



Action errors and rule violations at offshore oil rigs: The role of engagement, emotional exhaustion and health complaints



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ABSTRACT

Errors and rule violations at work can lead to adverse consequences such as increased non-productive time and reduced product quality, as well as accidents, injuries and even catastrophes. This study investigated psychosocial precursors of action errors and violations and postulated two main hypotheses: (a) there is a positive association between emotional exhaustion and action errors/violations, and health complaints and reduced engagement mediate this relationship (the “adverse pathway”); (b) there is a negative relationship between engagement and action errors/violations, and health complaints mediate the relationship (the “beneficial pathway”). Six hundred and fifty-three oil production workers from two oil rigs responded to a survey measuring the study variables. Findings from regression analyses supported the hypotheses, except for the expected mediation of health complaints of the emotional exhaustion and action errors/violations relationship. Additional findings were that temporary contractor workers reported a lower level of action errors/violations than permanent employees did, and that reported action errors and violations increased with reported overtime hours.

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1. Introduction

Action errors and rule violations at work can lead to adverse consequences such as increased non-productive time and reduced product quality, as well as accidents, injuries and even catastrophes (Frese and Keith, 2015; Hale and Hovden, 1998; Skalle et al., 2014). For instance, rule breaking or misinterpretation is a contributing factor to the majority of serious incidents (Skalle et al., 2014). Over the years, attention to organizational, work environmental and human factors as antecedents of errors and violations has increased among scholars (Bergh et al., 2014; Cooper, 2000; Flin et al., 2008; Guldenmund, 2000; Hale and Hovden, 1998; Haukelid, 1998, 2001, 2008; Reniers et al., 2011). There are several examples from the oil and gas industry of a relation between action errors and underlying organizational and human factors. For instance, the Piper Alpha oil platform disaster with 167 deaths was caused by poor communication at shift handover and leadership failures in 13 emergency responses (Cullen, 1990). However, there is still a need for more systematic knowledge of the mechanisms that enhance or reduce the risks of action errors and rule violations, including the role of cognitive challenges, emotional states,

organization of tasks and work stress, as well as health and work environmental factors (Bergh et al., 2014). The present study takes further steps along this path and investigates how the factors of emotional exhaustion, engagement and health complaints influence action errors and violations at offshore oil rigs.

Offshore oil rig activity involves a range of accident risks including fires, falling objects, hydrocarbon leakages and explosions. When errors are made in these workplaces, the consequences can be devastating (Deacon et al., 2013). Offshore workers are exposed to a number of physical and psychosocial stressors, including cramped physical environments, long work shifts, isolated location, noise, vessel motion, heavy physical work, hazardous work operations and lack of privacy (e.g. Gardner, 2003; Haward et al., 2009; Niven and McLeod, 2009; Parkes, 2012). These rather challenging work environmental conditions have a potentially adverse influence on well-being and health. On the other hand, there are also several beneficial work environmental factors at offshore oil rigs. Personnel spend much time with co-workers, with the potential for building social relationships; they have long periods off work, often have several benefits such as good-quality food, good fitness facilities and movie theatres, and for many the work pace is moderate. In addition, the work can be perceived as meaningful as the personnel work at the sharp end, seeing the immediate connection between their effort and the result—obtaining the oil and gas from the reservoir. These aspects may positively

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influence well-being, engagement and health among the workers. The simultaneous beneficial and negative work environmental attributes make offshore rigs particularly suitable places to study factors promoting and preventing action errors and violations.

1.1. Action errors and violations

Several theoretical models and taxonomies of human and organizational errors have been developed, and a major distinction has been made between *errors* and *violations* (Reason, 1990). Action errors are defined as “unintended deviations from plans, goals, or adequate feedback processing, as well as incorrect actions resulting from lack of knowledge” (Frese and Keith, 2015, p. 662). Whereas action errors involve unintentional actions, violations involve a more conscious intention of non-compliance, such as consciously failing to follow rules and procedures with which one is familiar (see Grabowski et al., 2009). Violations need not arise from harmful intention, but can result from taking short cuts, particularly if rules and procedures are perceived as inexpedient.

Reason (1990) distinguished between active and latent errors. Latent errors (or latent factors) refer to less apparent elements in the organization that can contribute to the occurrence of actual errors (active errors). Thus, latent errors are weakened design or organizational defences, such as managerial factors, work climates and cultures, organizational structures and psychosocial work environments. According to Reason (2005, p. 58), the “damaging consequences (of latent errors) may lie dormant for a long time, only becoming evident when they combine with active failures and local triggering factors to breach the system’s many defences”. Thus, latent errors can be considered to be “accidents or incidents waiting to happen”. Violations may also be classified according to latent and active forms. For instance, strong production pressure in an organization may promote gradual migration from safe practices to minor violations, and as tolerance develops, violations become more severe without people noticing. Thus, latent violations can stem from the culture, leadership and work environment. According to Reason (1990), psychological precursors are important latent errors or violations, and stated that they are “a complex function of the task being performed, the environmental influences and the presence of hazards” (p. 205). He further claims that human states or traits such as stress, motivation and capacity for perceiving hazards are relevant latent factors. A more detailed understanding of the nature of such psychological latent errors and violations is vital to prevent active action errors and violations, and subsequent possible accidents.

The current study investigates the role of health impairment processes on the one hand and the health-related factor of engagement on the other hand as latent factors and their relationship with active errors and violations.

1.2. Health impairment processes affecting action errors and violations

1.2.1. Fatigue and emotional exhaustion

The adverse work factors at offshore oil rigs can be associated with pressure- and stress-related risk factors and reduced well-being, exhaustion, sleep deprivation, fatigue and other health issues as outcomes (Sneddon et al., 2013). When workers face overwhelming job demands, they must exert effort to deal with them. Eventually, their resources may become depleted, which in turn may lead to emotional exhaustion (Bakker and Demerouti, 2007; Huynh et al., 2014). The effects of stress, exhaustion or fatigue are decreased speed in cognitive processing, an increase in reaction times, inattentiveness and lower vigilance (Helmreich et al., 2004; Leka and Jain, 2010). Lamond and Dawson (1999) suggested that fatigue could result in performance impairment equivalent to or greater than 0.1% blood alcohol concentration; a level

that is not compatible with the operation of dangerous equipment. Thus, when people become worn out, they are more likely to be momentarily distracted and to make errors of judgment (Chan, 2011; Hofmann and Stetzer, 1996; Mearns et al., 2001). For example, Flin et al. (2008) demonstrated that stress could severely impact employees’ achievement levels in a negative way, both with respect to efficiency and accuracy. Stress and fatigue have also been associated with reduced levels of work situational awareness among offshore drilling personnel (Sneddon et al., 2013). One example is the grounding of the Exxon Valdez in Alaska in 1989, which was associated with fatigue (Rogers and Grunstein, 2005). Also connected with fatigue and exhaustion over time is a condition characterized by indifference, poor motivation, cynicism and a generally distant attitude towards work—also named “cynicism” in the burn-out literature (Maslach et al., 2001). A likely consequence is violation of procedures and rules and generally taking short cuts to get work done using as little energy as possible.

Frone and Tidwell (2015) recently defined work fatigue as “extreme tiredness and reduced functional capacity that is experienced during and at the end of the workday” (p. 274) and categorized the concept according to the dimensions of physical, mental, and emotional work fatigue. The concept of “emotional exhaustion” refers to feelings of being overextended and depleted of one’s resources (Maslach et al., 2001). Thus, the concepts of work fatigue and emotional exhaustion overlap, and scholars apply them interchangeably. However, while work fatigue covers a somewhat broader scope, including physiological fatigue, emotional exhaustion is mostly related to emotional and cognitive states. In the following section, we will apply the concept of emotional exhaustion.

1.2.2. Emotional exhaustion and health complaints

There is a growing body of research evidence demonstrating that emotional exhaustion, fatigue and work stress are related to the experience of musculoskeletal pain, digestive discomfort and headaches (Leka and Jain, 2010; Wyller et al., 2009). With regard to musculoskeletal pain, stressful jobs may exert more load on the body (for example, when people lift objects incorrectly to get things done quickly because they are under pressure). Work stress may also lead to muscular tension, thus increasing “wear and tear” on the working muscles. It may also be linked to impairment to the body’s ability to repair its muscles and joints after exertion (Leka and Jain, 2010).

Emotional exhaustion over time may develop into a vicious circle of reduced abilities to manage stress and to take care of one’s health; thus, it is associated with a broad spectrum of health complaints (Wyller et al., 2009). A preoccupation with health complaints may further increase distraction and the probability of committing errors or violations. Thus, the likely progress would be an “adverse pathway” in which emotional exhaustion results in health complaints that in turn increase the risk for action errors and violations (see Fig. 1).

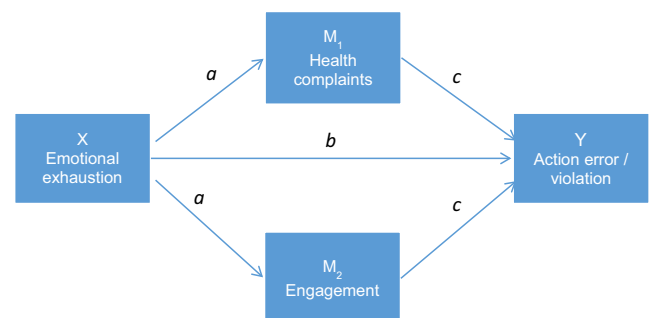


Fig. 1. The “adverse pathway”.

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