Voicing for Safety in the Workplace:

A Proactive Goal-Regulation Perspective

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Abstract

Safety voice refers to proactive communication actions that aim to improve safety by identifying current limitations and possibilities to create a safer workplace. This entails individuals to identify hazards and dangerous ways of working in advance, and provide constructive suggestions to generate a positive change. Drawing on goal regulation literature, we aim to investigate safety voice as a part of a dual safety-specific proactivity process: a goal generation phase characterised by mental simulation and anticipation of risks (namely 'safety envisioning'), and a goal striving stage which involves acting aimed at enhancing safety (here represented by 'safety voice'). Study 1a provides support to the distinction between these two phases in a large sample of laboratory supervisors (N = 233). Study 1b showed the predictive validity of safety envisioning on safety voice (N = 71 managers). Study 2 evidenced the effects of organizational antecedents (perceived job control; supervisor and coworker support) on goal safety envisioning in a large sample of chemical workers from Central Europe (N = 157). Our paper adds an emergent stream of research by applying a goal-regulatory perspective in occupational safety.

VOICING FOR SAFETY IN THE WORKPLACE:

A PROACTIVE GOAL-REGULATION PERSPECTIVE

As organisational environments become more complex and uncertain, it is becoming more difficult to anticipate and pre-empt risks (Griffin & Curcuruto, 2016; Hollnagel, 2014; Tucker, Chmiel, Turner, Hershcovis, & Stride, 2008; Weick & Suitcliffe, 2007). To manage safety in this context, it is not sufficient for employees to simply comply with safety regulations, such as following prescribed procedures (Burke, Sarpy, Tesluk, & Smith-Crowe, 2002; Christian, Bradley, Wallace & Burke, 2009; Curcuruto, Parker, & Griffin, 2019). It is also important for employees to proactively anticipate critical risks and raise their concerns about safety to support organisational learning and improve overall safety (Conchie, 2013; Hofmann, Morgeson, & Gerras, 2003; Zohar, 2008).

Over recent years researchers have sought to understand the active role played by employees in the creation of a sustainable safe work environment, (Clarke, 2006a; Conchie, Taylor & Donald, 2012; Curcuruto, Conchie, Mariani, & Violante, 2015; Neal, Griffin, & Hart, 2000). Proactive behaviours by employees can improve their own physical safety, the safety of their coworkers, and the overall organisational safety performance (Curcuruto, Mearns, & Mariani, 2016; Tucker et al., 2008; Vogus, Suitcliffe, & Weick, 2010). These proactive behaviours are difficult to prescribe in standard job descriptions and require substantial personal investment from employees. It is therefore important to understand the motivational resources that support engaging in this important behaviour.

Research has consistently demonstrated that goals are a key motivational resource that contribute to positive safety outcomes. Empirical studies show that organisations that clearly communicate safety goals achieve significantly better safety performance and compliance with rules and procedures, reduction of risk-conditions, inappropriate behaviours and accidents and

injuries over time (Boyce & Geller, 2001; Cooper, Phillips, Sutherland, & Makin, 1994; Fellner & Sulzer-Azaroff, 1985). Although goal-setting intervention strategies lead to better safety outcomes, most research has traditionally focused on prescribed goals identified by management to improve safety compliance oriented behaviours (Bumstead, & Boyce, 2005; Cooper, 2006; Laitinen, & Ruohomäki, 1996; Ludwig & Geller, 2000; Marsh, Robertson, Duff, Phillip, Cooper, & Weyman, 1995; Sulzer-Azaroff, Loafman, Merante, & Hlavacek, 1990). These goals tend to focus on compliance with procedures and standards, rather than on the anticipation of future safety risks. Less attention has been given to safety-related goals in situations that cannot be prescribed or predicted, but that are self-determined by employees in anticipation of future risks and threats.

In this study, we investigate a proactive form of employee engagement in the promotion of workplace safety, known as 'safety voice' (Conchie et al., 2012), with the adoption of a goal-regulation based approach to understand its motivational drivers (Bindl & Parker, 2010). Employee voice behaviour refers to "informal and discretionary communication by an employee of ideas, suggestions, concerns, information about problems, or opinions about work-related issues to persons who might be able to take appropriate action, with the intent to bring about improvement or change" (Morrison, 2014; p. 174). In the context of occupational safety research, employee voice is considered a proactive form of safety behaviour which tends to go beyond safety compliance (Curcuruto & Griffin, 2018). As such, safety voice is usually considered a specific behavioural expression of the broader construct of safety participation (Conchie, 2013, which includes actions such as "helping coworkers, promoting the safety program within the workplace, demonstrating initiative, and putting effort into improving safety in the workplace" (Neal et al., 2000, p. 101). In the present study, we intend to analyse safety voice as part of a broader proactive goal-regulation process which supports the early identification and preventive management of potential threats for workplace safety. Goal-regulation refers to a psychological conscious system of personal management that involves the

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process of guiding one's own thoughts and behaviours to reach relevant goals (Bindl & Parker, 2010). This self-regulatory process consists of distinct reflecting and enacting phases, where individuals must function as contributors to their own motivation, planning feasible behavioural strategies to achieve their desired goals. In spite of the differences between the existing self-regulatory models currently described in the literature, there is a general consensus about the distinction between a goal-generation phase, where individuals select and identify their personal goals, and a goal-striving phase, where individuals implement a specific course of action to achieve their desired outcome. Together, goal generation and goal striving compound a unique goal-regulation process which is essential to guide individual proactive actions in the workplace.

In this study, we also intend to explore the role of social and task context in shaping safety related goal regulation phases. Specifically, we investigate supervisor and co-worker support for safety as important sources of social resources in work-teams that direct employees' commitment in safety promotion, as shown in recent studies that highlighted the role of social-exchange mechanisms in motivating individual safety citizenship behaviour (Curcuruto & Griffin, 2018; Laurent, Chmiel, & Hansez, 2018; Tucker et al., 2008). Moreover, we will consider the role of perceived personal control on job safety-related instances. Various researchers have called for investigations into the role of work design and other organisational factors in promoting occupational safety (Curcuruto et al., 2019; Parker, 2014; Tetrick & Peirò, 2012; Zohar, 2008). For instance, Parker, Axtell and Turner (2001) showed that job autonomy predicts safe working practices, suggesting that job design strategies (i.e. job enrichment; employee empowerment) which support employees' perception of control over their work might not only have positive effects on enhanced employee performance, but could also promote other under-investigated positive benefits for the organisation, such as higher safety participation and a broader proactive role orientation by workers in safety maintenance and accident prevention (Turner, Chmiel, & Wall, 2005).

In the light of our research aims, the first part of the present article will discuss the relevance of adopting a goal-regulation perspective for the understanding of safety-specific forms of proactive behaviour like safety voice. Drawing on goal regulation literature, we will present a dual safety-specific proactivity process: a goal generation phase characterised by mental simulation and anticipation of risks (namely 'safety envisioning'), and a goal striving stage which involves acting aimed at enhancing safety (represented by 'safety voice'). Then, the following section will present the development of a set of research hypotheses on the role of contextual antecedents (i.e. perceived job control; supervisor and co-workers support) in supporting the safety-related proactivity process of goal generation and goal striving. The second part of our article will present three survey studies undertaken to test and verify our research hypotheses. Statistical results will be separately presented for each study. Finally, a general discussion will close the article, by presenting the contributions offered to the advancement of the research in the field, the implications for safety management in the organisations, and suggestions for future studies in the area of safety related proactivity.

Safety behaviour and proactive goal regulation

Traditional approaches to safety have focused on risk mitigation through safety compliance (Hollnagel, 2014). Safety compliance is certainly essential to contain risks that are known and can be anticipated. However, not all risks can be predicted in advance, especially in highly complex organisations with high levels of dynamism and interdependence between human and technical components (Griffin, Cordery, & Soo, 2016). The latter generates greater unpredictability than traditional organisations, which means that risks can emerge in a system, often in surprising ways (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 advance.

Our focus on proactivity supports a discretional goal-oriented approach to occupational health and safety (Tetrick & Peirò, 2012). From a proactivity perspective, individuals evaluate

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risks, demands, and future uncertainties in terms of challenges to be overcome rather than threats and losses (Parker, Wang, & Liao, 2019). In the field of occupational safety research therefore, proactivity tends to focus more on a *promotion* oriented self-regulatory perspective than traditional safety approaches, which are *loss-avoidance* oriented (Curcuruto, Conchie, & Griffin, 2019; Griffin & Talati, 2013). In a goal regulation perspective, the maintenance of safety is seen as a positive organisational outcome to achieve, rather than a potential loss to avoid (Hollnagel, 2014). Goal setting affects safety performance by directing the attention and actions of individuals, mobilising effort, and increasing commitment to safety maintenance and improvement (Kanfer, Frese, & Johnson, 2007). Combined with feedback from supervisors and peers, safety goal regulation support effort and persistence toward proactively solving or preventing safety problems (Marsch et al., 1996).

To understand the role of goal regulation in proactive safety behaviours, we draw on Parker and colleagues' model of proactivity (Parker, Bindl, & Strauss, 2010). Based on the two-stage motivation theory (Kanfer & Ackerman 1989, Chen & Kanfer, 2006), Parker et al. (2010) proposed that when an individual tries to bring about a different future, they engage in conscious goal-directed processes, including both goal generation and goal striving. In line with this approach, we distinguish between two dimensions of safety-related proactive goal regulation processes: safety-goal generation and safety goal-striving. Goal generation involves the anticipation of desired future outcomes and the development of strategies aimed at bringing these outcomes about, while goal striving captures "day-to-day behaviours" (Parker et al., 2010, p. 830) aimed at achieving these goals. To provide a specific focus for our study of goal regulation and safety, we investigate safety-goal generation in terms of "safety envisioning" and safety goal striving in terms of "safety voice".

Proactive goal generation: safety envisioning

We propose that safety envisioning is the foundation of proactive goal generation, and it involves a process of actively thinking about future risks and safety-relevant situations (Parker et al., 2010). Envisioning involves perceiving a future problem, and to imagine a different future that can be achieved by actively addressing this problem (Kooij, Kanfer, Betts, & Rudolph, 2018). Envisioning involves anticipating future outcomes and mentally representing and imagining a situation, or event at some forward point in time (Grant & Ashford, 2008). Similar concepts of anticipatory thinking developed in the field of occupational health psychology describe how individuals actively generate goals to manage their health and well-being (Greenglass, 2002). Individuals mentally simulate a critical event that may occur in the future (Flin, O'Connor, & Crichton, 2008), and then plan appropriate courses of actions and mobilise personal resources to change the future situation (Tetrick & Peirò, 2012).

In the field of occupational safety, safety envisioning describes a mental reflective process enacted by individuals to deal with potential threats for their own and colleagues' health and safety in the workplace. In safety envisioning, there is a risk that a future event may cause harm or loss, and the person needs to cope with this perceived risk. When the situation is appraised as a potential threat, the function of safety envisioning may lie in proactively solving the potential problem (Parker, Williams, & Turner, 2006), investing one's resources to prevent the threat (Curcuruto & Griffin, 2018), communicating the problem to the supervisor (Conchie, 2013), or getting colleagues' help (Brondino, Silva, & Pasini, 2012). All these examples of individual initiatives involve proactively investing one's resources to prevent the potential threat to workplace safety (Curcuruto et al, 2015). In any event, safety envisioning orients individuals toward the future and involves a proactive effort to build up personal resources to meet challenging situations (Parker et al., 2010). This anticipatory goal generation associated with safety envisioning is also reflected in the recent literature developments on socio-technical systems and high reliability organisations (HROs), like for instance the 'mindful organizing'

model (Weick & Sutcliffe, 2007), and the 'resilience engineering' paradigm (Hollangel, 2014). However, differently from these conceptual frameworks which are focused on the concept of risk anticipation and containment as collective processes enacted by teams and organizations, our present contribution intends to contribute to a better conceptualization of risk anticipation and prevention at the individual psychological level of analysis.

Proactive goal striving: safety voice

Safety-goal striving entails the concrete steps taken to achieve safety goals. Specific actions can include speaking out about safety concerns, showing personal initiative to solve problems, selling issues and suggestions to supervisors and coworkers, and persisting in the face of obstacles (Hofmann et al., 2003). Safety voice is a key behaviour that captures many aspects of safety-goal striving. Tucker and colleagues (2008) described voice as a form of open communication aimed at changing unsafe working conditions via formal and informal channels. Safety voice can be directed toward numerous targets (e.g. supervisors/managers, coworkers, union officials, government officials), and is instrumental in reducing accidents in the workplace (Hofmann & Morgeson, 1999).

Safety voice can be distinguished from similar extra-role behaviours such as safety participation (e.g. Neal et al., 2000), proactive problem-solving (e.g. Parker, Williams, & Turner, 2006), and prosocial safety behaviours like helping or stewardship (Curcuruto et al., 2015). For instance, while safety participation mainly focuses on the individual contribute to support the managerial programs that already exist in the organization (team safety sessions; suggestion system), safety voice entails a major emphasis to cope with situation that might be not prescribed by the organizational programs (Griffin & Curcuruto, 2016). Similarly, while proactive problem solving is about providing solutions to existing problems, safety voice entails directing individual effort toward the prevention of problems (Saracino et al., 2015). Finally, differently from prosocial behaviours (like helping or stewardship) which have a direct target in supporting other people in the organization, safety voice focuses on improving the way the work operations

are effectively done, with a specific change orientation focus (Curcuruto & Griffin, 2018). Safety voice is also difficult to enact because it may represent a challenge to existing work practices. Therefore, engaging in such behaviour has the potential to be viewed critically by other members of the workplace (Conchie, 2013; Tucker et al., 2008). In line with these arguments, Conchie and colleagues (2012) describe safety voice as a safety-specific challenging behaviour that seeks to improve safety by identifying current limitations and possibilities for positive change. Safety voice requires initiative (e.g. identifying ways in which safety may be improved), and assuming responsibility and choice (e.g. to raise a concern or to not raise a concern) (Curcuruto & Griffin, 2018). From this perspective, safety voice is a proactive and goal-directed safety behaviour that individuals engage in through their own volition (Conchie, 2013). The concept of safety voice is consistent with general research on proactive behaviours and discloses the importance of self-regulatory mechanisms for leading people to show initiative and take charge to improve the workplace (Bindl & Parker, 2010).

The above discussion of safety goal regulation highlights the role of two distinct activities. First, safety envisioning represents a process of goal generation in which an individual actively evaluates occupational risks and future alternatives. Second, safety voice represents a process of goal striving in which an individual engages in proactive behaviours to defend, and potentially improve, workplace safety. On this basis, we first propose:

Hypothesis 1: *Safety envisioning and safety voice are distinct concepts in an overall process of proactive safety-related goal regulation.*

Antecedents of safety envisioning and safety voice

Social and contextual resources are an important source of self-regulation activities (Parker et al., 2010; 2019; Tetrick & Peirò, 2012). In the field of safety research, few studies have explored the contextual antecedents that lead people to take an anticipatory and proactive approach toward safety (Curcuruto et al, 2019; Zohar, 2008). Although speaking out about safety

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concerns is important to injury prevention (e.g. Curcuruto et al., 2015; Hofmann & Morgeson, 1999), safety research on the contextual correlates of employee voice, here considered as a proactive communication act directed to the protection of people and workplace safety, is still sparse (Curcuruto & Griffin, 2018; Tucker & Turner, 2015).

Drowning on the exhaustive conceptual review on the organizational antecedents of proactivity in the workplace offered by Wu and Parker (2001), we will consider in our study three antecedents: perceived job control, supervisor support and co-worker support. Support from supervisors and coworkers has been theorised to stimulate proactive behaviour through social-exchange mechanisms based on reciprocation principles (Curcuruto & Griffin, 2018; Mearns & Reader, 2008; Laurent et al., 2018; Reader, Mearns, Lopes, & Kuha, 2018; Tucker et al., 2008). On the other hand, perceived job control is theorised to stimulate individual proactivity through enhanced capability (Curcuruto et al., 2016; Parker et al., 2001; 2019; Simard & Marchand, 1995). In the next subsections of the article, the role of these organisational antecedents will be discussed in detail, followed by the formulation of specific research hypotheses on how each antecedent supports the safety-related proactive goal regulation process.

Perceived support for safety from supervisors and coworkers.

Multiple studies in literature have shown that supervisor support of safety has a positive impact on safety-related work conducts (Conchie, 2013; Mearns & Reader, 2008, Tucker et al., 2008). Scholars have interpreted this influence in terms of improved safety communication (Curcuruto, Griffin, Kandola, & Morgan, 2018; Zohar & Luria, 2005), coaching and empowering influence (Barling, Loughlin, & Kelloway, 2002; Gracia, Tomas, Martines-Corcoles, & Peiro, 2020; Mullen & Kelloway, 2009). In spite of the differences associable with their specific underlying conceptual frameworks, all these studies tend to explain employees' safety-related behaviour as the result of enhanced perceived capability by employees who are supported by their supervisors in engaging in discretional risk anticipation activities in order to prevent in advance hazardous situations (Johnson, 2007; Zohar & Luria, 2005).

Coworkers also play an important role in social support processes through which goals are established and enacted. Tucker et al. (2008) noted that managers and supervisors may have limited direct contact with frontline employees' day-to-day safety experiences, suggesting that a sizable effect of support by coworkers of safety voice might originate from sources other than managerial support (Brondino et al., 2012). For instance, because front line employees are most likely to be affected by danger, they are more likely to speak up if they feel threatened, or if they feel coworkers are putting them in danger. Employees who frequently communicate with their coworkers on risk related issues to create a safer work environment are more likely to stimulate each other to engage in mental anticipation of potential risks and threats for safety.

Overall, beliefs about support for safety from the supervisor and coworkers are also likely to motivate efforts toward safety-related communication (Clarke, 1999; 2006b; Hofmann & Morgeson, 1999; Michael, Evans, Jansen, & Haight, 2005), and initiate voluntary safety-related activities (Neal & Griffin, 2006; Simard & Marchard, 1995). However, the role of goal regulation in this process is less clear. As suggested by Brondino et al. (2012), we propose both supervisor support and coworker support are two important organizational antecedents which enhance employees' capability to engage in mental simulation of possible deficiencies and breakdowns of safety conditions. In line with these conceptual assumptions supported from safety research literature, we advance the following hypotheses:

Hypothesis 2: *Supervisor support for safety positively affects safety envisioning (h2).*

Hypothesis 3: *Coworker support for safety positively affects safety envisioning (h3).*

Furthermore, following our discussion of goal regulation processes, we also propose the following mediational hypothesis:

Hypothesis 4: *Safety envisioning mediates the relationship between supervisor support and safety voice (h4a) and between coworker support and safety voice (h4b).*

Perceived job control on safety-related job issues

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As recently stated by Kafner and colleagues (2017), at work, goals are typically set by organizational representatives such as a supervisor; however, under most circumstances, employees also hold self-developed goals. As a result, the goals that direct actions are often an admixture of objectives held by the organization and by the employee. Goals that are set by the supervisor and "assigned" to employees are considered external goals, and the extent to which employees adopt the goal as their own reflects an internalization process (Parker et al., 2010; Zacher & Frese, 2015). The redefinition of an assigned goal as one's own goal depends in part on task characteristics, like job autonomy and beliefs of job control (Parker, 2014). Previous research on proactive behaviour has shown the importance of job design characteristics such as perceived autonomy and job control (Bindl & Parker, 2010; Williams, Parker, & Turner, 2010).). In the field of safety research, autonomy and job control have been linked to a wide range of safety outcomes, including safety compliance behaviour (Parker, Axtell, & Turner, 2001), actively caring for safety maintenance and housekeeping activities (Geller, Roberts, & Gilmore, 1996), effective responses to safety critical situations (e.g., Wright, 1994), a decrease in lost time to injury frequency (Shannon, Mayr, & Haines, 1997), and lower accident rates at an organisational level (e.g., Betcherman, Leckie, & McMullen, 1997).

Despite extensive evidence of the importance of job autonomy and control for safety, few studies have focused on the goal-setting mechanism which lead to more proactive forms of safety behaviours like safety voice (Curcuruto et al., 2019; Tucker & Turner, 2015). Simard & Marchand (1995) showed the that workforce participation in safety management through its involvement in safety committees sustained employees' tendency to proactively engage in making suggestions for safety improvement and selling safety-related issues to the supervisors. However, little research has been dedicated to exploring the specific mechanisms which link perceived control beliefs and proactive safety-related behaviours by the workforce (Curcuruto et al., 2016; Zohar, 2008).

Our self-regulation framework suggests that perception of control on safety issues in the work environment can support safety voice behaviour via goal setting and striving mechanisms (Bindl & Parker, 2010). Drawing on self-regulation theory, scholars have proposed that setting a proactive goal is likely to involve a deliberate decision process in which the individual assesses the likely outcomes of his or her behaviours (Morrison & Phelps, 1999). Frese and Fay (2001) identified as important for personal initiative individuals' expectations that they feel they control the situation and have an impact on the outcomes. Individuals with high control appraisals were proposed as maintaining a strong sense of responsibility for their organisation (Frese, Teng, & Wijnen, 1999), actively searching for information (Bindl & Parker, 2010), anticipating opportunities or threats in the near future (Strauss, Griffin, & Parker, 2013), searching for opportunities to act (Montani, Battistelli, & Odoardi, 2015) and having high expectations of success when they aim to improve the work situation and/or reducing a potential threat (Wu, Parker, Wu, & Lee, Cynthia, 2017).

When reference to safety promotion and accident prevention, recent studies have shown that control beliefs on safety-related issues positively affect change-oriented typologies of safety citizenship behaviours like safety initiative (Curcuruto et al., 2019), and that cognitive beliefs of psychological ownership affect safety voice behaviour (Curcuruto & Griffin, 2018). Comparably with the general literature on proactive work behaviour, we suggest that people who experience a significant level of mastery and control over their job activities will be also more capable of mentally anticipating how potential risk factors and situations might develop and occur in a near future (Flin & Fruhen, 2015).

In line with these considerations, and following our discussion on goal regulation processes, we propose the following hypotheses:

Hypothesis 5: *Perceived job control over safety related issues predicts safety envisioning.*

Hypothesis 6: *Safety-envisioning mediates the relationship between job control and safety voice.*

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Method

We conducted two studies. Study 1 aimed to preliminary explore discriminant (study 1a) and criteria validities (study 1b) of goal generation and goal striving processes of safety voice. Study 2 explored the influence of established contextual antecedents (supervisor and co-workers support for safety; perceived job control over safety related issues) on goal generation and goal striving. Figure 1 presents our overall research model across the three research studies.

Insert Figure 1 about here

Study 1

We investigated the distinction between proactive goal generation and goal striving in two distinct samples of supervisors. To date there has been little application of a self-regulation paradigm in occupational safety research. We assumed that supervisors are "experts" on safety and are likely to show a higher level of safety-related awareness and goal processes. In Study 1a we explored the discriminant validity of goal generation and goal striving in sample of university lab supervisors. Study 1b used a lagged design to investigate the effect of goal generation on goal striving over a period of six months, using a sample composed of middle managers and supervisors from a multinational chemical company.

Study 1a Method

Sample

The study took place in a large public University Administration in Southern Europe. The questionnaire was sent to the sample of supervisors who were formally responsible for the safety of the staff and/or students of the university. We chose this sample because it was characterised by a high variability of risk and safety systems and procedures. Across the sample, risk varied in terms of typology (i.e. from chemical and biological exposure to fire hazards), and probability

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and severity (i.e. risk was moderately high in some chemical and radiology departments and comparably low in libraries and humanities departments). Consequently, different safety systems and procedures were in place throughout the sample to mitigate risks and hazards for people and property. We chose to continue this initial study in a sample with varying degrees of risk rather than, for example, focusing only on high-risk settings, in order to maximise the generalisability of our results to other settings.

The survey was sent to 276 safety supervisors and 233 questionnaires were returned, constituting a response rate of 84.4%. 51.8% of the respondents were female. The average age was 45.3 years. Most respondents had a job tenure of over 12 years (55.4%) and had been responsible for safety in their team for less than five years (58.8%). Participants were primarily employed in the department laboratories (35.2%), faculty services (22%) and other technical support areas of the general administration (21%).

Procedure

The sample was contacted with the help of the university's human resource department, which was interested in supporting the research. The questionnaires were collected using a procedure ensuring anonymity and discretionary participation in the survey. Every questionnaire was delivered to the participant with a letter which presented the survey research aims and which explained that participation was voluntary and there was no reward for participating or penalty for not participating.

Measures

In the next paragraphs, all the questionnaire scales used in this study are described in detail. All the scales used a 5 point Likert scale format. The reliability of each scale in the present sample was tested with the Cronbach's alpha index, whose value is reported in brackets for each scale.

Safety envisioning/goal generation ($\alpha = .93$). We used four items developed by Curcuruto and colleagues (2016) to assess the individual cognitive future-oriented strategies to

cope with potential adverse events for safety in the workplace, such as the mental simulation of possible behavioural alternatives and the envisioning of possible future events. These items were adapted by the author to the safety contents from the original anticipatory coping orientation scale initially developed by Greenglass (2002). In this study, respondents were asked how much time and effort they expend in the actions described in the items, ranging from 1 (not at all) to 5 (a great deal). The items are: *"I imagine myself resolving a safety threat even before it presents itself", "I think about how to solve several potential problems for safety before they actually occur", "I anticipate safety problems by thinking about several possible scenarios", "I imagine various safety risks before dealing with a complex operation".*

Safety voice/goal striving (α = .85). Participants responded to five survey items that were developed by Tucker et al. (2008) to measure the degree to which they spoke up about safety concerns to their coworkers, supervisors and OHS management. The answers were collected in a five-point Likert scale that ranged from 1 (not at all) to 5 (a great deal). Examples of items were: *"I discuss new ways to improve the safety of work activities with my supervisor", "I raise safety concerns during planning sessions", "I speak up and encourage colleagues to get involved in safety issues".*

Control measures. In addition to the measures assessing the factor model constructs, we included in the questionnaire three additional control measures to compare safety envisioning and safety voice with existing established measures of similar related constructs. First, we used the four-item scale of safety knowledge by Neal et al. (2000). An example item is: *"I know how to carry out the work safely".* A 5-point response scale range from 1 (strongly false) to 5 (strongly true). In the present research sample, Cronbach's alpha was .90. Second, proactive personality defined as the relatively stable tendency to affect environmental change, was assessed using four of the highest loading items in Bateman and Crant's (1993) scale. The responses ranged from 1 (not true at all) to 5 (very true). An example item is: *"No matter what the odds, if I believe in something, I will make it happen".* In the present research sample

Cronbach's alpha was .81. Finally, the scale of risk-taking orientation (Vecchione &

Barbaranelli, 2005), was used to assess individual tendency to take risky decisions in work

contexts. A 5-point response scale ranged from 1 (strongly false) to 5 (strongly true). An

example item is *"I dare to do risky things that other people are generally reluctant to do"*. In the

present research sample, Cronbach's alpha was .83.

Data analysis strategy

We used a confirmatory factor analysis strategy using structural equation modelling to

test the discriminant validity between proactive goal generation and proactive goal striving.

Structural equation modelling is a multivariate statistical analysis technique that is used to

analyse structural relationships between observed measured variables and latent constructs. This

method is preferred by researchers because it estimates the multiple and interrelated dependence

in a single analysis. The analysis was conducted with the software MPlus (Muthen & Muthen,

2004).

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Study 1a Results

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Discriminant validity test To assess the discriminant validity of the proactive goal

generation and proactive goal striving, we first conducted confirmatory factor analyses using

MPlus (Muthen & Muthen, 2004) with maximum likelihood estimation. A two-factor model

treating proactive goal generation (envisioning) and proactive goal striving (voice) as separate

factors reached an adequate fit (χ^2 = 67.4, df = 26, CFI = .97, RMSEA =.06, SRMR = .05). This

model showed a significantly better fit than the alternative one-factor model with all the items

loading in a single factor ($\chi2$ = 419.8, df = 27, CFI = .77, RMSEA = .22, SRMR = .19).

Means, standard deviations, and zero-order correlations of the study variables and control

measures in the present expert sample are shown in Table 1. The two measures of goal

generation (envisioning) and proactive goal striving (voice) were found significantly correlated

at .47. The measure of proactive goal generation (envisioning) presented only moderated

correlations with the person-oriented control measures of safety knowledge (.23; $p < .01$),

proactive personality disposition (.19; $p < .01$), and no statistical correlation with measure of risk orientation (-.06; ns). Similarly, the measure of proactive goal striving (voice) presented correlations with similar magnitudes with safety knowledge (.27), proactive personality disposition (22) and no statistical correlation with measure of risk orientation (-.05; ns).

Insert Table 1 about here

Study 1b Method

Sample

Data were collected from a sample of senior and middle managers from six departments of a chemical plant in Southern Europe involved in the production of chemical additives for the agricultural sector. This plant is characterised by a high magnitude of risk for the health and safety of the workforce, such as explosions or chemical intoxication. All participants were formally in charge of the safety of the staff employed in their departments, and for compliance with legal safety.

The sample was contacted with the help of a university foundation involved in the design and implementation of innovative programs for occupational safety promotion. Participants were informed about the research aims in a letter. A short questionnaire was sent to the entire sample of supervisors at two different times, with the instruction of providing an identification code to allow the researchers to match their responses to a second survey at time 2 (six months later).

At the end, 73 managers participated in the research at two different time points (response rate: 86%). 92.6% of the respondents were male. The average age was 40.7 years. Most of respondents had a job tenure of over 12 years (62.5%). Participants were primarily employed in the production departments (30.2%), maintenance and logistic departments (27.2%), research and development staff (10.5%), and engineering office (7%).

To establish that the sample size provided adequate power we conducted a post-hoc power analysis using G*Power 3 (Faul, Erdfelder, Buchner, & Lang, 2009). Based on the observed effect size and a regression design with three predictors and a sample size of 71 (2 participants did not provide their gender), G*Power calculates power of 0.80 which can be considered adequate (Cohen, 1988).

Measures

Information about the questionnaire scales used in this study are reported below. The reliability of each scale in the present sample was assessed with the Cronbach's alpha index, which is reported in brackets for each scale.

Safety envisioning/goal generation (α = .88). At Time 1, participants responded to the same four items by Greenglass (2002) used in Study 1a in order to assess the cognitive future-oriented strategies to cope with potential adverse events (i.e. mental simulation of possible behavioural alternatives; envisioning of possible future events). The answers were collected in a five-point Likert scale that ranged from 1 (not at all) to 5 (a great deal). An example item is: *"I think about how to solve several potential problems for safety before they occur"*.

Safety voice/goal striving. This construct was measured at time 1 (α = 82), together with safety envisioning, and again, six months later (α = .80). Five items assessed first-line supervisors' safety voice practices (Tucker et al., 2008). At time 1, supervisors were asked to report how frequently they normally engaged in safety voice behaviours during their work activities. At time 2, the supervisors were asked to report on how frequently they had engaged in these proactive safety practices over the last six months using a five-point Likert scale ranging from 1 (not at all) to 5 (a great deal). An example of item is: *"I speak up and encourage colleagues to get involved in safety issues"*.

Data analysis strategy

In order to statistically verify the predictive effect of proactive goal generation on proactive goal striving we used a hierarchical regression analysis approach. This form of regression analysis is useful when there is a certain number of potential predictor variables and the scope of the study is to statistically determine which variables have the most predictive power. Operationally, hierarchical regression refers to the process of adding in the regression model in steps. In the present study, we were interested to verify the effect of proactive goal generation (assessed at time 1) on proactive goal striving (assessed at time 2) after controlling the effect of job tenure and the level of the criteria variable assessed at time 1.

The statistical effects of the antecedents on the criteria variable are assessed by β indices. In regression analysis, the β values are the estimated coefficients of the independent variables indicating a change on the criteria variable caused by a change of the respective independent variable keeping all the other explanatory variables constant. Finally, the coefficient of determination R^2 is used as an overall indicator of the proportion of the statistical variance of the criteria variable which is predictable from the independent variables.

Study 1b Results

Lagged effect test Proactive goal generation was significantly related to proactive goal striving at Time 1 ($r = .49$; $p < .001$), and at Time 2, respectively ($r = .45$; $p < .01$) (see table 2). To test our hypothesis, we conducted hierarchical regression analyses, predicting proactive goal striving at Time 2. Organisational tenure was significantly related to the study variables and was thus included as a control variable in Step 1. In Step 2, we entered our measure of proactive goal striving at Time 1. Finally, we entered proactive goal generation in Step 3. Proactive goal generation predicted a significant amount of variance in proactive goal striving ($\beta = .33$, $p < .05$; $\Delta R^2 = .07$, $p = .038$). These findings are reported in table 3 and confirmed our expectations about the predictive power of proactive goal generation on proactive goal striving, as well as the time stability of the double stage of our safety proactivity self-regulation model.

Insert here table 2 and table 3

Study 2

Study 2 explored the role of safety envisioning/goal generation as a mediator between established organisational antecedents of safety-related proactive behaviour and safety voice/goal striving. We tested our hypotheses with a mediation analysis model. In this study, for each employee safety voice was rated by the direct line manager of each participant.

Method

Procedure and sample

The study took place in a multinational chemical plant in Central Europe involved in the production of chemical additives for the plastics, cosmetic and coating industrial sectors. This site is characterised by a significant magnitude of risk for the health and safety of the workforce, such as explosions or chemical intoxication. The survey was administrated at the beginning of the monthly scheduling production sessions of the different plant departments. Participation in the survey was entirely voluntary. A presentation letter accompanied the questionnaire which was personally delivered to each employee.

Two typologies of questionnaire were used in this study. A first 'employee version' was delivered to the operative workers. This version of the questionnaire included a self-report measure of safety envisioning, and the self-report measures of the organizational antecedents: supervisor safety support, co-worker safety support, perceived job control. A second short 'supervisor questionnaire' included an external rate of the safety voice provided for each participant-operative worker by the direct work supervisor.

159 workers eventually provided their answers which were matched with an external rate of their safety voice behaviour provided by their direct work supervisor. The response rate was

71.5%. The sample was comprised of men (89%), principally employed in production (30.1%), engineering (28.3%), logistics and maintenance support (17.2%), utilities and technical services (13%). The average age in the sample was 45.8 (SD = 9.9). Most of the respondents had a job tenure of over 12 years (79%).

Measures

For all the five scales included in this survey we used five-point Likert scales that ranged from 1 (not at all) to 5 (a great deal). Self-report answers were collected for the antecedents and safety envisioning/goal generation measures. For every participant, external rate of safety voice/goal striving was provided by the direct supervisor of each employee.

Supervisor support for safety (α = .85). Five items by Mearns and Reader (2008) were used to measure the supportive supervision for safety by the direct manager supervisor. Item examples are: *"My supervisor is always willing to help us when we talk about the safety issues of the activities", "My supervisor is sincerely sympathetic to the safety problems I encounter in my activities", "I feel I can openly talk about safety issues for a task with my supervisor and get support".*

Coworker support for safety (α = .83). Three items by Tucker et al. (2008) were used to measure perceived coworker support for safety in the work activities. The items are: *"My colleagues encourage each other to work safely", "My colleagues are keen to talk to fellow employees who fail to use safety equipment/procedures", "My colleagues are prepared to stop others from working dangerously".*

Perceived job control on safety related issues (α = .79). Three items were used to measure the perception of control over safety issues in the workplace. The items were adapted from the psychological empowerment scale (Spreitzer, 1995). The items are: *"I have a great deal of control over the safety of my work unit", "My impact on the safety of my work unit is large", "I have significant influence over safety of my work unit".*

Safety envisioning/goal generation (α = .82). Participants responded to the same four items used in study 1a (Greenglass, 2002) which assessed cognitive future-oriented strategies to cope with potential adverse events, such as the mental simulation of possible behavioural alternatives and the envisioning of possible future events. An example item is: "*I think about how to solve several potential problems for safety before they occur*".

Safety voice/goal striving (external rate) (α = .85). Participants were rated by the direct line manager using the same five items used in study 1a (Tucker et al., 2008) to measure the degree to which they spoke up about safety concerns to their coworkers, supervisors and OHS management. An example item is: "*He/she discusses with me new ways to improve the safety of work activities*".

Data analysis strategy

In order to verify the role of proactive goal generation as mechanism by which the organizational antecedents affect proactive goal striving we statistically tested a mediational analysis model with MPlus software (Muthen & Muthen, 2004). In psychological sciences, mediation analysis is a statistical technique that is used to assess the relative magnitude of different pathways and mechanisms by which a set of independent predictor variables may affect a criteria outcome. In the present study, we set up proactive goal generation as unique mediator variable of a fully mediated model. A mediator variable is the variable that explains the relationships between the dependent and the independent variables. Therefore, we assumed that the organizational antecedents (perceived job control; supervisor and co-worker support) affect proactive goal striving only indirectly, through the mechanisms of safety envisioning.

Results

Preliminary measurement model A five-factor model treating proactive goal generation (envisioning) and proactive goal striving (voice), coworker support for safety, supervisor support for safety and safety-related perceived job control as separate factors reached a fairly adequate fit (χ^2 = 256.6; df = 160; CFI = .94; RMSEA = .06; SRMR = .07). Our hypothesised model was

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verified to present better fit indices than alternative model solutions: *i)* a model with goal generation and goal striving in a single factor *ii)* a model with all antecedent items loading in a single factor. After further checks for potential method bias effects (i.e. a model with all the items loading in a single factor), we based the following hypothesis verification on the hypothesised five-factor model (see table 4). Means, standard deviations, and zero-order correlations are reported in table 5.

Insert Table 4 and Table 5 about here

Hypothesis verification A fully mediated model containing no direct pathways between the antecedents and proactive goal striving provided a good fit with the data ($\chi^2 = 261.71$; df = 163; CFI = .96; RMSEA = .05; SRMR = .06) and did not differ significantly from the measurement model ($\Delta\chi^2$(df = 3) = 5.11). Including a direct path from supervisor support did not result in a significant change in model fit (partial mediation model[d] ($\Delta\chi^2$(df = 2) = 4.33). However, in this model the pathway from supervisor support to goal striving was not significant ($\beta = .12$, p = .10). A direct path from coworker support similarly did not result in a significant change in model fit (partial mediation model[e]; ($\Delta\chi^2$ (df = 2) = 5.84). The direct pathway from coworker support to goal striving was not significant ($\beta = .09$, p = .15). Finally, we included a direct pathway from safety-related perceived job control to goal striving (partial mediation model[f]; ($\Delta\chi^2$ (df = 2) = 3.12), which was also not significant ($\beta = -.16$, p = .07). We thus retained the most parsimonious model which included only indirect paths between the antecedents and proactive goal striving (see Figure 2).

Insert Figure 2 about here

We used bootstrapping (Shrout & Bolger, 2002) with 1000 samples to compute the indirect effects of the antecedents on proactive goal generation. The 95% confidence interval for personal job control excluded zero (.052; .190), supporting a significant indirect effect (.12). In the case of supervisor support for safety the 95% confidence interval excluded zero too (.039; .153), supporting a significant indirect effect (.09). Finally, in the case of coworker support as well, the 95% confidence interval did not include zero as a value (.045; .189), providing support for a mediating effect (.11). These statistical findings supported our principal hypotheses on both antecedent effects on the envisioning phase and the mediatory role of the latter between the antecedents (supervisor support; coworker support; perceived job control) and goal striving.

In summary, all the hypotheses of direct effects by antecedents on proactive goal generation (h2, h3, h5) were found statistically verified. The indirect effects hypotheses were also found verified (h4a, h4b, h6: 'proactive goal generation' mediates the effects by supervisor support, co-worker support, and perceived job control on 'voice/proactive goal striving').

General Discussion

Using a multi-study approach, with the usage of multiple research samples, our research findings provided empirical evidence on the validity of a two-component model of proactive goal regulation (Bindl & Parker, 2010) in the field of occupational safety. This model distinguishes between a goal-generation phase (represented in our research by 'safety envisioning') and a goal-regulation phase (represented by 'safety voice'). Our research findings showed it as a valid conceptual framework to explain the psychological mechanisms that lead individuals toward a proactive approach toward the management of safety in the workplace, and how distal antecedents like perceived job control, supervisor and coworker safety support sustain the individual's goal regulation process. In this final section of the article, we will discuss the main contributions of our research for the advancement of our understanding of proactive work behaviours in the field of workplace safety, offering indications for future research lines and practical suggestions for managerial interventions based on our research findings.

Conceptual contributions for research advancement.

Consistent with recent trends in the literature, our study focused on safety voice as a representative example of proactive work behaviour in the field of occupational safety, according with recent studies that evidenced how this behavioural construct is specifically associated with distinct outcomes for workplace safety (Curcuruto et al., 2015), distinct organisational antecedents (Conchie, 2013), and distinct motivational drivers (Curcuruto & Griffin, 2018). Our research approach allowed us to offer several original contributions to the development and refinement of the existing proactivity models in the field of occupational safety, such as a) embedding the a safety-related proactive work behaviour analysis like "safety voice" in a broader proactive goal regulation framework; b) investigating the relevance of "safety envisioning" as a proactive goal-generation mechanism which supports the emergence of proactive work behaviours (like, in this case, safety voice); c) analysing the effect of contextual antecedents like perceived job control, and supervisor and co-worker support in supporting the goal-generation and goal-striving phases; d) presenting evidence of discriminative validity of the measures of goal generation and goal-striving from other previously established individualistic constructs (like proactivity disposition, safety knowledge, and personal risk-orientation). These contributions will be presented in more detail in the successive paragraphs.

Safety voice as part of a broader proactive goal regulation framework. Primarily, our research contributes to the advancement of research on safety voice by embedding this construct in a proactive goal regulation framework in a field where anticipation of problems and proactive problem solving are crucial instances. Finding its conceptual foundations in recent research streams which emphasize the importance of the active contributions by individuals to workplace safety improvement (Curcuruto et al., 2019; Griffin et al., 2015; Hollnagel, 2014), our research introduces and describes a self-regulatory motivational mechanism that guides employees to proactively generate and act on their safety-related goals. Even if the investigation of a proactive work behaviour like voice is not now in the field of occupational safety (Conchie, 2013;

Curcuruto & Griffin, 2018; Tucker et al., 2008), our research tried to offer a more processual perspective on safety voice, here considered as the outcome of a self-regulatory goal process. In addition, this study provides more evidence related to the goal-regulatory perspective on proactivity proposed by Parker et al. (2010) and illustrates the strength of personal job control perceptions in motivating proactive behaviour. It also points to the role of more contextual effects, such as supervisor support and colleague support, in helping to generate and strive for proactive goals.

Safety envisioning as a proactive goal generation mechanism. Second, consistent across three studies, our findings coherently support the relevance of safety envisioning as a proactive goal-generation mechanism which supports the emergence of proactive work behaviours with strong implications for the maintenance of workplace safety. All the findings from our three studies suggest that, coherently with a goal-regulatory perspective on proactivity (Bindl & Parker, 2010), safety-related goal generation, here investigated as anticipatory safety envisioning of potential risks for workplace safety, consistently relate to safety-related goal striving actions (here represented by safety voice) across three distinct research samples. The relevance of the influence of safety envisioning and proactive work behaviours is especially evident in study 1b and study 2. In study 1a, conducted in a smaller sample of team safety supervisors, we also saw how safety envisioning is associated with self-report measures of safety voice collected after a lagged time of six months. Consistent with a goal-regulatory perspective on proactive behaviour, this finding suggests that safety-related proactive goal generation does relate to later safety-related proactive goal striving.

The effects of perceived job-control, supervisor and co-worker support. Third, in addition to the findings from the previous studies 1a and 1b, study 2 focused on the investigation of the effects of organisational antecedents of the safety-related goal regulation process. Here, we considered two main categories of distal antecedents: a) perceived job control on safety-related issues; b) perceived support for safety by supervisors and coworkers. Our analyses on the data

collected from a sample of chemical operators showed how these contextual antecedents positively affect the goal generation phase of safety envisioning. Finally, safety envisioning was also found to positively fully mediate the effects of the organisational antecedents on the goal striving stage represented by safety voice, providing additional support to the crucial function played by safety envisioning, and to the goodness of the broader proactive goal regulation framework adopted by the present research.

Discriminative validity of safety envisioning and safety voice measures. Fourth, the findings across the three studies suggest that the two components of the safety related goal generation process described in this article (goal generation; goal striving) appear to be more highly associated with contextual antecedent variables (perceived job control; supervisor and co-worker perceived control) rather than individualistic oriented variables. For instance, in study 1a, conducted in a large sample of university lab technicians, we found that their measures of safety envisioning and safety voice presented only moderately low correlations with other significant established constructs from the existing literature on proactive behaviour and safety research in organisations, like proactive personality disposition, personal risk-orientation, and safety knowledge. These correlational findings support to some extent the assumption of discriminant validity of the construct measures of safety envisioning and safety voice. Even if it was not possible in the context of the present research to offer a comparative analysis of the differential effects of person-related variables and organisational antecedents on the safety-related goal generation process, the correlational statistical findings from study 1 seem to suggest a certain independence of safety envisioning and safety voice from stable characteristics of employees' personality, orientations and skills.

Research limitations and future research avenues.

In spite of the contributions for the conceptual development and refinement of proactivity models in the field of occupational safety, there are a few limitations in our multi-study research that need to be underlined. These aspects will be shortly discussed in the next paragraphs.

First, the general conceptual framework of our multi-study research referred to the proactive goal regulation model advanced by Bindl and Parker (2010). However, we considered only two of the four components of the original model (*envisioning* and *enacting* opportunities for proactive actions), not including the components of *planning* and *reflecting* on the outcomes of proactivity (Bindl & Parker, 2010). Our choice was justified by the higher relevance of envisioning and enacting for the prevention of accidents in the workplace. Usually, the existence formal roles and systematic procedures to manage risks in the workplace makes less relevant for the workers to develop their personal plan of actions for the immediate correction of a treat for safety. In such a delicate applied framework like occupational safety, the open communication of risks represents a privileged way with which individuals' proactivity take a concrete form to support organisations to prevent or mitigate risks and hazards in their work environment. For this reason, we specifically focused our analysis on safety envisioning and safety voice as expression of individual goal generation and goal striving process. However, future studies could be interested to address how *reflecting* activities by individuals on their enacted attempts of positively influence safety maintenance might influence their future propensity to engage again in similar proactive efforts. For instance, it might be that a worker actually reported a risky situation to their superior, or provided punctual suggestions to improve the safety a specific working situation, but then he does not seen any follow-up actions by the organisation to solve the problem, or to implement a suggested idea to improve the workplace, eventually getting discouraged and demotivated in displaying again similar spontaneous initiatives in the future, given the lack of factual appreciation or feedback from the organisation.

Second, in the present study we mainly focused our attention on the understanding of the role of safety envisioning and its organizational antecedents on the individual propensity to engage in safety voice as part of a two-stage safety specific goal regulation model. However, future studies using this framework should include as well the investigation of the influence of more individual oriented constructs (i.e. safety motivation; safety knowledge; safety self-

efficacy) that may affect individuals' safety envisioning in the goal generation phase, or that may work like mediator of the relationship between organizational antecedents and goal generation. Similarly, potential moderation variables (i.e. safety climate; work overload) that might affect the relationships between the goal generation and goal striving phases could provide a better understanding on the contextual conditions that may affect the goal generation process described in the present article.

Third, we consider in our research the construct safety voice as a unique overall construct. However, recent research trends in organisational psychology research (Morrison, 2014) ask for more research to conceptually differentiate distinct typologies of voice behaviour, considering distinctions such as promotion vs prevention-oriented voice, prohibitive voice, whistleblowing. Future studies in the area of occupational research should certainly provide an advancement of our understanding on voice behaviour by analysing its different typologies and implications for workplace safety, risk management, and psychological health.

Forth, some reflections need to be shared about the generalization of our research findings. The research samples were drawn from Southern and Central European populations. Previous cross-national studies conducted in the field of occupational safety (Curcuruto et al., 2019; Reader, Noort, Shorrock, & Kirwan, 2015) have discussed the importance of cultural variables like, power distance, uncertainty avoidance and collectivism vs individualism as key variables for understanding the differences between cultures affecting safety related work conduct. For instance, the variables of power distance and collectivism may be strongly related to the cultural acceptance and management values around an individual focused concept like proactivity (Hofstede, 2001). Unfortunately, we were not able to include in our research models specific control measures to evaluate the potential influence associated with these cultural variables, and this aspect needs to be recognised as a potential limitation in the generalization of our research findings.

Practical implications. Despite the research limitations discussed above, our study presents interesting practical implications for managers, consultants, and practitioners. First, organisations can use our findings about the distinct role of the different organisational antecedents to set up intervention strategies to increase individual capabilities to engage in envisioning activities to anticipate risks and threats for safety. For instance, trainings for organisational supervisors might be specifically focused to develop communication, decision-making and team management skills that stimulate individuals to prioritise risk anticipation, dedicating time and allocating effort to cognitive strategies that monitor dynamically the potential onset of risks and threats for safety, correcting them before they actually produce a negative effect to the safety of people and organisational machineries and properties. Parallel with this, our results seem to suggest that designing roles, work procedures, and task activities that enhance individual perception of being able to control and affect the management of safety, can spontaneously stimulate an anticipatory approach to problem solving and accident prevention, in ways that might be relatively independent by the group management style and behaviours enacted by supervisors. It might be that a combination of job design, group management and supervisor training might produce more beneficial effects.

Conclusions

Employee voice is a proactive work behaviour which has received an increasing attention in occupational safety research in the recent years. Our research aimed to offer a novel conceptualization of safety voice as part of a broader proactive goal-regulation process. The findings that we have presented across three studies seem to suggest the importance of employees' engagement in safety envisioning, which represents a self-starting mental anticipation activity that serves to identify in advance future conditions that may represent a concrete threat for workplace safety. The positive effect by perceived job control on safety envisioning seems to further underline the self-generated nature of the latter. Sources of social support for workplace safety from the supervisor and co-workers are important as well to

reinforce the self-started effort by individual in safety envisioning. We hope that the present research may inspire future studies in the field of occupational safety, which may extend this research line by including other elements that may co-occur in the analysis, to a better understanding of safety-related proactive work behaviour as part of a continuous goal-regulation process. For instance, considering variables such as individual strategic planning and individual self-reflection could be valuable. Strategic planning may help us to understand the conditions with which safety envisioning lead individuals to enact an effective work behaviour. In addition, reflecting on the effective success of a proactive action for the promotion of safety may play an important role in determining the future motivation by individuals in engaging again in a proactive course of action.

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TABLE 1.

Study 1a: Means, standard deviations, and zero-order correlations

	Mean (SD)	1	2	3	4	5	6
1. Age	45.29 (8.03)						
2. Tenure[1]	3.46 (0.81)	.62***					
3. Envisioning/goal generation	3.54 (0.87)	.03	.05				
4. Voice/goal striving	3.72 (1.03)	.03	.00	.47***			
5. Safety knowledge	3.21 (1.07)	.05	.14*	.23**	.27**		
6. Proactive personality disposition	3.67 (1.05)	-.02	.05	.19**	.22**	01	
7. Risk taking orientation	2.72 (1.22)	-.07	-.02	-.06	-.05	-.02	16*

Note. $N = 233$; *$p < .05$, **$p < .01$, ***$p < .001$

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[1] Tenure was defined in terms of time interval categories in correspondence of relevant changes of national law regulation related to safety over the previous 12 years: less than 2 years; between 2 and 5; between 5 and 12 years; more than 12 years.

TABLE 2.

Study 1b: Means, standard deviations, and zero-order correlations

	Mean (SD)	1	2	3	4
1. Age	41.04 (8.13)				
2. Gender	1.07 (0.25)	-.27			
3. Tenure[2]	4.70 (0.66)	.36*	-.41***		
4. Envisioning/goal generation (Time1)	3.56 (0.97)	.13	-.29	.40**	
5. Voice/goal striving (Time 2)	3.76 (0.74)	.25	-.21	.41**	.45***

Note. N= 71; *p <.05, **p <.01, ***p <.001

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[2] Tenure was defined in terms of time interval categories: less than 2 years; between 2 and 5; between 5 and 12 years; more than 12 years.

TABLE 3.

Regression analyses predicting voice/proactive goal striving at Time 2 (Study 1b)

	Step 1		Step 2		Step 3	
	β	t	β	t	β	t
Age	.18	1.16	.19	1.25	.21	1.33
Gender	-.03	-0.17	-.03	0.17	-.04	.19
Tenure	.27	1.91	.22	1.26	.17	1.11
Voice/Goal striving (Time 1)			.31	2.26*	.29	1.95
Envisioning/Goal generation (Time 1)					.33	2.11*
R^2		.19		.28		.35
ΔR^2 Step				.09*		.07*
F		1.71		2.38		3.14

Note. N = 73; *p <.05, **p <.01, ***p <.001

TABLE 4.

Model comparison (Study 2)

Model	χ^2	Df	CFI	RMSEA	SRMR
Hypothesized five-factor model	256.6	160	.96	.05	.06
Four-factor model[a]	451.8	164	.87	.09	.07
Two-factor model[b]	790.9	169	.73	.13	.11
One-factor model (method bias)	1058.5	170	.61	.15	.11
Full mediation model[c]	261.71	163	.95	.05	.06
Partial mediation model 1[d]	260.93	162	.95	.06	.07
Partial mediation model 2[e]	262.44	162	.94	.06	.08
Partial mediation model 3[f]	259.72	162	.95	.05	.06

[a] Proactive goal generation and proactive goal striving loading on a single first order factor; co-worker support for safety, supervisor support for safety and safety-related personal control on separate factors

[b] Proactive goal generation and proactive goal striving loading on a single first order factor; co-worker support for safety, supervisor support for safety and safety-related personal control loading on a single first order factor

[c] Full mediation between proactive goal striving and antecedents via proactive goal generation

[d] Partial mediation between proactive goal striving and antecedents (direct path from supervisor support included)

[e] Partial mediation between proactive goal striving and antecedents (direct path from coworker support included)

[f] Partial mediation between proactive goal striving and antecedents (direct path from personal job control included)

TABLE 5.

Study 2: Means, standard deviations, and zero-order correlations

	Mean (SD)	1	2	3	4	5	6
1. Age	45.88 (9.94)						
2. Tenure[3]	3.35 (0.95)	.52***					
3. Supervisor support	4.04 (0.91)	.09	-.06				
4. Coworker support	3.98 (0.81)	.13	.01	.43***			
5. Perceived job control	3.64 (0.87)	.12	.02	.39***	.35***		
6. Envisioning/goal generation	3.52 (0.84)	.13	-.01	.36***	.42***	.45***	
7. Voice/goal striving (external rate)	3.71 (0.67)	.17*	.02	.24**	.32***	.22**	.37***

Note. N= 159; *p <.05, **p <.01, ***p <.001

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[3] Tenure was defined in terms of time interval categories: less than 2 years; between 2 and 5; between 5 and 12 years; more than 12 years.

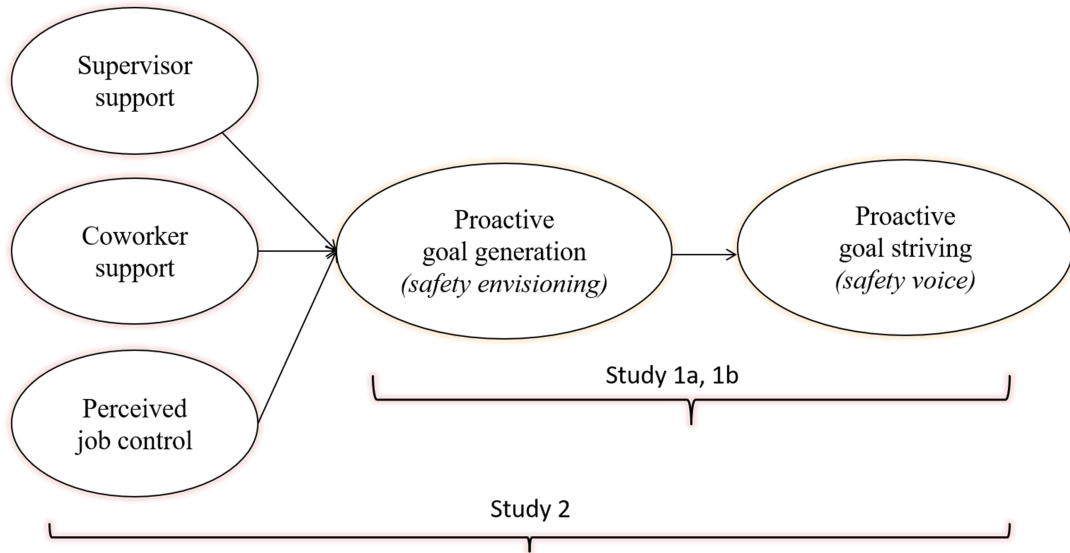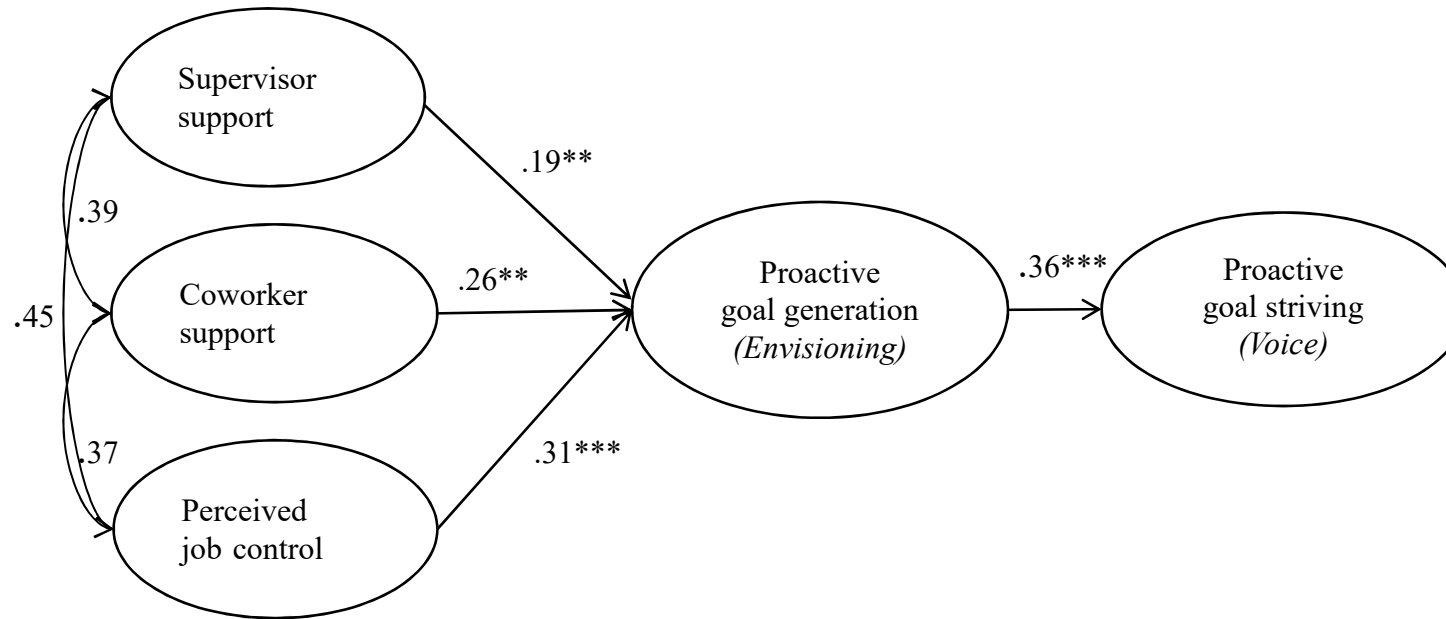FIGURE 1.

Overall research model

FIGURE 2.

Structural model (Study 2)

Note:

all the answers to the measures of study 2 were self-reported by the participants (N=157) except for the criteria variable of safety voice/goal striving, whose assessment was externally provided by the direct supervisor of each participant. All the hypotheses of direct effects by antecedents on proactive goal generation (h2, h3, h5) were found statistically verified. The indirect effects hypotheses were also found verified (h4a, h4b, h6: 'proactive goal generation' mediates the effects by supervisor support, co-worker support, and perceived job control on 'voice/proactive goal striving').