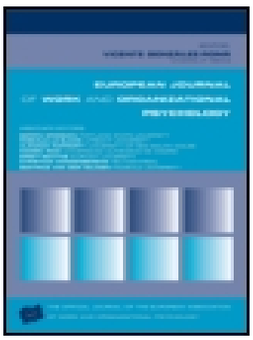

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European Journal of Work and Organizational Psychology

ISSN: 1359-432X (Print) 1464-0643 (Online) Journal homepage: https://www.tandfonline.com/loi/pewo20

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To cite this article: Matteo Curcuruto, Sharon K. Parker & Mark A. Griffin (2019): Proactivity towards workplace safety improvement: an investigation of its motivational drivers and organizational outcomes, European Journal of Work and Organizational Psychology, DOI: 10.1080/1359432X.2019.1572115

To link to this article: https://doi.org/10.1080/1359432X.2019.1572115

Published online: 11 Feb 2019.

EUROPEAN JOURNAL OF WORK AND ORGANIZATIONAL PSYCHOLOGY
https://doi.org/10.1080/1359432X.2019.1572115

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Proactivity towards workplace safety improvement: an investigation of its motivational drivers and organizational outcomes

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ABSTRACT

Initiating a safety oriented change—or *safety initiative*—is conceptually distinct from other forms of safety participation and safety citizenship behaviour, yet little attention has been given to its performance outcomes or its motivational antecedents. An initial study with a sample composed of middle managers (N = 86) showed that safety initiative predicted objective improvement actions 6 months later, whereas, showing differential validity, safety compliance predicted the implementation of monitoring actions. Two subsequent studies focused on motivational antecedents. First, using a sample of team leaders (N = 295), we tested a higher-order structure of proactive motivation that incorporates three domains: "can do", "reason to" and future orientation. Second, in a longitudinal study of chemical work operators (N = 188), after checking for the influence of potential confounders (past behaviours; accidents experience; perceived risk), we showed that safety initiative was predicted only by proactive motivation. Instead, *safety compliance* was found to be associated with affective commitment and scrupulousness, whereas *safety helping* was found to be associated with affective commitment. Self-reported behaviours were validated against rater assessments. This study supports the importance of distinguishing safety initiative from other safety behaviours, indicating how to create an organizational context supporting a proactive management of workplace safety.

ARTICLE HISTORY
Received 28 February 2018
Accepted 11 January 2019

KEYWORDS
Safety behaviour; initiative; motivation; compliance; helping

Disturbing levels of accidents and injury in the workplace continue to highlight the importance of safety-related behaviours and the need to understand their antecedents (Griffin & Curcuruto, 2016). An early focus on safety compliance, or individuals' adherence to safety rules and procedures, has increasingly been complemented by attention to a broad array of safety behaviours that help to prevent accident and injury (Griffin & Neal, 2000; Hollnagel, 2014; Reason, 2008; Weick & Sutcliffe, 2007; Zohar, 2008). Initiating a safety-oriented change in the workplace is one type of change-oriented behaviour of increasing interest to researchers and practitioners (Curcuruto & Griffin, 2018). Whereas compliance with rules and procedures requires standardized responses to known risks, initiating safety-related change requires individuals and teams to anticipate and deal with unknown risks, and eventually, to improve organizational safety systems (Curcuruto & Griffin, 2016; Hollnagel, 2014).

In this study, we use the term 'safety initiative' to describe the behaviours through which an individual proactively takes responsibility for suggesting and promoting changes that will improve safety. To develop the concept of safety initiative, we draw on research investigating proactivity in other domains, such as work performance, careers and socialization (Frese & Fay, 2001; Grant & Ashford, 2008; Parker & Collins, 2010).

Despite the potential importance of safety initiative, especially in unpredictable and changing environments where prior risks cannot be easily identified, little research has investigated its consequences or its antecedents. Safety initiative has rarely been defined within the safety domain, and tends to be conceptualized as one element of a broader concept of safety participation or voluntary safety behaviour (Conchie, 2013; Curcuruto & Griffin, 2016). To the extent that safety-related proactivity is assessed, it is usually considered as a component of the construct of safety citizenship that merges proactivity with more passive behaviours. The lack of clarity in concepts and measures among safety behaviours is likely to obscure important differences (Curcuruto, Conchie, Mariani, & Violante, 2015; Curcuruto & Griffin, 2018). For example, in the domain of work performance, scholars have demonstrated that affiliative forms of citizenship and compliant forms of task performance are distinct from more change-oriented forms (e.g., Chiaburu, Oh, Berry, Li, & Gardner, 2011).

We conceptualize initiative as an important organizational change-oriented behaviour that is distinct from safety compliance and other affiliation-oriented behaviours of organizational citizenship that can protect the health and safety of other people in the workplace: civic virtue, helping, stewardship and housekeeping (Curcuruto et al., 2015; Hofmann, Morgeson, & Gerras, 2003).

Over three studies we establish the conceptual distinctiveness of safety initiative, identify proactive motivation as a key psychological determinant of safety initiative, and link proactive motivation to safety initiative in the context of alternative predictors and behaviours.

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The first study tests the proposition that safety initiative is a change-oriented behaviour that is distinct form safety-related helping behaviours and from safety compliance. We propose that safety initiative will predict improvement outcomes while safety helping and safety compliance will predict monitoring outcomes.

The second study develops a higher-order construct of proactive motivation towards safety management that is a psychological determinant of safety initiative. The higher-order construct comprises "can do" motivation (role breadth self-efficacy; control beliefs), "reason to" motivation (psychological ownership; felt responsibility for constructive change) and future orientations (anticipation orientation; improvement orientation).

The third study tests the relative impact of a proactive motivation on safety initiative compared to psychological determinants of conscientiousness and commitment. We also compare the effect of these determinants on safety compliance and safety helping. Together, the three studies test the link between proactive motivation, safety initiative and outcomes within a comprehensive framework of the psychological determinants of safety behaviour. The overall framework for the studies is depicted in Figure 1.

Initiating a safety-related change: a distinct form of safety citizenship

Most safety behaviour research has focused on individual safety compliance; that is, individuals carrying out their work activities in accordance with policies, procedures and rules (Christian, Bradley, Wallace, & Burke, 2009; Wallace & Chen, 2006). Safety compliance is clearly important. Considerable evidence shows that greater individual safety compliance is associated with fewer adverse events, accidents and injuries (Zohar, 2002; for meta-analyses see: Clarke, 2006, 2010; Christian et al., 2009; Nahrgang, Morgeson, & Hofmann, 2011).

Nevertheless, scholars have identified broader safety behaviours beyond compliance that are increasingly important in an organizational context. Example of behavioural concepts include active caring for safety (Geller, Roberts, & Gilmore, 1996), contextual safety performance (Neal, Griffin, & Hart, 2000), safety voice communication (Mullen, 2005; Tucker, Chmiel, Turner, Hershcovis, & Stride, 2008), helping and housekeeping activities (Hofmann et al., 2003; Turner, Chmiel, & Walls, 2005), whistleblowing and reporting non-appropriate conducts (Conchie, 2013). Scholars have tended to refer to these behaviours collectively as safety participation (Christian et al., 2009; Neal et al., 2000) or safety citizenship (Hofmann et al., 2003).

The distinction between safety compliance and safety participation parallels that between task and contextual performance in the broader work performance literature (e.g., Borman & Motowidlo, 1997). Task performance refers to carrying out the prescribed role tasks that contribute to an organization's technical core activities, whereas contextual performance encompasses a range of behaviours that support the social and psychological core of the organizational work context (e.g., volunteering for additional work; assisting and cooperating with coworkers). In a similar vein, whereas safety compliance refers to carrying out one's work in accordance with prescribed safety procedures, safety participation is parallel to contextual performance and focuses on "voluntary behaviours that make the workplace safer beyond prescribed safety precautions" (Turner, Stride, Carter, McCaughey, & Carrol, 2012, p. 811). These behaviours include a broad range of activities (such as participating in voluntary safety activities, helping coworkers with safety-related issues, and attending safety meetings) that may not directly contribute to an individual's personal safety but that "help to develop an environment that supports safety" (Neal & Griffin, 2006, p. 947). Thus in the safety domain, as in the work performance domain, there is a recognition that carrying out prescribed activities is not enough to sustain effectiveness in the workplace (Griffin & Neal, 2000).

In recent times, scholars in work performance literature have gone beyond this distinction between task and contextual performance to develop a more complex picture of performance constructs and their antecedents (Griffin, Neal, & Parker, 2007). One important direction has been to distinguish

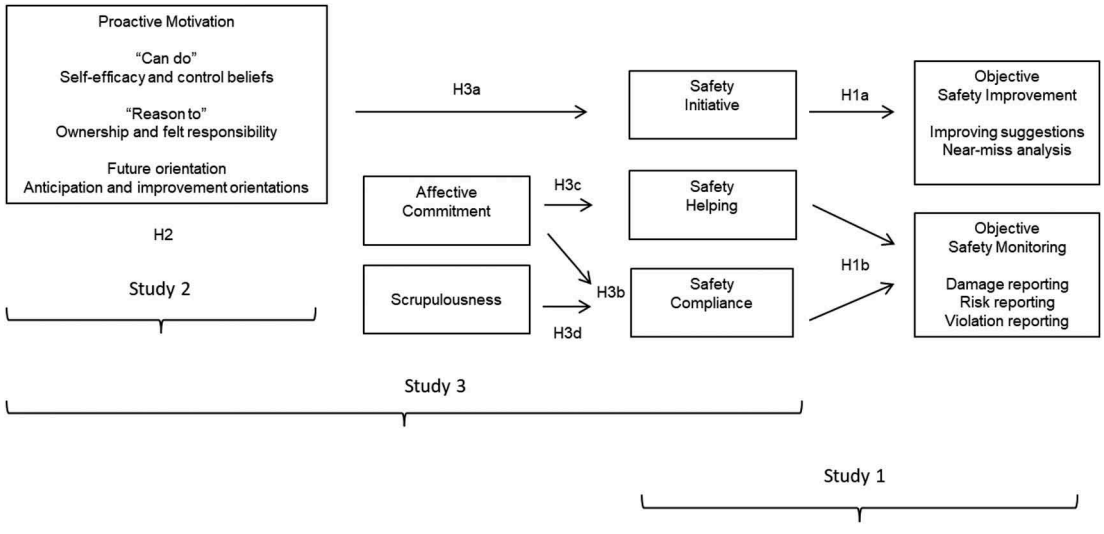

Figure 1. Multi-study research model.

more proactive forms of behaviour from more passive ones. Proactivity refers to self-initiated and future-focused efforts to change oneself or the situation (Grant & Ashford, 2008; Parker, Bindl, & Strauss, 2010; Parker, William, & Turner, 2006). Proactivity is argued to be especially important in uncertain and unpredictable situations where it is not possible to pre-specify all the desired actions; rather, individuals need to be able to self-initiate change. Importantly, scholars have argued that all categories of behaviour (task, citizenship, contextual) can be carried out in a more or less proactive way. For example, Griffin et al. (2007) distinguished core task performance (or task proficiency) from task proactivity; McAllister, Kamdar, Morrison, and Turban (2007) identified taking charge as a challenging (or proactive) form of citizenship, which they argued is distinct from more affiliative citizenship behaviours such as helping; and Chiaburu et al. (2011) argued that change-oriented citizenship should be distinguished from more affiliative forms of citizenship. These studies show that proactive forms of behaviour have distinct antecedents, being predicted by constructs like role breadth self-efficacy (McAllister et al., 2007), or openness and extroversion (Chiaburu et al., 2011), whereas, for example, affiliative oriented citizenship is predicted by conscientiousness and agreeableness (Chiaburu et al., 2011).

Similarly, a recent study by Curcuruto and Griffin (2018) on safety citizenship behaviours (SCBs) showed that psychological ownership predicted a change-oriented typology of SCB like *safety voice*, whereas affective commitment affected an affiliative oriented form of SCB like *stewardship*. The authors suggested that, in the same way that task performance and citizenship can be considered as having more or less proactive forms, SCBs can also be more or less proactive, and be directed both to other people and to the organization itself.

Organizational outcomes of safety initiative

A better understanding of safety initiative is important because of the role it plays in addressing unknown, emerging, or unanticipated risks (Curcuruto & Griffin, 2016). Safety compliance is certainly more than appropriate when the risks are known and can be anticipated. However, not all risks can be predicted in advance, especially in highly complex organizations with high levels of dynamism and interdependence between human and technical components (Griffin, Cordery, & Soo, 2016). The latter generates greater unpredictability than traditional organizations, which means that risks can emerge in a system, often in surprising ways (Hollnagel, 2014; Weik & Sutcliffe, 2007). Individuals need to be thinking ahead to anticipate the emergence of possible risks, and they need to be able to use their initiative to take steps in light of this anticipation. More generally, self-initiated behaviours are important in an unpredictable context because the uncertainty means that not all valuable employee contributions to safety can be specified a priori (Geller et al., 1996). Employees often have local knowledge, skill and expertise that, if applied proactively, can enable the prevention of problems and accidents (Reason, 2008). A change-focus supports a culture of continuous improvement and learning, which has been argued to be essential for maintaining safe operations over time (Hollnagel, 2014). Anticipatory actions and a strong future-focus enhance the likelihood of achieving better risk management whilst also preserving production efficiency (Griffin et al., 2016). Safety initiative thus potentially promotes and sustains safety in multiple ways.

Because they have different intended outcomes, we expect different outcomes of safety initiative relative to safety compliance. We propose that safety initiative will be associated with an objective safety improvement index; that is, an index recorded and provided by independent raters of the number of suggestions for improving safety that are put forward, and the number of near misses identified and analysed to propose solutions. Both indicators represent individual self-initiated and future-focused behaviours that aim to improve safety.

For differential validity purposes, we also investigated the link between self-reported safety compliance behaviour and an objective safety monitoring index. Specifically, we predict that self-reported safety compliance will predict external ratings of employees' engagement in legally mandated reporting of risks, hazards, property damages, omission and violations. We also suggest that affiliative forms of SCB—like safety helping—are intrinsically aimed both at protecting other people and at supporting the standard organizational effectiveness (Curcuruto & Griffin, 2016, 2018). Therefore, we expect that self-reported safety helping will be associated with employees' engagement in prescribed reporting as mandatory by safety regulation systems. Individuals who engage in affiliative SCBs care about the health and well-being of their colleagues (Conchie, 2013; Curcuruto et al., 2015; Curcuruto & Griffin, 2018) and thus will be prosocially motivated to report risks and hazards that could be harmful to them or others. Our hypotheses are:

Hypothesis 1a: Safety initiative predicts an index of objective safety improvement.

Hypothesis 1b: Safety compliance (i) and safety helping (ii) predict an index of objective safety monitoring.

Motivating safety initiative

Proactive behaviours in the workplace like safety initiative involve some unique motivational challenges relative to more passive behaviours. First, self-initiated change can be felt to be risky because, as noted by Parker et al., (2010, p. 834), "there is no one else to blame" if the proactive action does not achieve its goals. Second, as future-oriented action, the outcome of proactivity is uncertain, so employees may be concerned about putting in high levels of effort for such an uncertain outcome (Geller, 2002). Third, the change focus of proactivity means that there is a risk of encountering resistance from one's boss or peers, which can further discourage the self-initiation of safety improvement (Tucker et al., 2008). Fourth, as well as these higher risks, the benefits of proactivity can be less clear because of its anticipatory emphasis. For example, actions taken to prevent a problem are often less visible than actions taken to solve an existing problem (Mullen, 2005). These challenges of high risk and low apparent

benefit are accentuated when it comes to safety-related proactivity, which might be especially challenging to motivate in light of the dominant focus on production in many organizations (Hollnagel, 2014). Factors related to time pressure and production pressure likely make it even more challenging for individuals to be available to dedicate time and cognitive resources to proactivity efforts.

Overall, even though the role of motivation is not new in safety research (Neal & Griffin, 2006), the current literature presents at least two main conceptual limitations. First, the motivation to enact safety initiative is expected to be different not only for the motivation of compliance, but it is also most likely different from the motivation leading to affiliative forms of safety citizenship (Conchie, 2013). Although studies have shown that safety compliance is predicted by different variables than safety participation (e.g., Christian et al., 2009; Griffin & Neal, 2000; Nahrgang et al., 2011), little research has addressed different predictors of safety initiative compared to more passive forms of safety citizenship. For example, in Christian et al.'s meta-analysis, safety participation encompassed both passive forms of participation such as helping, communication and civic virtue, as well as more proactive forms such as initiating safety-related changes, so it is not possible to disentangle distinct predictors. One exception to this trend is Conchie (2013) who distinguished safety voice from safety helping, and showed that only safety voice but not helping was predicted by intrinsic motivation for safety, suggesting differences in motivational processes underpinning different safety behaviours.

Drawing on Parker et al.'s (2010) framework for proactivity, later we propose three categories of motivational predictors that influence safety initiative. The authors defined proactivity as a goal-driven process involving both the setting of a proactive goal and striving to achieve that proactive goal (Parker et al., 2010). The proactive goals that individuals can pursue vary based on two dimensions: the future they aim to bring about (in the present case, improving the organization's safety systems) and whether the organizational conditions are being changed. Parker et al. (2010) identified a set of motivational states that prompt proactive goal generation and sustain goal striving. First, a "can do" category of motivation refers to beliefs about one's ability to enact safety initiative behaviours in the workplace. In the context of safety, we propose the importance of self-efficacy beliefs and control appraisals in prompting individuals to initiate safety-related proactivity efforts and to deal with their consequences. Second, a "reason to" motivation category is concerned with subjective safety values and a high degree of internalization of safety responsibilities, which leads individuals to be willing to challenge status quo conditions. Finally, we present a third category, future orientation, which we propose directs people's efforts towards the safety-specific goals of prevention and continuous improvement. These motivational elements are elaborated later.

"Can do" motivation: self-efficacy and control beliefs

Proactivity is potentially quite risky, so individuals need to have a strong belief that they can be proactive, as well as the belief they can deal with the consequences of proactive actions (Morrison & Phelps, 1999; Parker et al., 2006). Drawing on expectancy theories, Parker et al. (2010) proposed the importance of "can do" motivation that encompasses individuals' self-efficacy beliefs (Can I do this?) and their control beliefs (Is it possible to influence the situation?). In support of this path, many studies have shown the importance of self-efficacy (e.g., Parker et al., 2006) and control appraisal (Frese & Fay, 2001) in shaping proactivity.

Role breadth self-efficacy, which refers to individuals' perceived capability in performing proactive, integrative and interpersonal tasks beyond prescribed technical duties, has been shown to be especially important (Ohly & Fritz, 2007; Parker, 1998). In the context of safety, we similarly propose the importance of self-efficacy beliefs in prompting individuals to initiate proactivity efforts and to deal with their consequences. In regard to the former, the belief that one can be successful in supporting safety, beyond complying with rules, is likely to be important in generating proactive safety goals given the high potential psychological risk associated with challenging the status quo. As in other domains, self-efficacy might enhance persistence and increase individuals' willingness to overcome obstacles (Bandura, 2001), both of which have been suggested as important for a successful proactive action (Frese & Fay, 2001).

Beyond self-efficacy, it is also important to believe that the behaviour at stake will lead to the positive expected outcome for safety improvement (Bandura, 2001). Without such control beliefs, people cannot see themselves as effective in generating appropriate safety initiative; yet not enacting this behaviour as they perceive that their efforts will be futile. Individuals with positive control appraisals about improving safety will tend to have a strong sense of responsibility, to not give up easily, to search for opportunities to act, to have high hopes for success and to actively search for information and feedback; all elements that support safety-related proactivity.

"Reason to" motivation: internalized ownership and felt responsibility

As argued by Parker et al. (2010, p. 834) "can do" motivation is insufficient: "People might feel able to improve work methods, for example, but have no compelling 'reason to' do so. Individuals therefore need to want to be proactive or see value associated with being proactive to change a particular target". Drawing on self-determination theory, these authors argued that proactivity action is likely to stem from autonomous rather than controlled forms of motivation, including intrinsic motivation (interest, perceived challenge, flow, etc.) and identified/integrated motivation (fulfilling important goals, expressing values, realizing future identities, perceiving change as important, etc.). With safety compliance, the "reason to" is already in place: compliance is expected as prescribed by external regulations (Gagnè & Deci, 2005; Parker et al., 2010). With safety initiative, an externalized "reason to" is harder to be assumed; instead, the motivation likely needs to stem from within the person. As Griffin et al. (2007) suggested, proactive work behaviour is often most important in weakly prescribed

situations (Mischel, Shoda, & Mendoza-Denton, 2002) in which individuals have high levels of discretion, goals are not tightly specified, the means for achieving them are uncertain, and attainment is not clearly linked to rewards, as in the case of initiating change for the improvement of safety. Consequently, the outcomes of safety initiative actions are uncertain and might occur in the longer term rather than the near term. Under such circumstances there needs to be a strong internal force driving the behaviour.

A first indicator of autonomous motivation is a strong sense of psychological ownership. As Parker et al. (2010, p. 834) argued: "it is not enough to consider that proactive action is important…to then consider that the action is 'someone else's job'". Drawing on prior evidence that individuals who define their role narrowly tend to behave more passively (e.g., Parker et al., 2006), we propose the importance of individuals seeing safety initiative as part of their role, or safety ownership, to engage in discretional actions aimed at improving workplace safety.

A second distinct indicator of autonomous motivation is that of having subjective personal accountability for safety, or felt responsibility for safety. In the performance domain, felt responsibility has been shown to predict proactive behaviours such as taking charge (Morrison & Phelps, 1999). We thus propose that felt responsibility for safety will create the "reason to" initiate and persist with a proactive action for safety improvement until the full achievement of the goal, potentially overcoming production pressure barriers and other people's scepticism and resistance (Frese & Fay, 2001; Parker et al., 2010). Engaging in a safety initiative is challenging and risky, so individuals need to strongly want to be proactive, define it as their job, and/or see value associated with being proactive.

Future orientation: anticipation and continuous improvement

As well as individuals' personal beliefs that they can be proactive in the safety domain, and their internalized "reason to" do so, we propose that individuals also need to endorse proactivity-oriented safety principles or beliefs. Parker, Wall, and Jackson (1997) made a similar argument in regard to proactivity in production settings. They argued that, as well as individual's internalized "reason to" motivation in the form of one's personal ownership, individuals also need to endorse beliefs or principles relevant to proactivity in modern manufacturing, such as just-in-time thinking. In the case of safety-related proactivity, emergent research streams on high-reliability systems (Weick & Suitcliffe, 2007), engineering resilience (Hollnagel, 2014) and safety dynamic capability (Griffin et al., 2016) identify the importance of individuals embracing the strategic future-oriented concepts of continuous improvement and anticipation.

Generally, a future orientation enables individuals to adopt more proactive strategies for goal achievement (Strauss, Griffin, & Parker, 2012). In the context of occupational safety, a future orientation directs attention to potential risk (Griffin et al., 2014), mobilizes resources to adapt to future possibilities (Hollnagel, 2014), and motivates a more flexible approach towards safety-related threats beyond simply following established plans and courses of actions (Weick & Sutcliffe, 2007). In this perspective—the earlier concept—an improvement orientation refers to individuals' beliefs about the principle of engaging in safety improvement activities. Continuous improvement of procedures and work conditions is part of a safety-oriented learning culture (Guldenmund, 2010; Reason, 2008), and motivates individuals to detect, contain, and bounce back from errors and, finally, to develop more adaptive strategies and approaches to cope with existing safety problems and potential work issues with implications for safety in the future (Goodman et al., 2011; Griffin et al., 2014; Hollnagel, 2014; Weick & Sutcliffe, 2007).

The second important concept, anticipation orientation, refers to individuals' beliefs about the need to think ahead, anticipate and prevent potential safety incidents. Prevention in the safety context is vitally important (Peirò, 2008), involving reflective, anticipatory and proactive coping strategies by individuals facing work risks (Greenglass, 2002; Vogus, Sutcliffe, & Weick, 2010). Concepts such as cognizance (Reason, 2008) and mindfulness (Weick & Sutcliffe, 2007) refer to states of chronic awareness of the possibility of unexpected events that may jeopardize safety, which in turn are suggested to result in proactive and pre-emptive analyses and discussion (Fruhen, Flin, & McLeod, 2014; Goodman et al., 2011; Weick & Sutcliffe, 2007). Similarly, the resilience approach in organizational safety (Hollnagel, 2014) focuses on individuals and teams being robust yet flexible so they can anticipate and adapt in the face of disruptions or ongoing production pressures. We therefore expect that individuals with a strong anticipation orientation will be more inclined to mentally anticipate the changing shape of risk, and thus to take proactive steps to mitigate potential risks.

In sum, we propose that the motivation for proactive change-oriented actions towards workplace safety improvement must encompass three elements: "can do" motivation (self-efficacy, control beliefs), "reason to" motivation (psychological ownership and felt responsibility) and future orientations (improvement orientation, anticipation orientation). We expect each of these elements to be mutually reinforcing and positively inter-correlated such that, together, they define proactive motivation towards workplace safety management. For example, possessing a strong anticipation orientation should help individuals to experience high psychological ownership and self-efficacy even in the face of potential difficulties and stressful events (Frese & Fay, 2001; Peiró, 2008). Our hypothesis is:

Hypothesis 2: Proactive motivation towards workplace safety management is a higher-order category of motivation that is identified by three sub-categories: "can do" motivation (self-efficacy, control beliefs), "reason to" motivation (psychological ownership, felt responsibility), and future orientations (improvement orientation, anticipation orientation).

Predictors of safety compliance and safety helping

We now elaborate how proactive motivation will influence safety initiative and differentiate the effects of proactive

motivation from other motivational determinants which can be potentially relevant for workplace safety management. We propose that proactive motivation will support and sustain individuals' safety initiative, stimulating both the desire to be proactive and the persistence to overcoming barriers.

Hypothesis 3a: Proactive motivation positively predicts safety initiative.

To show the distinct processes underpinning safety initiative, we examine two further motivational predictors of safety compliance and safety helping. First we propose that affective organizational commitment will predict safety compliance and safety helping. Organizational commitment has been proposed as an important lever for safety behaviour (Barling & Hutchinson, 2000; Clarke, 2010; Griffin & Talati, 2013). Affective commitment to an organization means that individuals identify with the organizational goals, and therefore are more likely to engage in behaviour that aligns with these goals, such as complying with organizational safety procedures (Parker, Axtell, & Turner, 2001). Affective commitment can also reflect employees' sense that there is genuine managerial concern for employee safety, which then motivates them to want to adhere to procedures (Clarke, 2010; Mearns, Hope, Ford, & Tetrick, 2010). A recent meta-analysis by Clarke (2010) of 161 studies showed the role of affective commitment as an important mediator of the effects of safety climate on safe work behaviours, primarily forms of safety compliance. Consequently we hypothesize:

Hypothesis 3b: Affective organizational commitment predicts safety compliance.

From a social-exchange perspective, safety helping can be a way to reciprocate high positive relationships with the organizations and supervisors who show they care for their employees (Curcuruto & Griffin, 2018; Hofmann et al., 2003; Mearns & Reader, 2008; Zohar, 2002). In the broader literature on work performance (Zeidan, 2006) and organizational citizenship (Podsakoff, MacKenzie, Paine, & Bachrach, 2000), affective commitment has been shown to predict forms of citizenship considered prosocial or affiliation-oriented, like altruism and supportive behaviours (Belschack & Den Hartog, 2010; Carmeli & Colakoglu, 2005; Curcuruto & Griffin, 2018; Shore & Wayne, 1993; Vogus, Rotham, Sutcliffe, & Weick, 2014). We thus also hypothesize:

Hypothesis 3c: Affective organizational commitment predicts safety helping (h3b).

We further propose that conscientiousness will predict safety compliance. Conscientious people tend to be efficient and organized as opposed to easy-going and disorderly. Generally, it is assumed that more conscientious workers are more prone than others to comply with organizational rules and procedures showing more positive attitudes towards formal in-role expectations (Caprara, Barbaranelli, Borgogni, & Perugini, 1993). For example, individuals with high scores on any valid measure of conscientiousness are assumed to tend to pay attention to details and avoid risks (Hogan & Foster, 2013, p. 27). Consistent with this reasoning, safety-specific meta-analyses and research have shown that conscientiousness is consistently associated with safety compliance (Clarke & Robertson, 2008; Demerouti, 2006; Probst, Graso, Estrada, & Greer, 2013; Wallace & Chen, 2006; Wallace & Vodanovich, 2003). As a stable personality trait of individuals, conscientiousness is described as composed of two principal facets (Caprara et al., 1993): scrupulousness and perseverance. In the present study, we will specifically focus on the first component, which refers to people's dependability, orderliness and precision in fulfilling one's own work tasks and commitments. Since compliance with safety procedures is an integral part of job responsibilities in most job rolesof modern organizations, we believe that scrupulousness can be considered a stable determinant of safety compliance behaviours.

In line with this we hypothesize:

Hypothesis 3d: Scrupulousness positively predicts safety compliance.

We test the hypotheses across three studies. In the first study, we investigate middle managers' (N = 86) safety initiative, helping and compliance, and the effect of these behaviours on organizational safety outcomes recorded 6 months later (Hypothesis 1a and 1b). In the second study, we test the hierarchical structure of a conceptual model of proactive motivation towards workplace safety management (Hypothesis 2), using a large sample of employees (N = 295) rather than the small sample of middle managers from Study 1. In Study 3, we investigate the relationship between the dimensions of proactive motivation and safety initiative in a further sample of 188 operative workers from a petrochemical industrial plant (Hypothesis 3a). In this study, we also examine the differential predictors of safety compliance and safety helping (Hypotheses 3b, 3c, 3d).

Study 1: differential safety outcomes for the organization

In an initial study, we assess whether employees' self-reports of safety initiatives predict distinct safety outcomes relative to safety compliance and safety helping. We expect that self-reports of safety initiatives will predict objective safety improvement indicators (including the number of suggestions and near-miss analysis reports made by employees), whereas safety compliance and safety helping will predict more compliance-oriented indicators of objective safety monitoring (including the number of risk factors reported, the number of safety violations reported, and the number of property damage incidents observed and reported by employees).

Method

Sample and procedure

This study was carried out in a petrochemical company in Northern Italy. The sample was 86 team leaders who had responsibility for supervising safety in their teams. Team leaders were from various departments (production, logistics and maintenance, research and development, technical and

supportive services). Average age and job tenure of the team leaders were 43.6 years (SD = 7.5) and 9.6 years (SD = 10.2) respectively. Team leaders responded to a survey in which they reported their own safety compliance, safety helping and safety initiative behaviours. Six months later, the OHS office provided us with collated ratings of safety outcomes for each team leader who completed the survey.

Measures

Safety behaviour

Participants reported the extent to which they engaged in safety behaviours related to safety initiative, safety helping, and safety compliance over the previous 4 months. Instructions were: "Please consider your work behaviour in the last 4 months. How often have you engaged in the following behaviours?" Participants responded to a total of 13 items on a scale ranging from 0 (*never*) to 4 (*frequently*). Safety initiative was measured with a four-item scale based on Hofmann et al.'s (2003) measure of initiating a safety-related change. Items were: "Trying to change the way the job is done to make it safer", "Trying to change policies and procedures to make them safer", "Trying to improve safety procedures" and "Making suggestions to improve the safety of a work activity". Cronbach's alpha in the present sample was .88. Safety helping was measured with the six item "helping" scale used by Hofmann et al. (2003). Example items were: "Assisting others to make sure that they perform their work safely", "Helping others with safety-related responsibilities", "Getting involved in safety activities to help my crew work more safely". Cronbach's alpha in the present sample was .92. Safety compliance was measured with three items by Mearns, Flin, Gordon, and Fleming (2001), with items reverse scored. The content items were: "Not complying with some rule or procedure to be able to achieve good results at work", "Disregarding safety rules or procedures in order to finish the job on schedule", "Neglecting some rules or procedures to carry out well done task". In the present sample Cronbach's alpha was .79. Like the original version, this shortened scale presented moderated correlations with measures of risk perception and accident experiences.

Objective safety improvement

For each of the participants in the research sample, an objective "safety improvement index" was derived from an objective data-archive recorded by the management of the company's Occupational Health and Safety Management System Office (OHSMS). This system involved managers in this office recording, via intranet, all the inputs provided by team leaders in relation to possible constructive changes and problem resolution activities connected with safety and risk management. Specifically, we considered here the extent to which team leaders engaged in voluntary improvement programmes set up by the OHSMS for safety maintenance and improvement over time. This data was recorded in the 6 months following the collection of self-report measures of safety behaviours. In particular, the improvement index was created by combining: (a) the frequency of spontaneous voicing suggestions for improvement with original problem solving of current safety-related critical instances and (b) the frequency of spontaneous reporting of near-miss analysis for preventing future similar adverse events. All these actions recorded by OHSMS staff indicate discretional initiative formally not requested by the job description and legal regulatory agreements between the company and the trade unions. It is relevant to report that any of these reporting activities is formally filtered and processed by the OHSMS before being eventually recorded, considering their potential to generate concrete valuable inputs to the continuous improvement of safety in the plant. The two indices, voicing suggestions for improvement and near-miss analysis reporting, were positively correlated (r = .63; p < .05). Given their common emphasis on improving safety, and their positive correlation, we combined these measures into a single index of safety improvement outcome. Twelve managers were then asked to provide an assessment for every supervisor initiative for improvement on the basis of data-archive information, using an assessment range from a level zero (no kind of initiative) to a level five of proactivity (frequently proactive initiatives). Every supervisor was assessed by a single manager. In our participant sample this improvement index had a mean of 3.35 with scores ranging from 0 to 5.

Objective safety monitoring

Every participant was associated with a "safety monitoring index", indicated by the frequency of reporting of unsafe conducts, omissions and potential risk and hazard factors in the physical and technological environment that might require some corrective action by the OHSMS staff. Individuals report potential risks/hazards and other critical events via the intranet, and OHSMS staff formally recorded these reports. The OHSMS staff them process the reports in order to generate appropriate corrective action outcomes. Reporting potential risks and hazards was considered mandatory by the national and industrial legal regulations and omitting to do so was subject to punishment. In the current sample, this monitoring index had a mean of 3.51 with scores ranging from 0 to 6.

Translation and adaptation of safety behaviour measures

To ensure that the Italian version of the self-report scales were equivalent to the original versions in English, the development of the Italian instruments proceeded as follows: (1) two translations were made by blind experts in the constructs, (2) agreement by the experts on an initial version of the Italian scales, (3) the Italian version was back-translated by a native English speaker, (4) after fine-tuning, the second version of the scale was administered to 24 subjects from the plant that hosted this research, in order to assess the comprehensibility, clarity and the general relevance of the content to the business context, (5) some small modifications were made to the items.

Results and discussion

Means, standard deviations and correlation values of the study variables are shown in Table 1. First, objective safety improvement and objective safety monitoring were positively correlated (r = .46, p < .01), although not so strongly

Table 1. Safety behaviour and outcomes after 6 months (Study 1): means, standard deviations and correlations.

Dimension	*M*	*SD*	1	2	3	4	5
1. Safety initiative (Time 1)	3.63	.99	*(.88)*				
2. Safety helping (Time 1)	3.40	1.05	.41**	*(.92)*			
3. Safety compliance (Time 1)	4.41	.69	.10	−.06	*(.79)*		
4. Objective safety improvement (Time 2)	3.35	1.59	.57**	.25	.21	–	
5. Objective safety monitoring (Time 2)	3.51	1.63	.28*	.23	.30*	.54**	–

$N = 86$. Coefficients of alpha are presented in parentheses along diagonal.
*$p < .05$, **$p < .01$.

to suggest multicollinearity. The correlations between independent variables and criteria were significant in the main expected ways. Safety initiative was significantly correlated with objective safety improvement index ($r = .57$, $p < .01$). Safety compliance was positively correlated with objective safety monitoring ($r = .30$, $p < .01$).

To test research hypotheses, we conducted a hierarchical regression analysis with objective safety improvement at Time 2 as the dependent variable. Given our current research focus, we chose this statistical approach in order to identify the unique effects of safety initiative, taking in account the effects of job tenure (included in Step 1) and the other two forms of safety behaviours (safety compliance and safety helping, included in Step 2). Safety initiative behaviour was finally entered in the final Step 3 (see Table 2). As hypothesized, in the final regression equation, only safety initiative at Time 1 significantly predicted objective safety improvement ($\beta = .49$, $p < .05$). The resulting overall R^2 index was .21, indicating a fairly substantial amount of explained variance .

Next, using the same approach, we conducted a hierarchical regression analysis with objective safety monitoring at Time 2 as the dependent variable, with job tenure as a control variable. As expected, safety compliance significantly predicted objective safety monitoring in the final regression equation ($\beta = .42$, $p < .01$). The overall R^2 index was .19, indicating a significant moderated amount of explained variance (Cohen, 1988)

In summary, consistently with Hypothesis 1a, safety initiative was uniquely associated with a measure of objective safety improvement and not with an objective measure of safety compliance. Supporting Hypothesis 1b, safety compliance was uniquely associated with an objective measure of safety monitoring and not with an objective measure of safety improvement. These findings support the validity of the self-reported assessments of safety behaviours, and support the idea that these behaviours result in different safety outcomes. Conversely, safety helping was not found to be correlated neither with objective safety monitoring (as originally hypothesized), nor with objective safety improvement.

Table 2. Hierarchical regression analysis predicting objective safety criteria after 6 months (Study 1).

	Regression effects on antecedents					
	Step 1		Step 2		Step 3	
Antecedent	*β*	*t*	*β*	*t*	*β*	*t*
Objective safety improvement (Time 2):						
Job tenure	.21	1.35	.18	1.30	.08	.57
Safety compliance (Time 1)			.01	.09	.04	.25
Safety helping (Time 1)			.38	1.38	.04	.03
Safety initiative (Time 1)					.49	2.22*
R^2		.04		.13		.21
ΔR^2				.11		.08
F		1.18		2.36		3.77
Objective safety monitoring (Time 2):						
Job tenure	.17	1.18	.17	1.33	.15	1.15
Safety compliance (Time 1)			.38	2.93**	.39	3.01**
Safety helping (Time 1)			.25	2.01	.21	1.34
Safety initiative (Time 1)					.08	.49
R^2		.03		.19		.19
ΔR^2				.18		.00
F		1.38		5.07		3.81

$N = 86$.
*$p < .05$, **$p < .01$.

Study 2: the higher-order structure of proactive motivation

In the second study, we focus on the motivational antecedents of safety initiatives. We propose the importance of a higher-order proactive motivation construct that comprises three psychological states with a safety-specific content domain: "can do" motivation (role breadth self-efficacy; control beliefs), "reason to" motivation (psychological ownership; felt responsibility for constructive change) and future orientations (anticipation orientation; improvement orientation).

Method

Measures

In order to assess the higher-order structure of the theorized motivational states of "can do" motivation (self-efficacy, control beliefs), "reason to" motivation (psychological ownership, felt responsibility) and future orientation (anticipation orientation, improvement orientation), a 30-item questionnaire was developed on the basis of the existing proactivity literature using a theory-driven deductive approach (Curcuruto & Griffin, 2016), with the adaptation of preexisting measures of proactive motivation constructs to new contents associated with workplace safety management instances (Curcuruto, 2016). A description of the final set of items is reported in Appendix 1. In the present study, for every dimension we used five items evaluated on a five-point Likert scale. Participants were asked to express their degree of agreement with every item statement on a five-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*). On average, every scale presented corrected item-total correlation indices of .67 or higher. More details for each scale and their psychometric properties in the research sample of Study 2 are reported later.

The *role breadth self-efficacy* scale had item factor loading between .77 and .88, and also had high levels of internal consistency ($\alpha = .95$). A sample item of the five-item scale is: "I feel confident in analyzing recurring safety problems and suggesting solutions".

The scale of *control beliefs* showed item factor loading between .72 and .78, presenting as well a good level of internal consistency ($\alpha = .87$). A sample item is: "I feel in control of most safety problems in my work group".

The scale of *psychological ownership* had item factor loadings between .70 and .88, and also had a high level of internal consistency (α = .91). A sample item is: "I would be personally concerned if safety initiatives by workers were not constantly encouraged".

The scale of *felt responsibility* presented item factor loading between .66 and .83 and good level of scale consistency (α = .81). A sample item is: "I feel personally responsible for improving the safety of our operations".

The *improvement orientation* scale evidenced item factor loading between .75 and .87, and its relative reliability index showed good levels (α = .84). A sample item is: "Trying out new safety procedures in the end makes you less efficient in the job" (reverse code item).

Finally, the *anticipation orientation* scale presented factor loading indices between .70 and .86, showing high level of internal reliability (α = .89). A sample item is: "I can imagine myself resolving a safety threat even before it presents itself".

Control measures

To test discriminative aspects of the new psychometric instrument, we included two additional scales. First, we used the four-item scale of *safety motivation* by Neal et al. (2000) to compare our new scales with existing established measures of similar constructs. An example of items was: "I feel that it is important to maintain safety at all times". In this research sample, Cronbach's alpha was .93. Second, the levels of *risk perception* by workers were measured by a three-item scale adapted from the previous work by Leiter, Argentero and Zanaletti (2009). This scale measured risk perception in the workplace in terms of degree of probability, magnitude and personal exposure to risks. Participants were asked to indicate their personal exposure to risk and hazard for their health and psychical integrity (0 = *no exposure*; 4 = *totally exposed*), the perceived degree of probability to be personally a victim of a work accident in the following 12 months (0 = *improbable*; 4 = *certain*), and the perception of the severity of the consequence of work accidents for their health (0 = *harmless*; 4 = *fatal*). In this sample, Cronbach's alpha was .74.

Sample

The sample was 295 full-time team safety supervisors from a range of companies. Most were from a chemical fibre company (29.3%) and an engineering company (14.1%), with the remaining participants being from a pharmaceutical company, a packaging plant, an automobile production company, an energy company, and a city council administration. The average response rate from each company was 80%. Only 22% of participants were female. The average age of the sample was 39.4 years (*SD* = 15.1), and a job tenure average of 8.4 years (*SD* = 4.5). Average experience as team safety head was 3.8 years. Finally, the participants were principally employed in production (37.9%), logistics (21.2%), or in the research and development department (12.3%) of their organizations.

The questionnaires were collected during working hours, before periodic sessions on safety issues in the workplace, using a procedure ensuring anonymity, acceptance and discretional participation in the survey. All participation was voluntary and there was no reward or penalty for not participating. Data collected was used for research purposes only.

Results

Confirmatory factor analysis was performed to estimate a range of alternative models that test the factor structure for the 30-item proactive motivation scale. Each model included the six first-order factors corresponding to the subscales described earlier. We tested the model proposed in Hypothesis 2 by incorporating a second-order factor structure (representing safety-specific "can do" motivation; safety-specific "reason to" motivation; and future orientation). The hypothesized model with six first-order and three second-order factors yielded a good fit to data with a CFI of .96, a RMSEA of .04 and a SRMR of .06. All items significantly loaded on their respective components greater than .60 ($p < .01$) and 23 out of the 30 observed items loaded on their respective factor at .70 and higher ($p < .01$) (for more details see Appendix 1). In every case, the average of the item loading on every factor was higher than the correlation among the latent factors, giving us additional evidence of internal discriminative validity among the components of the model (Fornell & Larcker, 1981).

Comparison of alternative models

We then compared the hypothesized factor model (Model 1) with five alternative models. Three models contained only first-order factors: a one-factor model representing an overall motivation dimension (Model 2), a three-factor model representing the three broader dimensions (Model 3), and a six-factor model representing all subscales (Model 4). Two models incorporated alternative higher-order factor structures to the six first-order factors: a single higher-order factor (Model 5), and two higher-order factors (Model 6). As evident in Table 3, the chi square test did not show statistical differences between the hypothesized model and the collected data. Also, it appears better than the potential concurrent combinations of components in alternative second-order models.

AIC and BIC indices were used to compare the models (see Table 3). These indices are founded on information theory and provide an indication of the balance between statistical parsimony and goodness of fit across a set of concurrent statistical models from the same dataset, as they penalize the increase of the quantity of parameters included in a given statistical model (Anderson, 2008). Therefore, AIC and BIC are an estimator of the relative quality of statistical models for a given set of data. Thus, AIC and BIC provide a means for model selection: the model with the lowest AIC and BIC should be preferred. In addition, Burnham and Anderson (2003) provided specific threshold guidelines, which indicate that a difference of AIC and BIC higher than 7 suggest a significant and substantial difference of statistical plausibility between distinct concurrent models.

Table 3. Comparison of a priori "proactive motivation" superordinate factor models (CFA) (Study 2).

Model	Psychological factors	2nd order factors	Factor model description	χ^2	*df*	CFI	RMSEA	AIC	BIC
Model 1 (hypothesized factor model)	**Six first-order factors** (AO, CB, FR, IO, PO, SE)	Three	Three superordinate second-order factor dimensions of proactive motivation: (a) "Can do" motivation (CB, SE) (b) "Reason to" (FR, PO) (c) "Future orientation" (IO, AO)	601.1	396	.96	.04	744	1,010.5
Alternative model 2	**A single first-order factor**	None	All items loading to only a single proactive motivation factor	2,699.5	405	.54	.14	2,825.5	3,057.7
Alternative model 3	**Three first-order factors** (CB-SE) (FR-PO) (IO-AO)	None	The items loading in three first-order factor dimensions: (a) "Can do" motivation (CB-SE), (b) "Reason to" motivation (FR-PO), (c) "Future orientation" (IO, AO)	1,727.3	402	.75	.11	1,859.2	2,102.6
Alternative model 4	**Six first-order factors** (AO, CB, FR, IO, PO, SE)	None	A multiple set of safety-specific proactive motivation states—as described in the study—without any higher superordinate factor	600.1	390	.96	.04	756.1	1,043.7
Alternative model 5	**Six first-order factors** (AO, CB, FR, IO, PO, SE)	One	A single superordinate second-order factor dimension of proactive motivation towards safety	650.7	399	.95	.05	788.7	1,043.1
Alternative model 6	**Six first-order factors** (AO, CB, FR, IO, PO, SE)	Two	A first superordinate dimension of proactive motivation (CB, FR, PO, SE), and a second one of future orientation (IO, AO)	650.2	398	.95	.05	790.2	1,048.3

N = 295. CFA method of estimation was maximum likelihood.
Legend. AO = Anticipation Orientation; CB = Control Beliefs; FR = Felt Responsibility; IO = Improvement Orientation; PO = Psychological Ownership; SE = Self-Efficacy.

Our statistical analyses showed that our proposed hierarchical model presented the lowest AIC and BIC indices. This finding suggested that the hypothesized model was not only the best acceptable solution, but also the one presenting the best balance between statistical parsimony and goodness of fit. Given that all the alternative models included in our analyses presented AIC and BIC indices higher than Burnham and Anderson's threshold criteria (2003), we discarded them from future considerations in the present study.

Discriminant validity

Finally, the new scales presented only moderated correlations with a general measure of safety motivation, and low correlations with a risk perception scale (see Table 4), showing evidence of discriminant validity considering both promotion-preventive and approach-avoidance conceptual perspectives (Higgins, 2012; Hollnagel, 2014). Overall, all these results support the construct of proactive motivation towards safety management, as developed in Hypothesis 2.

Study 3: effects of proactive motivation on safety initiative

In the final study, we analyse the hypothesized effect of proactive motivation on safety initiative using a semi-longitudinal research design, and test a broad set of research hypotheses on motivational antecedents of different typologies of safety behaviours.

Method

Sample and procedure

The research was conducted in a petrochemical plant with approximately 300 employees. This industrial context can be characterized as a high-reliability organization system in terms of a strong emphasis on proactive, anticipatory and self-generative management of safety issues in a socio-technical system (Hollnagel, 2014; Reason, 2008; Vogus et al., 2014, 2010; Weick & Sutcliffe, 2007). At Time 1, participants provided their answers to an exhaustive version of a survey questionnaire, including measures of individual motivational antecedents (proactive motivation; affective commitment; scrupulousness), safety behaviours (safety initiative; safety helping; safety compliance) and control measures (individual risk perception; personal experience of critical incidents for safety). After 18 months, participants provided their answers to a shorter version of the questionnaire. This included measures of the safety behaviours criteria to test the longitudinal effects of motivational antecedents measured at Time 1 on the behavioural safety criteria measured at Time 2, after checking the influence effects of the same

Table 4. "Proactive motivation" factors: descriptive and correlation statistics (Study 2).

Factor	*M*	*SD*	1	2	3	4	5	6	7	8
1. Self-efficacy	3.54	.81	*(.95)*							
2. Control beliefs	3.44	.85	.58**	*(.83)*						
3. Psychological ownership	3.66	.85	.36**	.27**	*(94)*					
4. Felt responsibility	3.81	.73	.51**	.38**	.59**	*(.85)*				
5. Improvement orientation	3.63	1.10	.27**	.26**	.30**	.28**	*(.84)*			
6. Anticipation orientation	3.47	.88	.57**	.41**	.44**	.59**	.30**	*(.94)*		
7. General risk perception (np)	3.23	1.01	−.11	.07	−15**	−.09	−.01	−.23**	*(.74)*	
8. General safety motivation (np)	2.96	1.15	.18**	.26**	.21**	.25**	.05	.22**	.43**	*(.93)*

N = 295.
Coefficients of Alpha are presented in parentheses along diagonal; *$p < .05$; **$p < .01$. (np) indicates "non-proactive" psychological construct used here for discriminative validity.

safety behaviours measured at Time 1, together with the impact of the other control variables (risk perception, accident experiences).

A total of 186 valid questionnaires were collected at the beginning of two annual "safety day" meetings in 2013 and 2015. The response rate was 65%. The sample was comprised of men (92%), principally employed in the production (42.3%), logistic (13.7%), technical service (11.8%), packaging (11.2%) and research and development sectors (7.6%). Average age and job tenure were 40.4 (SD = 9.3) and 16.2 (SD = 9.8) years respectively, with standard deviations of 8.9 and 5.3.

Measures

Proactive motivation

In this study, we used a distinct measure for each element of proactive motivation represented by the three second-order factors used in Study 2: "can do", "reason to", future orientation. The overall measure of the superordinate dimension of "can do" proactive motivation included the 10 items of the scales of self-efficacy and control beliefs already presented in Study 2, and described in Appendix 1. In the present sample, the measure of this superordinate dimension presented a Cronbach's alpha of .83. Similarly, the overall measure of the superordinate dimension of "reason to" proactive motivation was composed of the 10 items of the scales of psychological ownership and felt responsibility introduced in Study 2. A description of all the items is reported in Appendix 1. In the present sample, the measure of this superordinate dimension presented a Cronbach's alpha of .85. Finally, the measure of the superordinate dimension of future orientation included the 10 items of the scales of anticipation orientation and improvement orientation presented in Study 2. Again, a description of these items is reported in Appendix 1. In the present sample, the measure of this superordinate dimension presented a Cronbach's alpha of .84.

Safety initiative

We used the four-item scale of "initiating safety-related change" by Hofmann et al. (2003) described in Study 1, using the same 5-point response scale. Employees were asked to report to which extent they engaged in these behaviours from the previous 4 months to the survey administration, with a range from 0 (*never*) to 4 (*frequently*). In the present research samples, the scale showed good internal consistency at both Time 1 (α = .91) and Time 2 (α = .85).

Safety helping

We used the same six-item scale of *helping* already used in Study 1 to measure safety helping (Hofmann et al., 2003). Employees were asked to report to which extent they engaged in these behaviours from the previous 4 months to the survey administration (0 = *never*; 4 = *frequently*). In the present samples, the scale showed good internal consistency at both Time 1 (α = .93) and Time 2 (α = .88).

Safety compliance

We used the same three-item scale presented in Study 1 (Mearns et al., 2001). Employees were invited to report to which extent they engaged in these non-compliance behaviours in the previous 4 months (0 = *never*; 4 = *frequently*). All items were reverse scored (content items are reported in the method section of Study 1). Cronbach's α was .83 at Time 1 and .79 at Time 2.

Organizational affective commitment

A four-item scale was used to assess affective organizational commitment (Pierro, Ricca, Tanucci, & Cavalieri, 1992). The scale was an adaptation of the scale originally developed by Allen and Meyer (1990). Participants were asked to report their level of agreement with a set of statements concerning their affective relationship with their organization. An example of an item is: "I really feel a sense of belonging to this organization". The scale used a 5-point response scale ranging from 1 (*strongly false*) to 5 (*strongly true*). With the present sample, Cronbach's α was .89.

Scrupulousness

This trait was measured with a short three-item scale tapping one of the two sub-dimensions of the conscientiousness scale by Caprara et al. (1993), which was developed for the administration in organizational contexts, on the basis of the NEO Personality Inventory (Costa & McCrae, 1992), showing a high degree of correlation (.63) with the previous scale validated by Costa et al. (Caprara et al., 1993). Specifically, the scrupulousness facet used here refers to dependability, orderliness and precision and caution tendencies by employees in carrying out their daily work. The items were: "In my work activities, I usually pay attention to the smallest detail of everything", "Before ending a job I spend a lot of time revising it", "I usually organize my work down to the smallest detail". The scale used a 5-point response scale ranging from 1 (*strongly false*) to 5 (*strongly true*). With the present sample, Cronbach's alpha was .92.

Control measures

In addition, we included two control variable measures. *Risk perception* in the workplace was measured with a three-item question scale (based on Leiter and colleagues, 2009) already described in Study 2. Cronbach's alpha in the present sample was .70. Four items were used to control for the effects of previous personal *experience of critical incidents* and negative events in one's own work-team activities. The scale asked: "Over the last 2 years, how many times have you personally experienced the following situations in your work-unit?". The situations included: property damage, minor-injuries, major injuries and near-miss events. In the present sample, this scale had a Cronbach's alpha of .81. The definitions given to participants were: near-miss, a risky-event without consequences for the instruments of labour and workers; property damage, a critical incident with negative consequences to structures/work tools, but without consequences for the health of workers; minor injury, a critical incident with negative consequence for people's health solved with a dressing, without days off work; and major injury, a critical incident which resulted in injuries which caused at least 1 day off work.

Concurrent validity

To provide evidence for concurrent validity of our safety behaviours measures, we asked and obtained further support

from the senior management of the Health and Safety office of the plant. First, 16 work-team supervisors from the production and maintenance divisions were asked to provide an external rate of the safety behaviours (initiative; helping; compliance) of three employees of the work groups under their responsibility. We expected these supervisor ratings would correlate with the average self-ratings of individual safety behaviours (initiative; helping; compliance) within this research subsample composed of 48 employees. These three employees from each work-team were selected randomly by the senior management of the Health and Safety office before the questionnaire administration at Time 2. Every team supervisor rated three shift members using the same scales reported earlier. Every individual was rated by only one shift supervisor.

Results

Measurement model

The structural equation approach was used to test the role of the three distinct superordinate dimensions of proactive motivation: "can do", "reason to", future orientation. We first estimated a comprehensive measurement model that included the main superordinate components of proactive motivation. For the superordinate "can do" dimension, we used scale scores for the two subscales of self-efficacy and control beliefs. For the superordinate "reason to" dimension, we used the scale scores for the two subscales of felt responsibility and psychological ownership. For the superordinate dimension of future orientation, we used the scale scores for the two subscales of improvement and anticipation orientations.

Our measurement model also included additional motivational factors of affective commitment indicated by four items and scrupulousness indicated by three items. Finally, the measurement model included three factors that captured the behavioural criteria of safety compliance, safety helping and safety initiative.

The overall measurement model showed an acceptable fit to the data (χ^2 = 423.6, *df* = 296, CFI = .96, RMSEA = .05). The hypothesized model showed a significantly better fit than alternative models including a method-bias factor model and four alternative five-factor models which considered proactive motivation scales loading respectively in a first-order factor of safety initiative, safety helping, safety compliance, affective commitment or scrupulousness (see Appendix 2 for more details on these alternative models).

Descriptive and correlation statistics

Means, standard deviations and zero-order correlations of the variables are shown in Table 5. All the three distinct factors of proactive motivation showed positive correlations with safety initiative and safety helping measured at Time 2. The "can do" dimension showed the higher correlations (r = .26 and .19; p < .01), followed by "reason to" (r = .24 and .16; p < .01), and future orientation (r = .21 and .17; p < .01). Instead, we did not find any relevant correlation with safety compliance assessed at Time 2 (r between .07 and .13; p > .05). Finally, none of the three dimensions of proactive motivation presented significant correlations with the control variables (risk perception; critical incident experience).

Concurrent validity test

Concurrent validity of safety behaviour measured at Time 2 was tested on a subsample of 48 shift workers. We expected to find positive correlations of shift supervisor external ratings of safety behaviours and individual self-report behaviour. Statistical findings showed the external rate of safety initiative significantly and positively correlated with individual self-reported safety initiative (r = .41; p < .05). The external rate of safety helping was found to be correlated with individual self-reported safety helping (r = .33; p < .05), whereas the external rate of safety compliance was significantly, positively correlated with individual self-reported safety compliance (r = .38; p < .05).

Hypothesis testing

We then estimated structural paths to test our hypothesized model, with the three superordinate dimensions of proactive motivation ("can do"; "reason to"; future orientation) affecting

Table 5. Descriptive and correlation matrix: safety behaviour (Time 1 and Time 2) and individual antecedents (Time 1) (Study 3).

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. "Reason to" motivation	3.97	.67	*(.85)*												
2. "Can do" motivation	3.74	.63	.51**	*(.83)*											
3. Future orientation	3.91	.59	.46**	46**	*(.84)*										
4. Affective commitment	3.53	1.1	.42**	.38**	.23**	*(.89)*									
5. Scrupulousness	4.35	.65	.03	.09	.07	.11	*(.92)*								
6. Safety initiative (T1)	2.92	1.1	.29**	.28**	.25**	.21**	−.01	*(.91)*							
7. Safety helping (T1)	2.98	1.3	.24**	20**	19**	.20**	.10	.37**	*(.93)*						
8. Safety compliance (T1)	4.24	.86	.13	.14*	18*	.17*	.31**	−.10	−.08	*(.83)*					
9. Safety initiative (T2)	3.76	.95	.24**	.26**	.21**	.12	.06	.46**	.21**	.07	*(.85)*				
10. Safety helping (T2)	3.87	1.06	.16**	.19**	.17**	.23**	.08	.16**	.51**	.12	.53**	*(.88)*			
11. Safety compliance (T2)	4.16	.78	.07	.11	13	.18**	.21**	17**	14*	.43**	−.13	−.06	*(.79)*		
12. Incidents experience	.76	.91	.01	−.05	−.07	−.04	−.06	.09	.18**	−.25**	.10	.06	−.13	*(.82)*	
13. Risk perception	2.42	1.17	.08	.07	−.05	.03	−.07	.12	.23**	−.19**	.04	.08	.11	.24**	*(.66)*

N = 188. Coefficients of alpha are presented in parentheses along diagonal; *p < .05; **p < .01.
"Reason to" motivation dimension domain includes psychological ownership and felt responsibility.
"Can do" motivation dimension domain includes control beliefs and self-efficacy.
Future orientation dimension domain includes anticipation orientation and improvement orientation.

safety initiative (assessed at Time 2). This model also included the effects of past behaviours and control variables (both assessed at Time 1) on safety initiatives, safety helping and safety compliance (all assessed at Time 2). This model provided an acceptable fit with the data (χ^2 = 22.5; *df* = 18; CFI = .99; RMSEA = .04). In our model, the path from proactive motivation to safety initiative was significant both for "can do" (β = .20; p < .01), "reason to" (β = .18; p < .01) and future orientation (β = .17; p < .01), supporting Hypothesis 3a. Coherently with Hypotheses 3b and 3c, affective commitment predicted safety compliance (β = .16; p < .01), and safety helping (β = .27; p < .01). Supporting Hypotheses 3d, scrupulousness predicted safety compliance (β = .14; p < .05). All these findings are showed in Figure 2.

General discussion

We set out in this research to ascertain whether safety initiative—initiating a safety-related change in the workplace—is a meaningful and distinct form of safety behaviour and, if so, to understand its motivational underpinnings and distinctive outcomes for the organizations. In the existing literature, to the small extent safety initiative is covered, it is blurred in with organizational citizenship such that it is not possible to ascertain its unique contribution. The wider work performance literature has made a strong case that change-oriented behaviour is conceptually and empirically very different from other forms of organizational citizenship (Griffin et al., 2007; McAllister et al., 2007). The focus on self-initiation and change renders safety initiative particularly useful in uncertain contexts yet, at the same time, it is a psychologically risky form of behaviour that can be challenging to cultivate. We have argued here that safety initiative might be especially important for maintaining high reliability in complex and uncertain contexts where it is not possible to a priori prescribe all the safety precautions that should be taken. Findings across three studies support the distinctiveness of safety initiative, not only via factorial validity, but also by showing this form of behaviour has distinct motivational antecedents and is uniquely associated with improvement oriented outcomes.

First, in Study 1, we showed that only safety initiative predicted objective safety improvement outcomes six months later, including the number of safety suggestions generated in work groups and spontaneous reports of near misses. These outcomes are highly future-focused, with the suggestions and reports focusing on longer-term changes in the work and organizational environment in order to mitigate risk. Examples of recorded suggestions include proposing to improve an operational procedure or a work practice, suggesting new tools or technological changes to adjust the fit between production and safety, and proposing original solutions to correct recurrent problems after a near-miss. Such behaviours are likely to be essential for achieving high reliability. As has been argued in the literature, in complex organizations with high levels of dynamism and interdependence between human and technical components, unpredictability is generated (Hollnagel, 2014; Weick

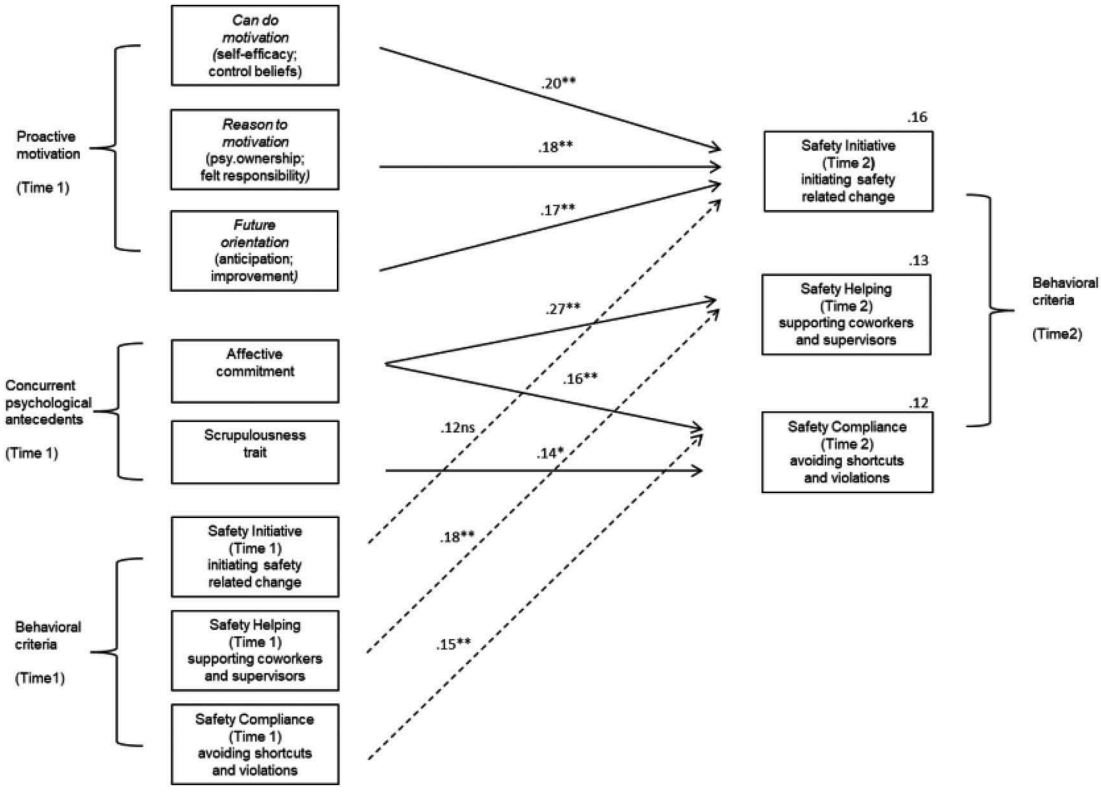

Figure 2. Verified model in Study 3.

Notes. Full lines show hypothesized paths; dashed lines show non-hypothesized paths; dotted lines show the effects of safety behaviours measured at Time 1 (control effect) on the same safety behaviours criteria measured at Time 2.

& Sutcliffe, 2007), which in turn results in unanticipated risks. It is vital that employees proactively anticipate and report the emergence of possible risks beyond those that are more immediate. Our study shows that individuals' level of engagement in safety initiative predicts these tangible, objective and important and future-oriented outcomes. In the meantime, safety compliance did not predict objective improvement outcomes but, as expected, predicted monitoring outcomes that focus on correcting current risks in the present, such as removing immediate hazards in the environment. Of course, these outcomes are important, indeed crucial, as well. The point is, however, that they are unlikely to be sufficient in most organizations, so a focus on safety compliance alone, or even a focus on safety compliance and helping, is likely to be incomplete when considering workplace safety.

In Study 2 and Study 3, our focus moved to understanding where safety initiative derives from. We introduced the notion of proactive motivation towards the management of safety in the workplace, and showed that this higher-order concept (encompassing "can do" and "reason to" forms of motivation) is quite distinct from the perceptions of risk predictability, severity and exposure that are often highlighted as driving more reactive approaches to safety management (Griffin et al., 2016). The latter are prevention-oriented concepts, whereas proactive motivation reflects a promotion-oriented approach to safety (Curcuruto & Griffin, 2016; Higgins, 2012) that has had little attention (Hollnagel, 2014; Wallance & Chen, 2006). Most importantly, and as predicted, proactive motivation was indeed a key driver of safety initiative. At the same time, neither affective commitment nor scrupulousness dimension of conscientiousness—two previously established predictors of safety behaviour—predicted safety initiative. These antecedents predicted the more passive forms of safety behaviour in our study, safety compliance and safety helping.

Our findings for antecedents of compliance vs proactivity concur with research in the broader literature on proactivity. Parker et al. (2006) reported that proactive motivation (encompassing self-efficacy, role orientation and other variables like those included in proactive motivation) predicted proactive problem solving (similar to safety initiative), whereas affective commitment predicted generalized work compliance (similar to safety compliance). Although some studies have shown that commitment predicts proactivity (e.g., Den Hartog & Belschak, 2007), these studies actually in most cases do not include proactive motivation, so it is not that commitment is unimportant, only that proactive motivation is much more important. Likewise, Parker and Collins (2010) reported that conscientiousness was not an important predictor of proactive work behaviours and proactive strategic behaviours like taking charge and improving work methods, although it did predict proactive person-environment fit behaviours. They argued that "although conscientiousness drives effort to better fit within the environment, it does not necessarily drive effort towards more personally 'risky' behaviours that change the environment, such as challenging the status quo" (p. 614). In sum, like the broader proactivity literature, it appears that safety initiative requires more than a sense of commitment or desire to put in effect: it also requires that an individual have strong positive beliefs about their capabilities and the feasibility of change, and a flexible and future-focused orientation towards one's role and safety. In addition, our results suggest that distinct elements of safety citizenship might be better understood when studied as separated constructs (Curcuruto & Griffin, 2018).

Our findings suggest that managers and safety advisors should consider how to stimulate specific safety behaviours, recognizing that what is important for one behaviour might be different to what is required for another behaviour. Our study suggests that safety compliance will be enhanced through the activation of scrupulousness and the stimulation of commitment, whereas safety initiative is driven by self-efficacy beliefs, broader role orientations and a future-focused approach to safety. The latter are active cognitive-motivational states that, in turn, are likely to be facilitated by different contextual factors. For example, whereas role clarity is important for promoting work proficiency or core task performance (Griffin et al., 2007), job autonomy is one of the most important antecedents of work proactivity (e.g., Parker et al., 2010). It might be that autonomy—perhaps in the form of empowering leadership, self-management teams, or team empowerment—is similarly crucial for safety-related proactivity. If so, achieving a balance between control-oriented processes and role clarity that engender compliance against autonomous structures that motivate behaviours like proactivity might be a very important challenge (Parker, 2014).

Limitations and future research

The study has several strengths, including the use of three independent samples from different organizational levels (middle managers, team supervisors, work operators), one of which used objective data. But there are nevertheless methodological limitations. First, we used self-report measures of safety behaviours. Evidence of the validity of these self-reports came from our initial study, which showed that they predicted lagged organizational outcomes. A further advantage is that self-report measures avoid the bias that can occur using supervisory ratings (for example, employees are unlikely to fail to comply with safety regulations in front of a supervisor). Finally, we took steps to ensure that individuals can be honest in their reports, and not feel pressured to provide socially desirable responses. Nevertheless, it is important to replicate this research using other forms of data collection.

Our second important limitation is that, although both Study 1 and Study 3 contribute with a longitudinal element of analysis in our research—with data collection provided at two different times—we were not able to include concurrent measures of the independent and dependent variables at each time of data collection. Consequently, this does not allow us to infer any causal links between the antecedents and the criteria included in our research studies. In Study 3, the reverse causal influence from scrupulousness to safety behaviour is unlikely, since scrupulousness is considered a

relatively stable personality trait. However, it is plausible (although perhaps less likely) that, for example, engaging in safety initiative results in higher proactive motivation, or that engaging in safety initiative induces higher levels of affective commitment. Further longitudinal research should be designed by including a higher level of control on the research variables. This would test every possible causal effect, including the possibility to check for *reverse-effects* in directions not immediately deductible from the literature.

Third, given empirical evidence from previous studies that show safety participation predicting compliance, researchers might be interested in investigating the potential mediational role of safety initiative and safety helping on workers' safety compliance. Furthermore, as we did not test our research hypotheses within a single study, we could not consider safety behaviours as mediators of the effects between motivation and objective outcomes. Future studies could produce important contributions by investigating these mediational mechanisms.

Fourth, in Study 3 we found that the effects of distinct elements of proactive motivation on safety initiative were all significant. This seems to suggest that these distinct dimensions of proactive motivation can contribute to stimulating individual initiative in a complementary way. However, future studies should be focused on understanding under which conditions "can do", "reason to" and future orientation might singly effect safety initiative in the absence of a significant influence from the other dimensions.

Finally, generalizability remains to be established, especially as Study 1 and Study 2 were based on samples consisting of safety supervisors and team leaders rather than shop floor workers. In addition, all of the research was conducted within a chemical processing context, where safety is a significant business-related area, and the possibility of socially acceptable answers need to be investigated in more depth.

Beyond replicating the research in other samples and with stronger research designs, further important variables might be considered in future research. Notably, our studies did not include investigations of work contexts (supervision; team-working, etc.), which likely contribute in different ways to affecting safety behaviours, via the direct motivational paths investigated in our research, or interacting with other contextual moderators. More attention should also be given to additional individual worker characteristics (safety knowledge, situational awareness) and social factors (e.g., trust climate) that might allow the emergence of proactive behaviours towards workplace safety. Ultimately, given the likely challenges of being proactive in such a delicate organizational domain, it is important to assess which contextual and individual forces, or their interaction, generate proactive motivation. We hope this study provides the foundation for this important and logical next step.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix 1. CFA's factor loading coefficient indices (Study 2)

Item content description	Loading
Self-efficacy	
SE2 Feeling confident in…analyzing recurring problems for safety to propose solutions	.93
SE3 Feeling confident in…devising new methods to improve safety in my work area	.90
SE1 Feeling confident in…helping to set the safety goals in one's own work-team	.83
SE4 Feeling confident in…dealing with colleagues from departments to discuss improvements	.78
SE5 Feeling confident in…taking concrete initiatives to make improvements to the safety of my department	.69
Control beliefs	
CB2 Perceiving to being able to make significant contributions to the safety of the work area	.82
CB3 Perceiving to have opportunities to influence safety if something of relevant happens	.79
CB4 Perceiving that one's own actions have great importance for the safety of the work-team	.74
CB1 Perceiving that most of the safety problems in the work are under one's own control	.72
CB5 Perceiving to be able to positively impact safety-related issues in the workplace	.64
Psychological ownership	
PO4 Being personally concerned for…worker involvement in safety improvement programs	.91
PO3 Being personally concerned for…continuous safety communication to the workforce	.89
PO5 Being personally concerned for…considering new ways to manage safety in the organization	.83
PO1 Being personally concerned for…stimulating worker initiatives for safety	.78
PO2 Being personally concerned for…safety engagement by every team member	.67
Felt responsibility	
FR2 Depend on me to make improvements to the safety of the workplace	.79
FR3 Feeling a sense of personal responsibility in trying to make changes for safety	.76
FR5 To strive hard to be an example for one's own commitment to safety	.71
FR4 To pay attention to the errors that colleagues can take in their work	.67
FR1 Being interested in being involved in extra work-activities safety related	.65
Anticipation orientation	
AO5 Anticipating a risk or a safety problem thinking of the possible alternative scenarios	.90
AO4 Looking the situations from various safety perspectives to find the appropriate solutions	.88
AO2 Even before they really happen, thinking about various risky situations for safety	.86
AO3 Looking forward to ensure that future safety in my team is good and well-defined	.79
AO1 Imagining how to face adverse safety situations before they arise	.69
Improvement orientation (reverse code scale)	
IO4 The time dedicated to safety improvement issues might subtract time to production goals	.88
IO5 Learning continuously new things on safety might make you less efficient in your work	.85
IO2 The principal goal of the work here is to produce results, not to think about safety	.76
IO3 Sometimes the safety procedures and regulations are changed just for the sake of doing it	.66
IO1 When the work goes on smoothly there is no need to think about changing things	.60

Appendix 2. CFA measurement model comparison: superordinate dimensions of proactive motivation (Study 3)

Model	Model description	Factors included in the model	χ^2	*df*	CFI	RMSEA	AIC
Model 1	**Eight first-order factors**	"Can do" motivation	423.6	296	.96	.05	587.6
		"Reason to" motivation					
(hypothesized factor model)	Three distinct superordinate dimensions of proactive motivation	Future orientation					
		Safety initiative *(initiating safety-related change)*					
		Safety helping					
		Safety compliance					
		Scrupulousness					
		Affective commitment					
First-order model	**Only method factor**	A single method factor	2,809.1	299	.43	.19	2,913.1
Alternative model 2	**Five first-order factors**	Safety initiative ± Proactive motivation	711.7	289	.90	.07	835.7
		Safety helping					
	proactive motivation merged with safety initiative	Safety compliance					
		Scrupulousness					
		Affective commitment					
Alternative model 3	**Five first-order factors**	Safety initiative *(initiating safety-related change)*	760.4	289	.89	.08	884.4
		Safety helping ± Proactive motivation					
	proactive motivation merged with safety helping	Safety compliance					
		Scrupulousness					
		Affective commitment					
Alternative model 4	**Five first-order factors**	Safety initiative *(initiating safety-related change)*	819.9	289	.88	.09	943.9
		Safety helping					
	proactive motivation merged with safety compliance	Safety compliance ± Proactive motivation					
		Scrupulousness					
		Affective commitment					
Alternative model 5	**Five first-order factors**	Safety initiative *(initiating safety-related change)*	847.7	289	.87	.09	971.7
		Safety helping					
	proactive motivation merged with scrupulousness	Safety compliance					
		Scrupulousness ± Proactive motivation					
		Affective commitment					
Alternative model 6	**Five first-order factors**	Safety initiative *(initiating safety-related change)*	714.8	289	.90	.08	838.8
		Safety helping					
	proactive motivation merged with affective commitment	Safety compliance					
		Scrupulousness					
		Affective commitment ± Proactive motivation					

Notes. $N = 188$. CFA method of estimation was maximum likelihood.
In the hypothesized factor model, proactive motivation is conceptualized as composed of three superordinate dimension domains of "reason to" motivation, "can do" motivation and "future orientation".
"Reason to" motivation dimension domain includes psychological ownership and felt responsibility.
"Can do" motivation dimension domain includes control beliefs and self-efficacy.
"Future orientation" dimension domain includes anticipation orientation and improvement orientation.
No superordinate factor is hypothesized in alternative models 2–6.