



Effects of the feeling of invulnerability and the feeling of control on motivation to participate in experience-based analysis, by type of risk

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ARTICLE INFO

Article history:

Received 23 February 2012

Received in revised form

21 November 2012

Accepted 29 November 2012

Keywords:

Experience-based analysis (EBA)

Risk perception

Feeling of invulnerability

Feeling of control

Occupational accidents

Work accidents

ABSTRACT

Experience-based analysis (EBA) refers to a set of safety-management practices consisting of detecting, analyzing, and correcting the individual, material, and organizational causal factors of accidents in order to prevent their reoccurrence. Unfortunately, these practices do not always garner the adherence of employees. This article presents a study that examines the impact of risk perceptions on agents' motivation to participate in EBA in various production sectors. The study was conducted at two sites, a chemical factory and a nuclear power plant, by means of a questionnaire administered to 302 employees. The results indicated that the feeling of control was not only positively linked to the feeling of invulnerability, but that these two factors were negatively linked to risk perception. In addition, the actors in both production sectors were more motivated to participate in EBA of accidents linked to the core processes of their industry (which were more accurately perceived) than in EBA of ordinary accidents (accidents not specific to chemical or nuclear processes). Moreover, the agents' feeling of invulnerability and feeling of control both reduced EBA motivation for ordinary accidents to a greater extent than for chemical and radiation-related accidents. Recommendations are made in view of encouraging agents to get more involved in EBA.

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1. Introduction: from risk perception to participation in experience-based analysis of accidents

For some years now, France has seen a drop in work accidents that appears to be due to better knowledge of occupational risks and stricter regulations pertaining to prevention. However, it seems that these changes are more a reflection of modifications in the occupational risks themselves than of improved prevention of accidents on the job (Cuny and Gaillard, 2003). In high-risk industries like those examined in the present study (chemical and nuclear), today's most worrisome safety problems concern ordinary accidents (falls while walking, handling and packing operations, use of tools, etc.) rather than accidents linked to the core processes of these industries (discharge or ejection of chemical substances, poisoning, radioactive contamination, etc.). In matters of prevention, this situation has led to changes not only in terms of risk communication, but also in terms of lessons learned from the analysis of accidents involving company personnel. In this context, a current concern of firms is how to increase their employees' participation

in experience-based analysis (EBA) of "ordinary" accidents. "Ideally, after-action reviews should function as forums through which groups can discuss candidly perceptions about regular work operations. Through this communication forum, employees in high-risk environments have the opportunity to learn from recent incidents and retain these lessons for future incidents" (Allen et al., 2010, p. 751). At the industrial sites where we conducted our studies, these forums, also called "safety talks", are held monthly by the managers. Each forum focuses on a particular risk, selected according to the events records within the company or the industrial site. Workers are encouraged to analyze the selected accidental event in order to seek what causes it and to find out ways to prevent such an event in the future.

Unfortunately, EBA – designed to help organizations learn lessons from past accidents or events in order to improve safety at the workplace – does not always seem to rally a large amount of adherence among operators. EBA of ordinary accidents apparently doesn't interest workers much, even though such accidents are becoming more and more common. They tend to consider EBA related to such accidents useless, and tend to be more passive when they are invited to analyze and share their experiences on such risks. The diffuse nature of these accidents, and the fact that the nuclear and chemical industries are immersed in a very strong corporate culture when it comes to radioactive or chemical

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hazards, seem to generate a lack of interest whenever EBA of ordinary accidents is at stake. This disinterest may also come from the perceptions that employees in these two sectors have of ordinary risks as compared to risks related to the core processes of their industries (chemical risks or radiation risks). It looks like the workers tend to minimize the usefulness of “safety talks” concerning ordinary accidents because they perceive their consequences on their health as being low, while they tend to maximize the usefulness of forums related to accidents linked to the core processes of their company, the health consequences of which are perceived as high and threatening. Such an attitude could refer to a melioration bias (Herrnstein et al., 1993).

This being the case, it seems important not only to determine how employees in these two production sectors perceive both ordinary risks and core-production risks, but also to examine their feeling of exposure or vulnerability to these different kinds of risks, as well as their perceptions of how much control they have over them. Another plausible hypothesis regarding the lack of interest in EBA could be that perceived vulnerability and perceived control affect people's motivation to participate in EBA. More specifically, might the fact of feeling invulnerable to a risk, or of believing that one has some degree of control over it, cause agents to pay less attention to actions aimed at preventing that risk? These considerations led us to take an interest in the link between risk perception and employee involvement in EBA practices aimed at improving risk identification, management, and prevention.

Research on risk perception looks at how individuals assess the risky situations they encounter. In this area, Kahneman et al. (1982) proposed the idea that probabilistic judgments made by individuals (whether a lay person or an expert) rest on a limited number of heuristics which often allow them to make reasonable judgments, but also sometimes cause their judgments to be erroneous. These authors showed, for example, that individuals exhibit a tendency to perceive events that are likely to affect a large number of people as being more serious than events affecting only a few people.

In matters of communication, it also seems that people generally judge new information to be relevant and full of lessons to be learned, whenever that information agrees with their own prior beliefs. And when the information contradicts their prior knowledge, it is perceived as being uninteresting, erroneous, or even non-representative of the situation being judged (Nisbett and Ross, 1980, cited by Slovic, 1987). In their study, Renn et al. (1992) showed that individual and social perceptions of risk can be amplified or diminished, depending on the mainline thinking in a group. In the same vein, other studies have shown that people are inclined to make judgments that conform to the beliefs conveyed by their group of membership (Dake, 1992; Kouabenan, 2006; Rippl, 2002). In sum, risk assessment is structured “by multiple variables linked either to the nature and dimensions of the risk itself, or to factors related to the individual characteristics of the risk-perceiving subjects” (Kouabenan and Cadet, 2005, p. 68).

In the area of motivation to protect oneself, individual and social perceptions of risk have been shown to be among the most decisive factors in people's dispositions about adopting prevention behaviors. Accordingly, perceived probability, perceived seriousness, and perceived vulnerability are the dimensions of risk perception that appear to have the greatest impact on protection motivation (Weinstein, 1993). In a meta-analysis of 36 studies ($n = 15,988$) conducted between 1979 and 2004, Brewer et al. (2007) examined the link between risk perception and a health-related behavior (in this case, vaccination against infectious diseases). The results confirmed the effect of the risk's perceived probability on participants' willingness to be vaccinated ($r = .26$). They also confirmed the positive effects of perceived vulnerability to the risk ($r = .24$) and perceived seriousness of the risk ($r = .16$).

However, risk perception does not always cause individuals to adopt safe behaviors, for the simple reason that perceptions can be biased and thereby result in distorted risk assessments (Kouabenan, 2006). Such biases can, for example, lead people to underestimate or overestimate the risks they are facing. Called positive illusions by some (Taylor and Brown, 1994), this type of bias may also correspond to a tendency to expect to experience a greater number of happy life events than unhappy ones in the future (Scheier et al., 1989). Other studies have stressed people's propensity to underestimate certain risks while overestimating others (Rothman et al., 1996).

Our rationale for using the above theoretical approach is the fact that the very process of engaging in an after-event review has been shown to provide a cognitive framework for elaborating experience-based data likely to change the behavior of individuals and improve system performance (Ellis and Davidi, 2005). It follows from this that the purpose of EBA – as a set of practices for detecting, analyzing, and transmitting experience gained from past accidents – is to induce changes in risk-related behaviors. Clearly, then, it is important to better understand how people perceive these risks so as to be able to predict their willingness to engage in EBA (Kouabenan, 2006). We are particularly interested here in discrepancies between people's perceptions of various types of risks, and we will attempt to find out whether the type of risk itself can be a source of differences in commitment to EBA.

We focused on positive beliefs because they are known to influence people's risk perceptions and judgments about their ability to cope with risks (Kouabenan, 2007). Indeed, in the area of protection motivation, such biased beliefs are just as likely to provoke a disinterest in prevention programs, as they are to prompt people to protect themselves (Janoff-Bulman and Frieze, 1983). Scheier et al. (1989), for example, pointed out the beneficial effects of optimism on the recovery of patients who had undergone surgery (coronary artery bypass); we also know that persons who generally expect to succeed in whatever they do apply more effort to attaining their goal than those to expect to fail (Carver et al., 1979). On the other hand, expectations that cause people to underestimate risks can lead to unsuitable behaviors because people do not seem to care much about protecting themselves against events they judge improbable (McKenna, 1993).

It appears in addition that individuals are more optimistic about a risk when they have a strong feeling of control over that risk. Along these lines, McKenna (1993) study of 99 participants (office workers, teachers, and students) showed that when the participants were put in situations where their perceived control was very low, their feeling of invulnerability tended to drop considerably. A meta-analysis by Klein and Helweg-Larsen (2002) of 27 studies conducted between 1980 and 1997 supports these conclusions. The data collected by these two authors showed, as a whole, that optimism was often strongly associated with a feeling of control ($r = .31$).

These findings suggest that a worker's feeling of invulnerability might be associated with the number of precautions he/she takes to avoid accidents, and led us to hypothesize that workers who take fewer precautions to avoid accidents feel more invulnerable to risks or see themselves as being less exposed than workers who do not (Hypothesis 1). In other words, a feeling of invulnerability may be a factor in failure to engage in EBA practices because it causes people to underestimate risks. We also hypothesized that risks directly related to the company's core production processes would be perceived as greater than risks related to ordinary, everyday accidents (Hypothesis 2).

Another point of interest in this study was whether and to what extent the feeling of invulnerability and the feeling of control have a different impact on motivation to engage in the EBA of accidents related to the agent's main activity or the industry's

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