six sub-dimensions of action: (i) helping (assisting colleagues to fulfill their safety responsibilities); (ii) stewardship (protecting colleagues from risks and dangers); (iii) initiating change (taking action to improve safety); (iv) voice (promoting the safety of activities); (v) civic virtue (being involved in non-mandatory organizational programs and meetings), and (vi) whistleblowing (reporting those who violate safety procedures) (Hofmann et al., 2003). These sub-dimensions mirror those from the general OCB literature and suggest that safety behaviors may too be teased apart to look at their differential effects on outcomes. Indeed, support for this suggestion comes from recent research that shows these behaviors operate differently with safety processes. In a study looking at the effects of leaders on citizenship behaviors, Conchie (2013) showed that leaders influenced employees' proactive safety behaviors by increasing their intrinsic motivation, but affected their prosocial safety behaviors through a different route (one not identified in the study). Further, Curcuruto, Guglielmi and Mariani (2013) found that team climate influenced proactive behaviors by increasing proactive orientation, but influenced prosocial behaviors by increasing affective commitment. In light of such differences, we propose in the following section that prosocial and proactive safety behaviors have a different relationship with safety performance outcomes.

1.3 Prosocial Behaviors, Proactive Behaviors and Safety Performance Outcomes

An organization's safety performance can be measured by tangible events, such as the frequency of injuries, accidents or near-misses. These outcomes are distinct from individual safety behaviors, such as those discussed in Section 1.2, which precede performance outcomes in time and may contribute to their occurrence (Christian et al., 2009). Evidence suggests that specific safety behaviors have a differential influence on safety performance outcomes. Namely, that prosocial safety behaviors may be more important in predicting the frequency of micro-accidents and accidents that involve no injury, while proactive safety behaviors may be more important in predicting the frequency of near-miss events and lost-time injuries.

1.3.1 Prosocial safety behaviors, micro-accidents and accidents without injury

Micro-accidents are on-the-job injuries that require medical attention, but do not incur lost workdays (Zohar, 2000; 2002a). Compared to accidents, micro-accidents are more frequent and offer a reliable outcome measure against which antecedents, such as safety behaviors, may be tested. Their primary cause is linked to individual unsafe action, which predicts the frequency of micro-accidents over and above the level of risk inherent within the workplace (e.g., unsafe conditions; Zohar, 2000; 2002a). For this reason, it can be assumed that interventions focused on correcting employee unsafe behaviors are likely to see a bigger reduction in the rate of these events than interventions focused solely on structural features.

Applying this finding to the current discussion suggests that prosocial behaviors may play a stronger role in predicting an organization's rate of micro-accidents, when compared to proactive behaviors. This is because prosocial behaviors are concerned with looking out for the safety of others and helping teach co-workers safer ways of working. It is less focused on bringing about improvements in the conditions in which people operate or the procedures by which tasks are completed. This latter focus is concentrated more on structural type changes and sits more comfortably with proactive safety behaviors. As such, we might expect prosocial safety behaviors to be negatively related with micro-accidents such that an increase in prosocial behaviors will be associated with a reduction in the rate of on-the-job injuries that require medical attention. Geller (2001, 2002) offered some support for this suggestion by showing that micro-accidents were related to the level of support among co-workers. As such we predict that:

Hypothesis 1: Prosocial safety behaviors are negatively related to the rate of micro-accidents.

Within some industries, an organization's safety performance may be measured by the rate of property damage (i.e., damage to structures and machinery). These events are often regarded as accidents that do not involve injury, but which have the potential to lead to injury through their enactment. Some research suggests that property damage may stem from inadequate maintenance of machinery or technological structures (Geller, 2001). However, these events are more often attributed to human factors such as a lack of training or poor monitoring of the safety system (Christian, Bradley, Wallace & Burke, 2009), or human error in the usage of machinery and failing to follow work procedures (Hansez & Chmiel, 2010). Given the focus on working practices that may be overcome through training and education, it seems plausible that the rate of property damage would be negatively related to prosocial safety behaviors. More specifically, we would expect that environments defined by support and cooperation to be marked by greater knowledge and competence in using the equipment and complying with procedures, and a reduction in the misuse of machinery.

Hypothesis 2: Prosocial safety behaviors are negatively related to the rate of property damage (accidents without injury).

1.3.2 Proactive safety behaviors, lost time injuries and near-miss events

In contrast to micro-accidents, lost-time injuries are often predicted by unsafe conditions that lie dormant within the system until they are triggered by an unsafe act (Reason, 1997). They are lower in frequency than micro-accidents as their occurrence requires several antecedent factors to exist, some of which may be technological in nature. Micro-accidents, by contrast, may arise from a single antecedent factor and often these relate to human behavior, such as an unsafe act. Behavioral safety interventions, for example, have been shown to reduce micro-accidents more effectively than lost-time injuries (Cavalleri & Gobba, 1989; Zohar, 2002b).

The recognition that unsafe conditions are the primary cause of these events has given rise to much research focused on identifying ways in which these conditions may be improved before a negative event happens (Vogus & Sutcliffe, 2007). One method through which this corrective action may take place is by employees' voicing their concerns about existing practices and making suggestions for change (Curcuruto, Guglielmi & Mariani, 2014; Hofmann & Morgeson, 1999). These proactive safety behaviors focus at an organizational level and are invaluable for organizational learning, as they allow for the identification and anticipation of potential hazards within the system that may trigger a lost time injury; thus preventing their negative consequences before they happen (Hollnagel, Paries, Wood & Wreathall, 2011). Prosocial safety behaviors are generally less effective in this regard as they focus on facilitating interpersonal relations, such as cooperation, and as such have their biggest impact on unsafe behaviors rather than system changes. Based on this reasoning, we predict that:

Hypothesis 3: Proactive safety behaviors are negatively related to the rate of lost time injuries.

An organization's vulnerability to accidents and injury is signaled by their rate of reported near-miss events. A near-miss event is a hazardous situation in which an accident could have resulted, but did not because of some random or planned intervention (Jones, Kirchesteiger & Bjerke, 1999). While seemingly paradoxical, a high rate of reported near-miss events may signal a healthy organization, as it suggests that employees are willing to document their occurrence to facilitate organizational learning. This is supported by meta-analyses that show organizations with a good safety culture typically have higher rates of reported critical near-miss events than those with a poor safety culture (Probst & Brubaker, 2008; Reason, 2008). Part of the reason why higher rates of near-miss events may be regarded as healthy is that it reflects a proactive channel of information and communication about safety issues, which enables an organization to anticipate and prevent problems (Parker & Collin, 2010; Reason, 2008).

Near-miss event reporting shares similarities with proactive safety behaviors (i.e., they both involve voicing about a negative event, they are both reporting-type behaviors, and they both seek to change existing systems). Most notable is the fact that both behaviors carry a high risk to employees when they are enacted, as they have the potential to be interpreted unfavorably by the organization and responded to accordingly. For this reason, both proactive behaviors and near-miss event reporting are difficult to promote among employees. Based on their shared characteristics, it might be reasonable to assume that an environment that tries to reduce the perceived risk of communicating negative information will observe an increase in proactive safety behaviors, but also an increase in the reporting of near-miss events. This is consistent with theoretical writings that associate a positive safety culture, in particular trust that raising safety issues will be responded to fairly, with a greater willingness to engage in reporting behaviors (e.g., Burns, Mearns & McGeorge, 2006; Reason, 1998).

Less effective at promoting near-miss event reporting are prosocial behaviors. These beahviors focus on building cooperative and supportive relationships between members, rather than on communicating information that has the potential to lead to negative consequence. This is especially true if near-miss event reporting may lead to the identification, and unjust discipline, of a colleague. Based on this reasoning, we predict that:

Hypothesis 4: Proactive safety behaviors are positively related to the rate of near-miss event reports.

Research design

The study hypotheses were tested using a longitudinal design. Self-report data on prosocial and proactive safety behaviors were collected at the outset of the study. Six months later, objective safety performance data were collected from the organization for the time that had elapsed since the first phase of data collection. Safety performance data were collected at the work group level (this is the level at which the participating organizations recorded such data; to ensure employee anonymity). Past research shows that group level data are generally more predictive of safety outcomes when compared to individual level data (Beus, Payne, Bergman & Arthur, 2010). In part, this is due to the fact that some safety outcomes, such as accidents, are relatively low in frequency and when measured at an individual level have reduced variance and create an increased risk of spurious correlations. Measuring safety performance outcomes at the group level reduced this problem.

2. Method

2.1 Sample and procedure

Participants were frontline employees recruited from two chemical plants operated by different companies within Italy. One plant (P1) focused on manufacturing, logistics and research/development. The other plant (P2) focused on plastic production. Each plant had achieved Occupational Health and Safety Assessment Series 18001 certification. This certification ensures that companies formulate goals and policies regarding the Health and Safety of Workers as required by the regulations and in accordance the dangers and risks potentially present in the workplace.

Questionnaires were distributed to a total of 753 employees across both plants. Of these, 213 questionnaires were returned in P1 (64% response rate), and 298 in P2 (71% response rate) to give a total sample of 511 cases. The majority of participants were male (P1 = 68.2%; P2 = 83.6%), which is characteristic of the industry. The average age of employees was 37.4 years (P1: M = 33.3; SD = 8.1; Range 20 – 66; P2: M = 40.1, SD = 8.3, Range 18 - 66). Just over half of participants (56.3%) were educated to a high school diploma level, with an average length of service within the plant of 8.4 years (P1 = 7.4; P2 = 9.3). In both plants, the majority of participants were employed in production (P1 = 54.5%; P2= 61.3%) followed by logistics (P1 = 17.6%; P2 = 18.7%).

Questionnaires were distributed to employees by the first author in a sealed envelope together with instructions for their completion. Distribution took place during the beginning of regular monthly meetings that focused on planning the activities of the work team. Participants were guaranteed anonymity and confidentiality, and informed that their responses would be used mainly for academic purposes, with a short summary of the overall findings being submitted to their company for the purposes of learning and improvement. Completed questionnaires were returned to the researcher at the end of the same planning meeting. Objective data on safety performance outcomes (e.g., micro-accidents, injury) were taken directly from the health and safety archive data collected by the company for each shift work team.

2.2 Measures

Prosocial and proactive safety behaviors. Employees' prosocial and proactive safety behaviors were measured by using 19 items from Hofmann et al.'s (2003) safety citizenship scale. Prosocial safety behaviors were measured using the two sub-scales of helping and acts of stewardship, and proactive safety behaviors were measured using the two subscales of voice and initiating change. Example items for prosocial safety behaviors are '*Help other members of the team with their responsibilities related to safety*' (helping) and '*Take action to protect other members of the group in risky situations*' (stewardship) (α = .94). Example items for proactive safety behaviors are *'Raise suggestions even if others disagree'* (voice) and *'Try to improve work* *procedures to make them safer'* (initiating change) (α = .92). Participants responded to all items on a five-point scale that ranged from Never (0) to Frequently (4).

Although Hofmann et al. (2003) modeled prosocial and proactive safety behaviors as a single construct, we retained them as distinct entities in this study to stay consistent with our predictions. This type of distinction is consistent with other studies that use a similar classification (McAllister et al., 2007; van Dyne & LePine, 1998). Moreover, it is supported by studies that show distinct outcomes for each set of behaviors (Vogus & Sutcliffe, 2007; Williams & Geller, 2000).[1]

Safety performance outcome measures. Participating chemical plants provided data on the rate of micro-accidents, property damage, lost time injuries, and near-miss events. These measures were provided at a shift-work group level, rather than per each individual.

Control variables. We controlled for the effects of age and team function on safety behavior outcomes within our analyses. Age, as measured in years, was taken as the mean average across all members in the group. Team function refers to the area of work a team specializes in. This comprised seven categories reflecting manufacturing production, chemical production, supply chain and maintenance, utilities and support, research and development, engineering, and contractors. Each team was scored as belonging to one of these areas.

3. Results

3.1 Discriminate validity of safety behaviors

The validity of our proposal that safety behaviors may be differentiated into prosocial and proactive acts was tested using confirmatory factor analysis (CFA). The results of a two-factor model reflecting this structure showed a good fit to the data, $\chi^2_{(147)} = 374.59$, $p < .001$, CFI = .95, RMSEA = .08 (95% C.I. = .07, .09). This fit was better than a four-factor model in which each set of behaviors (voice, initiating change, helping and stewardship) was modeled separately, $\chi^2_{(146)} = 370.95$, $p < .001$, CFI = .94, RMSEA = .09 (95% C.I. = .07, .10), $\Delta\chi^2_{(1)} = 3.64$, $p < .05$; and a model in which all four dimensions loaded onto a single second order 'citizenship' factor, $\chi^2_{(148)} = 413.07$, $p < .001$, CFI = .93, RMSEA = .10 (95% C.I. = .07, .10), $\Delta\chi^2_{(1)} = 38.48$, $p < .001$. We also tested a single factor model on which all behaviors loaded to examine for any potential bias effects related to the fact that all safety behaviors were self-report (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This showed the worst fit to the data, $\chi^2_{(152)} =$ 1033,7, $p < .001$, CFI = .78, RMSEA = .18 (95% C.I. = .17, .19). These results support the discriminate validity of two distinct categories of prosocial and proactive safety behaviors. Table 1 shows means, standard deviations and correlations among study variables.

3.2 Prosocial behaviors, Proactive behaviors, and Safety Performance Outcomes

To analyze the effect of prosocial and proactive safety behaviors on safety performance outcome measures (micro-accidents, property damage, lost workday accidents, and near-misses), behavioral data were aggregated to a shift work-team level. This meant that all variables (safety behaviors and safety performance outcomes) were at the same level of measurement. The two plants from which data were collected comprised 32 shift work-teams, which was a sufficient number to allow for reliable analysis at this level (LeBreton & Sentler, 2008). Independent t-tests showed no significant differences between the two plants in their levels of prosocial safety behaviors, $t_{(509)} = 1.22$, $p = .30$, or proactive safety behaviors, $t_{(509)} = .40$, $p = .61$, thus supporting their aggregation to a single sample for analysis. The suitability of the behavioral data for aggregation to a work-team level was examined by calculating the Rwj(i) index (Le Breton et al., 2008). This statistic provides a measure of agreement between employees belonging to the same work-team, with a value of .70 generally regarded as the minimal level acceptable for aggregation of individual data to group data (Le Breton et al., 2008). In the 32 work-teams used in this study, the Rwj(i) was greater than .70, with a mean value of .82 (min = .71, max = .94). This supports aggregation of the data to the group level.

The research hypotheses were tested through hierarchical regression analysis at the group level. The control variables of age and team function were entered in Step 1, and prosocial and proactive safety behaviours were entered in Step 2. The team function variable was coded so that manufacturing production was our reference work function group against which all other groups were compared. We chose this work function as our reference variable because this team function was the one with the largest number of groups. To perform the analyses, a bootstrapping method was used (Preacher & Hayes, 2008). This method is appropriate when sample sizes are relatively small because it produces a distribution using the observed data, from which statistical effects are estimated. This method was considered more reliable than a non-bootstrapping approach in the current sample, owing to the fact that only 32 work-teams were included in the analysis.

Table 2 shows the results of the analyses testing the four proposed effects. Consistent with hypotheses 1 and 2, the results show that prosocial safety behaviors negatively predict the rate of micro-accidents and property damage at six months. Work groups defined by high levels of affiliation are less likely to experience these outcomes over time. Similarly, the results show support for hypotheses 3 and 4, in that proactive safety behaviors predict low rates of lost-time injuries over time, and predict higher rates of near-miss events (as measured through employee reporting). We did not find any support for prosocial safety behaviors predicting lost-time injuries or near-miss events, or for proactive safety behaviors predicting micro-accidents or property damage. We also found no effects of age or team function on either of the safety behaviour outcome measures.

4. Discussion

Employees' active participation in safety is often measured as a single construct. However, emerging research suggests that differences exist within this construct between prosocial and proactive safety behaviors (Conchie, 2013; Curcuruto et al., 2013). The current study tested this emerging proposal by examining the relationship of prosocial safety behaviors (e.g., helping) and proactive safety behaviors (e.g., voice) with different safety performance outcomes. Consistent with emerging research, the results showed that prosocial behaviors within teams predicts the rate of micro-accidents and property damage, while proactive behaviors predict the rate of lost time injuries and near-miss event reporting. No cross over effects between the behaviors and safety outcomes emerged.

These results support and extend the proposal that employees' participation in safety has a significant impact on an organization's safety performance (Christian et al., 2009). In support of this proposal, the study found that safety behaviors predicted the rate of accidents and near-miss reporting, and that this effect was significant over a six-month period. Second, the results showed that prosocial and proactive safety behaviors operate independently to influence these outcome measures. At a theoretical level, this suggests an extension to existing models of safety to reflect this behavioral difference. By regarding these behaviors as one construct, as safety research often does, important differences may have been overlooked, and significant effects may have failed to emerge. By extending safety models to look at two behavioral routes, it should be possible to develop a more detailed understanding of routes through which safety outcomes occur. These routes will not only focus on different safety behaviors, but also their antecedents. At present, this level of understanding in safety literature is missing.

At a practical level, the findings suggest that interventions aimed at improving an organization's safety performance would be most effective if they were targeted at specific safety behaviors associated with these outcomes. When the outcomes are micro-accidents or property damage, organizations are likely to notice the greatest marked change if they focus on promoting helping among co-workers. When the outcomes are lost work-time injuries or near-miss event reporting, the organization would benefit most from promoting and supporting challenging proactive safety behaviors, such as raising suggestions for change. While both classes of behavior (prosocial and proactive) play an important role in promoting safety, interventions or training initiatives that focus too heavily on the entire class of behaviors, or on those behaviors unrelated to the outcome, may observe minimal improvements.

Research focusing on human resource management, work design and work performance, have highlighted ways in which these two classes of behavior may be promoted (Gagné & Panaccio, 2014; Parker, 2014; Strauss & Parker, 2014). According to a human resource management perspective, organizations may increase proactive safety behaviors by investing in communication strategies that focus on rewarding employees for going above and beyond mandatory safety behaviors. A public reward system for raising suggestions about safety, for example, would provide employees with a visible demonstration of commitment from management when they offer meaningful feedback, and would reduce perceptions of risk associated with these behaviors (Strauss & Parker, 2014). These types of initiatives would send a top-down message to employees that their involvement in safety is important and recognized positively by the organization, which enhances feelings of competence and safety motivation (Strauss & Parker, 2014), but also trust in the organization. The importance of worker trust for the success of such initiatives and ultimately good safety cannot be underestimated. Building on the work of Reason (1998), Burns et al. (2006) argue that trust is needed to foster organizational learning and ultimately a positive safety culture. In support of this, other studies have shown the importance of trust in management for promoting reporting-type behaviors (e.g., Conchie et al., 2012).

Similarly, research on job design has suggested that proactive behaviors may be promoted by focusing on characteristics of the task (Parker, 2014). For example, research shows that proactive safety behavior may be promoted by reinforcing and increasing levels of autonomy and self-determination in carrying out duties and/or promoting, where appropriate, action in favor of safety through appropriate incentive systems (Gagné & Panaccio, 2014; Strauss & Parker, 2014). In this way, organizations may make employees aware that they are not only expected to react to top-down management safety systems in the workplace, but that they may engage in bottom-up initiatives through their participation in safety. As such, they may help the organization to manage grey areas—those areas that may not be easily managed with the ordinary and formalized safety systems and procedures. In contrast, research on job design suggests that prosocial behaviors may be effectively promoted by focusing on the social aspects of teamwork (Parker, 2014). This may include reinforcing interdependence, cohesion, and peer-to-peer communication; which serve to enhance affiliative motivation, mutual trust and a positive psychological atmosphere in the workgroup (Curcuruto et al., 2013; Grant & Parker, 2009; Parker, 2014). One outcome of this may be an increase in prosocial behaviors, such as looking out for the safety of others when carrying out job tasks.

The study is not without its limitations. First, due to the way in which the participating organizations recorded outcome safety performance data, it was not possible to look at the relationship between safety behaviors and safety events at an individual level. While this limited our ability to map the relationship between behavior and involvement in a safety event for each individual, it avoided problems associated with low accident rates and spurious correlations that can emerge when data are examined at this level. One advantage of examining safety outcomes at a work-team level is that the variance in outcome measures is larger and so results are more reliable.

Second, because we examined safety behaviors and safety performance on only one occasion, some caution must be taken when interpreting the results as implying strong causation. The separation of our measures by six-months offers some confidence in our conclusions regarding the effects of proactive and prosocial behaviors on safety outcomes, especially when compared to cross-sectional research. However, it does not allow us to infer the same level of causation as with longitudinal studies involving measures at multiple time periods. While we expect our effects to emerge across a longer time period, future work would benefit from testing this prediction.

Third, we did not control for the effects of safety compliance behaviors in our analyses. Consequently, we cannot state how strong the relationships are between proactive and prosocial safety behaviors with the outcome measures after we factor out their relationship with safety compliance. In the current study a proxy measure of safety compliance behaviors, namely short-cuts propensity, was collected. Our analyses showed that this measure did not aggregate to a group level (F = 1.17, p = .35). At a statistical level, this precluded it from the current, group-level, analysis. At a theoretical level, we suggest rather tentatively that it may imply that complying with rules is not group dependent. If so, this suggests that an individual’s tendency to comply with safety may shape their tendency to actively participate in safety when working independently. However, when in a team, it is the group norms that have a stronger influence on safety participation behaviors. Further work may test this tentative suggestion, and if not supported, control for the effects of safety compliance when re-examining the relationships we focus on here.

Finally, this study focused on the chemical industry within Italy and for this reason it is unclear how far the results generalize to other contexts. Research on other safety-relevant variables, such as leadership, culture and climate, has shown that effects replicate in different contexts and in different countries (Mearns & Yule, 2009), and so we would expect the results reported here to generalize.

In summary, this study showed that the effects of prosocial and proactive safety behaviors on safety performance outcomes can be differentiated. Future models of safety should consider this finding in deciding whether it is appropriate to model ‘safety participation’ as a single construct, or if a detailed model that teases these behaviors apart would be more insightful. The suggestion from the study reported here is that gains can be made from looking at prosocial acts as a distinct set of behaviors to proactive acts, and examining their relationship to different organizational processes. In this way, it should be possible to tailor interventions to have maximum impact.

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Footnote

1 The current study did not use Hofmann et al.'s two sub-scales that relate to civic virtue and whistleblowing. This was due, in part, to a request by participating plants to keep the questionnaire short. It was also because these two subscales relate to work contexts regulated by specific legal regulation. In the present national context, these are known to encounter resistance by the work-unions. Excluding these subscales therefore avoided any biases on the study results from this fact.

Table 1.

Means, standard deviations and correlations among observed variables at the team level (N=32)

	Mean	SD	1	2	3	4	5	6	7
1. Prosocial safety behaviors	3.31	.71	--						
2. Proactive safety behaviors	3.35	.54	.74***	--					
3. Micro-accidents	.89	.77	-.57*	-.31	--				
4. Lost work day injuries	.37	.34	-.14	-.40*	.42*	--			
5. Near miss	.79	.90	.30	.46*	.32	.34	--		
6. Property damage	.85	1.51	-.42*	-.35	.37	.45*	.29	--	
7. No shortcut behaviors	4.33	.29	.37*	.41*	-.20	-.13	.12	-.11	--

Note: *p < .05; p** <. 01; ***p< .001

Table 2.

Results of hierarchical regression analysis testing hypotheses effects by prosocial safety behaviors *(H1, H2)* on safety performance outcomes after 6 months (N_{teams}=32)

	Micro accidents							
Antecedents	Step 1		Step 2		Step 3		95% confidence intervals (at step 3)	
	β	t	β	t	β	t	Min	Max
Team function	-.30	-1.28	-.23	-1.01	-.19	-1.30	-.08	.02
No shortcuts beh.			-.20	-.93	-.10	-.43	-.73	.33
Proactive safety beh.					-.01	-.04	-.86	.37
Prosocial safety beh.					-.56	-.2.27*	-.92	-.06
R^2		.09		.19		.44		
ΔR^2				.10		.25		
F		1.63		1.85		2.84		
	Property damages (accidents without injuries)							
Antecedents	Step 1		Step 2		Step 3		95% confidence intervals (at step 3)	
	β	t	β	t	β	t	Min	Max
Team function	-.51	-2.47*	-.44	-2.08*	-.39	-1.77	-.49	.37
No shortcuts beh.			-.10	-.47	-.04	-.15	-2.35	3.81
Proactive safety beh.					-.31	-1.20	-3.46	.68
Prosocial safety beh.					-.42	-2.04*	-4.8	-.12
R^2		.22		.18		.30		
ΔR^2				-.04		.12		
F		6.11		3.01		2.9		

Note: *p < .05. **p < .01.

Table 3.

Results of hierarchical regression analysis testing hypotheses effects by proactive safety behaviors *(H3, H4)* on safety performance outcomes after 6 months (N_{teams}=32)

				Lost working days				
Antecedents	Step 1		Step 2		Step 3		95% confidence intervals (at step 3)	
	β	t	β	t	β	t	Min	Max
Team function	-.19	-.80	-.13	-.54	-.09	-.36	-.10	.04
No shortcuts beh.			-.10	-.43	-.06	-.27	-1.04	1.07
Prosocial safety beh.					-.13	-.49	- 1.48	1.61
Proactive safety beh.					-.39	-2.01*	-1.9	-.08
R^2	.04	.	.05		.16			
ΔR^2			.01		.11			
F	.64		1.68		2.15			
				Near miss (reporting)				
Antecedents	Step 1		Step 2		Step 3		95% confidence intervals (at step 3)	
	β	t	β	t	β	t	Min	Max
Team function	.08	.34	.09	.36	.07	.32	-.09	.10
No shortcuts beh.			.12	.54	.10	.49	-.76	.73
Prosocial safety beh.					.31	1.51	-1.56	.39
Proactive safety beh.					.44	2.08*	.05	1.04
R^2		.02		.04		.17		
ΔR^2				.02		.13		
F		.11		.45		2.43		

Note: *$p < .05$. **$p < .01$.