



Attentional bias toward safety predicts safety behaviors



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ABSTRACT

Safety studies have primarily focused on how explicit processes and measures affect safety behavior and subsequent accidents and injuries. Recently, safety researchers have paid greater attention to the role of implicit processes. Our research focuses on the role of attentional bias toward safety (ABS) in workplace safety. ABS is a basic, early-stage cognitive process involving the automatic and selective allocation of attentional resources toward safety cues, which reflect the implicit motivational state of employees regarding safety goal. In this study, we used two reaction time-based paradigms to measure the ABS of employees in three studies: two modified Stroop tasks (Studies 1 and 2) and a visual dot-probe task (Study 3). Results revealed that employees with better safety behavior showed significant ABS (Study 2), and greater ABS than employees with poorer safety behavior (Studies 1 and 2). Moreover, ABS was positively associated with the perceived safety climate and safety motivation of employees, both of which mediate the effect of ABS on safety behavior (Study 3). These results contributed to a deeper understanding of how early-stage automatic perceptual processing affects safety behavior. The practical implications of these results were also discussed.

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1. Introduction

Safety research has long been concerned on the effects of situation- and person-related factors on employees' safety behavior (i.e., safety compliance and safety participation) and subsequent injuries and accidents in the workplace (Barling et al., 2003; Christian et al., 2009; Cox and Cheyne, 2000; Hayes et al., 1998; Parker et al., 2001). Similar to other studies on human resource management and organizational behavior, recent studies have primarily focused on "explicit processes and measures" in safety research (Becker and Menges, 2013; Koopman et al., 2013; Molesworth and Chang, 2009). However, advances in psychology show that information processing that occurs outside of consciousness significantly influences our attitudes, emotions, thoughts, and behavior (Fazio and Olson, 2003; Evans, 2008; Dijksterhui, 2010; Bohnert and Dickel, 2011). To compensate for the incompleteness and incorrectness of the current tacit model of the human mind used by organizational researchers, an increasing number of researchers have focused on the role of implicit processes (e.g., Barsade et al., 2009; Becker et al., 2011; Harms and

Luthans, 2012; Leavitt et al., 2011). Typical underlying implicit processes include (a) automatic association, (b) attentional bias, and (c) automatic approach–avoidance tendencies (Friese et al., 2011; Wiers and Stacy, 2006). Automatic association has been empirically explored in safety research (e.g., Burns et al., 2006; Marquardt et al., 2010; Molesworth and Chang, 2009). For example, an automatic association between "I" and "safety" is a significant predictor of safety performance (Marquardt et al., 2010), and an automatic association between "flying risk" and "positive" significantly predicts the risk behavior of pilots in a simulated flying task (Molesworth and Chang, 2009). Attentional bias and automatic approach–avoidance tendencies remain unstudied in relevant literature up to now. In the current study, we explored the role of attentional bias in the context of safety. Considering the priority of safety in high-risk industries (Barraclough and Carnino, 1998; Hudson, 2003; IAEA, 1986; Mearns et al., 2003), employees who value safety highly may pay more attention to and be more sensitive to stimuli and cues relevant to safety than employees who value safety poorly (Friese et al., 2011; Williams et al., 1988). This phenomenon implies the attentional bias toward safety (ABS) of employees. Hence, the exploration of the effect of ABS on safety performance will help us understand the role of person-related factors in safety studies (Christian et al., 2009).

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Attentional bias refers to the selective allocation of attentional resources toward specific aspects of stimuli (Williams et al., 1988). To save limited cognitive resources in the early stage of environmental information processing, individuals will selectively address stimuli that are relevant to their particular goals and concerns; this process is automatic and occurs outside of consciousness (Williams et al., 1988; Friese et al., 2011). Evidence shows that individuals with particular psychological characteristics (Teachman et al., 2007) or behaviors (Cohen et al., 1998; Brevers et al., 2011; Veenstra et al., 2010) display attentional bias toward specific stimuli or cues. For example, heavy drinkers show greater attentional bias toward alcohol-related cues than social drinkers (Fadardi and Cox, 2009). Attentional bias towards suicide-related cues significantly predicts the further suicide attempts of an individual (Cha et al., 2010). Optimism is associated with a greater attentional bias toward positive stimuli relative to negative stimuli (Seegerstrom, 2001). Based on this logic, we propose that employees who show high safety performance may be more sensitive to safety-related stimuli and cues in the context of safety.

Attentional bias is not simply a by-product of behavior but plays a vital role in behavioral causation and maintenance (Williams et al., 1996). According to the theory of current concern, attentional bias reflects the automatic motivational state and major life goals of an individual (Cox and Klinger, 1990, 1988; Fadardi and Cox, 2009; Klinger and Cox, 2004). Attentional bias may affect behavior by (1) implicitly and automatically carrying goal-relevant stimuli or cues to the forefront of the perceptual field (DeWall et al., 2009; Maner et al., 2007) and by (2) increasing the probability of cue-related cognitions (e.g., intrusive thoughts, Waters et al., 2003) and motivation (Fadardi and Cox, 2009) that may affect behavior (Neal and Griffin, 2006; Christian et al., 2009).

In high-risk industries, such as commercial aviation, nuclear power industry, and oil and gas industry, safety is an overriding goal for employees and organizations (Barraclough and Carnino, 1998; Hudson, 2003; IAEA, 1986; Mearns et al., 2003). If an employee considered safety as an important goal, safety-related cues such as safety posters and feedback of experience from events (Cooper, 2000; IAEA, 1986) might attract or capture his/her attention more strongly than other types of stimuli (Friese et al., 2011) during work. Thus, this employee might express ABS. Therefore, in the current study, ABS refers to the selective allocation of attentional resources toward safety-specific stimuli rather than other stimuli (Williams et al., 1988); this phenomenon reflects the automatic motivational state of employees toward safety (Klinger and Cox, 2004). In consideration of the substantial evidence showing that individuals with a particular behavior show attentional bias to specific cues (e.g., Cohen et al., 1998; Brevers et al., 2011; Veenstra et al., 2010) and that attentional bias plays an important role in inducing behavior (Waters et al., 2003), employees who are highly concerned about safety may show significant ABS and exhibit more safety behaviors. Safety behaviors consist of two dimensions, safety compliance and safety participation (Griffin and Neal, 2000). Safety compliance refers to activities employees need to do in order to maintain workplace safety. Safety participation refers to voluntary safety behaviors, such as helping coworkers, putting effort to promote the safety program in the workplace. As the relationship between antecedents and these two dimensions of safety behaviors is consistent in most of the safety studies (e.g., Christian et al., 2009; Griffin and Neal, 2000; Neal et al., 2000), we will not discuss these two dimensions separately in the following. Based on the statements above, it is proposed:

Hypothesis 1. Employees with higher safety behavior performance show significant ABS, and ABS positively predicts employees' safety behaviors.

From the perspective of social information processing, ABS is early-in-the-cognitive stream, which provides the basic building blocks of adaptive higher-order cognitions (e.g., perception, attitude, and motivation) and subsequent behavior (DeWall et al., 2009; Dijksterhui, 2010). Employees will notice, recall, think, and act differently under different early motivational states (Klinger and Cox, 2004). Therefore, capturing the ABS in the early stages of information processing may help explain downstream perceptions, motivations, and subsequent safety behaviors. Similar to the mechanism of other attentional biases (Waters et al., 2003; DeWall et al., 2009; Fadardi and Cox, 2009), ABS may influence safety behaviors in at least two ways.

First, individuals with higher ABS will more likely become aware of safety-related stimuli or cues in their environment than individuals with lower ABS. In high-risk industries, surface-level safety culture artifacts (Burns et al., 2006; Schein, 1990) are highly visible and accessible environmental cues used by management to maintain organizational safety (Cooper, 2000; Guldenmund, 2000; Schein, 1990). Typical safety-related artifacts include safety posters and personal protective equipment; inspections and investigations of incidents, accidents, or near misses also belong to this behavior category (Cooper, 2000; Guldenmund, 2000; Schein, 1990). These important environmental cues inform organizational policies, procedures, and practices about safety that indicate the safety priority in the workplace (Cooper, 2000; Glendon and Litherland, 2001; Mearns et al., 2003). Perceived safety climate refers to the individual perceptions of such safety policies, procedures, and practices (Neal and Griffin, 2006). Therefore, these cues may influence employees' perceptions of safety priority. Specifically, if an employee automatically pays attention to these safety-related artifacts, these activated cues will more likely to be processed further and trigger the explicit perception. As a consequence, employees with higher ABS will have a higher level of perceived safety climate. As a meaningful situation-related predictor of safety performance, the effect of safety climate on safety behavior through safety motivation has been empirically tested (Christian et al., 2009; Neal et al., 2000; Neal and Griffin, 2006). Thus, we predict the following:

Hypothesis 2. ABS is positively related to perceived safety climate.

Hypothesis 3. Perceived safety climate mediates the effect of ABS on safety behaviors.

Second, ABS may increase the probability of explicit safety-related motivation. Researchers found that manipulated attentional bias in the healthcare field can increase conscious motivation, thus affecting goal pursuit behavior (e.g., Fadardi and Cox, 2009; Field and Eastwood, 2005). This finding has been extensively supported by other studies (e.g., Field et al., 2009; Greenaway et al., 2012). In the safety field, safety motivation is an important direct predictor of safety behavior (Probst and Brubaker, 2001; Christian et al., 2009) which refers to the willingness of employees to work safely with associated valence (Christian et al., 2009; Neal and Griffin, 2006). We predict that ABS can activate conscious safety motivation, which in turn contribute to safety behaviors.

Hypothesis 4. ABS is positively related to safety motivation.

Hypothesis 5. Safety motivation mediates the effect of ABS on safety behaviors.

In summary, investigating the role of ABS can help to determine the deeper mechanism of safety performance and improve training techniques (Friese et al., 2011). We designed three studies to test our research hypotheses. Studies 1 and 2 were conducted to explore the main effect of ABS on safety behavior (**Hypothesis 1**). In Study 3, we introduced two mediators, namely, perceived safety climate and safety motivation, to test **Hypotheses 2–5**. To examine the effect of ABS on employee safety behavior in the workplace, the important

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