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Development and validation of a multi-level air freight handling safety climate scale

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ABSTRACT

Safety is of critical importance in many industries. One of the more dangerous environments in industry, and the military, is air freight handling, where the fatal injury rate has consistently been higher than the national average. Nonetheless, peer-reviewed safety research that is focused on air freight handling is practically non-existent. Therefore, research that helps academicians and managers better understand safety climate and its potential influence on employee attitudes and behaviors is vitally important. To address these concerns, we develop and validate an air freight handling-specific safety climate scale capable of capturing employees' safety climate perceptions at the organization and group levels. We also found that, in general, measurement scale dimensions in this context are like those in other high-risk, transportation-related contexts, and that the nomological network may be converging on a cross-context set of safety climate dimensions. The resultant scale can be used to investigate safety climate's relationship with various employee attitudes, safety and operational behaviors in this high-risk environment.

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1. Introduction

The importance of safety cannot be understated in any industry, and the air freight handling industry is no different. The U.S. Office of Personnel Management (2009; pg. 178) defines the occupation as:

> . . .jobs involved in loading, placing, securing, and unloading air cargo in the air terminal and on the aircraft when such work includes responsibility for maintaining the proper weight and balance of the loaded aircraft, positioning cargo based on destination and priority of shipment, and insuring that incompatible cargoes are not loaded in the same aircraft.

These duties are conducted by "air freight handlers," and collateral duties can include operating vehicles (such as forklifts, aircraft loading equipment, stair trucks, and general purpose vehicles); guiding or "spotting" vehicles and loading equipment; manual and mechanical lifting and maneuvering of aircraft freight (i.e., baggage, pallets, containers, vehicles,

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equipment); assisting and briefing passengers on safety and emergency procedures; as well as opening/closing aircraft doors and hatches. These duties are often conducted in small teams.

Air freight handlers are exposed to multiple potential hazards, to include vehicle and equipment accidents that could result in aircraft, vehicle, or equipment damage, or personal injury and death; bodily injury associated with lifting and maneuvering heavy items; bodily injury associated with operating in confined spaces; hearing loss associated with long term exposure to loud noises; and injury occurring from exposure to toxic chemicals. One of the gravest dangers faced by personnel in this industry is the operation of forklifts and aircraft loading equipment. Across all industries, nearly 100 workers are killed each year while operating forklifts, and another 95,000 workers are injured (Lu & Yang, 2010). Dangers are exacerbated when one considers that most of air freight handlers' duties take place at a busy airport with moving vehicles and aircraft, or inside tight quarters, such as a warehouse or an aircraft cargo or passenger hold. As a result, this high-risk industry has had a fatal injury rate consistently higher than the national average for all industries (United States Department of Labor, 2004).

The dangers of this profession were never more apparent than on February 17, 2013 when a U.S. Air Force (USAF) air freight handler was killed in a workplace accident on Joint Base Andrews, Maryland. According to the official investigation, two air freight handlers were in the process of moving a piece of equipment into a warehouse storage location. In order to accomplish this, three vehicles had to be moved. One individual operated each vehicle while the other individual used spotting procedures to safely guide the vehicle operator. While backing up the third vehicle, the vehicle operator lost sight of the spotter and accidentally pinned him between the vehicle and the warehouse wall, leading to his death (USAF Ground AIB Report, 2013). The investigation cited improper spotting procedures as a primary cause of the accident, as the vehicle operator is required to stop the vehicle any time he or she loses sight of the spotter. Altogether, the air freight handling field provides a unique context in which to study safety, and the continued study of safety-related events and their predictors could help reduce occupational injuries (Barling, Loughlin, & Kelloway, 2002).

Safety-related events, such as close calls and near misses, directly predict occupational injuries, and these safety-related events can be minimized when employees perceive that a high level of safety climate exists in their organization (Barling et al., 2002). Safety climate refers to the perceptions that employees have of the value their organization places on safety versus other factors (such as productivity; Zohar, 2010). The relationship between safety climate and safety-related outcomes is well documented, and research has shown that safety climate is a robust predictor of safety performance (de Koster, Stam, & Balk, 2011; Kelloway, Mullen, & Francis, 2006; Podsakoff, MacKenzie, Moorman, & Fetter, 1990; Zohar, 2010; Zohar & Luria, 2005).

Therefore, we propose that continued safety climate research, particularly in the air freight handling context, is an important next step to better understanding the safety climate concept and reducing safety-related incidents in high-risk industries. Air freight handling safety research is currently unexplored territory. Although research has been conducted in air, rail, and truck transport safety, the authors could not find any research that specifically addressed air freight handling safety. Furthermore, while it could be argued that consensus has been reached as to safety climate's relationship with safety performance, Zohar (2010) stresses the need for creating industry-specific safety climate scales in order to capture context-dependent perceptions of safety climate. Factors that are important for safety in one industry, such as nursing, may be different from factors in other industries, such as air freight handling. Therefore, the purpose of this research is to develop and validate an air freight handling-specific safety climate scale and lay the foundation for future safety climate research in this industry, and beyond.

2. Conceptual development

Overall approaches to safety exist along a continuum from engineered designs to human behaviors. Engineering approaches focus on making safer equipment and infrastructure, while safety management systems focus on managing and controlling risk, proactively detecting and correcting safety issues, analyzing safety-related data, and measuring safety performance to support resource allocation and decision-making (USDOT, 2018). Additionally, the human behavioral (or human factors) approach is focused on individual differences and initiatives to help employees make better safety-related decisions (Hofmann, Burke, & Zohar, 2017). Much progress in improving safety performance has occurred along the entire spectrum, particularly in the behavioral realm.

Human error is a major cause of accidents in industrial organizations (Flin, Mearns, O'Connor, & Bryden, 2000). Reason (1990), in his famous "Swiss Cheese" model, proposed that accidents and incidents occur as a series of errors. That is, organizational influences, unsafe supervision, preconditions for unsafe acts, and unsafe acts align to result in a mishap or accident. This model has been a prevalent foundation of risk management and proactive safety programs, particularly in civil and military aviation (Belland, Olsen, & Lawry, 2010; Edkins, 1998). In the current study, we focus on organizational and supervisory aspects of the model. That is, organizational and supervisory safety management practices, policies, and procedures, often enacted in a safety management system, represent latent conditions in which employees operate. The organization's safety climate is indicated by employee perceptions of existing conditions (Zohar, 2010), and the focus on these organizational factors has resulted in a litany of research into the way managers can develop safe climates within their organizations.

The safety climate concept has been extensively explored across a wide variety of industries, to include manufacturing, energy production, and health care, to name a few (Christian, Bradley, Wallace, & Burke, 2009). Additionally, safety climate has been studied in transportation contexts, to include trucking (Douglas & Swartz, 2009), rail (Morrow et al., 2010), and