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The one that got away: Lessons learned from the evaluation of a safety training intervention in the Australian prawn fishing industry

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ABSTRACT

Fishing is an extremely hazardous occupation with one of the highest rates of work-based injuries and fatalities globally. Psychology-based safety training represents one approach to improving fishing safety by addressing safety-related attitudes and beliefs, as well as fostering safety knowledge and more positive safety behaviors (such as safety compliance and safety participation). Partnering with a fishing industry association, we evaluated the impact of safety training within the Australian prawn fishing environment. The study employed a longitudinal design with three data collection points: baseline (pre-program), proximal follow-up (immediately post-program), and one-month follow-up. Although some positive changes were observed for safety knowledge and safety compliance, we encountered logistical challenges that limited our ability to evaluate comprehensively the efficacy of the safety training. Consequently, we provide an analysis of 'lessons learned' and offer practical advice to assist applied safety researchers in conducting future safety training studies in the fishing industry. We also describe our psychology-based safety training in detail with the intention of informing future intervention development in this at-risk industry setting.

1. Introduction

Since people first ventured between land and water, aquatic occupations such as fishing have embodied physical risk. The fishing industry has one of the highest occupational fatality rates in the world (Smith and DeJoy, 2011). In the United States (US), the National Institute for Occupational Safety and Health (NIOSH, 2014) reported that commercial fishing is one of the most dangerous jobs, with 124 fatalities per 100,000 workers between 2000 and 2009. In Australia, primary industries including agriculture, forestry, and fishing recorded the highest number of work-related fatalities: 60 deaths and a fatality rate nine times higher than the all-industry rate (Safework Australia, 2014). Clearly there remains a need to address the job-related factors that precipitate high rates of injury and fatalities in commercial fishing.

Human behavior such as non-compliance with safety rules is one of the main contributors to injuries and fatalities in the fishing industry. One US-based study done between 2000–2010 found that following vessel-related disasters (e.g., fire or running aground), 31% of fatalities were drownings due to person-overboard events (NIOSH, 2014). Importantly, none of the deceased fishermen was wearing personal flotation devices (PFDs) at the time of these incidents, which implicates non-compliance behaviors given PFD usage is mandated by law in many countries. Similar safety behavior issues have been observed in Australia, with one study finding that PFD usage was below 1% during the study observation period (Brooks, 2005). Other research done in the US found that many fishing-related safety incidents have behavioral underpinnings such as errors or purposeful violations/unsafe behaviors (Kucera et al., 2010).

Human behavior is considered to be the outcome or product of internal psychological processes such as attitudes towards the behavior (Ajzen, 1991) and motivational valence to act (e.g. Vroom, 1964), and group-level factors such as social norms (Cialdini et al., 1991). Studies have shown that safety-specific conceptualizations of these factors predict safe and unsafe work behaviors (e.g., Clarke, 2006; Griffin and Neal, 2000; Ulleberg and Rundmo, 2003). It follows that modifying psychological constructs such as safety attitudes and beliefs is likely to result in concomitant improvements in the frequency of safety behaviors. Indeed, previous interventions have targeted safety attitudes and beliefs with activities such as training, and demonstrated that these internal factors can be changed (e.g., Abend and Halman, 1998; Donald and Young, 1996; Harvey et al., 2001).

The link between behavior and psychological attributes such as attitudes has been applied to workplace safety in heavy industries such as mining and oil/gas with considerable impact (Geller, 2005; Tuncel

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et al., 2006). Psychology-based safety approaches operate on the premise that an employee's attitudes influence subsequent safety behaviors, and produce a particular result that either reinforces or changes the original way of thinking (Geller, 2011). This proposition is reflected in meta-analytic studies linking psychological determinants of safety behaviors and, in turn, workplace injuries (Christian et al., 2009). Therefore, improving professional fishers' safety attitudes and beliefs through a psychology-based training initiative is likely to lead to increased safety behaviors, and as a result, decreased injuries and other adverse safety events.

Given the need for innovation in the design and application of safety training interventions across the fishing industry (Brooks, 2005), we designed, implemented, and evaluated a psychology-based safety training program. A psychological approach to safety is particularly important among fishing operators given the prevalence of negative safety attitudes and beliefs (Havold, 2010), and widespread acceptance of physical risk as part of the job (Bye and Lamvik, 2007). Of the limited intervention work done in the fishing industry, one recent study investigated the effectiveness of a participative intervention conducted among shrimp fishermen in the Gulf of Mexico (Levin et al., 2016). Using a theory of planned behavior (Ajzen, 1991) framework, a suite of activities was implemented including training and awareness-raising visual materials. Results showed that behavioral intention to act safely was enhanced, as were pro-safety attitudes and beliefs. This prior research demonstrates the plausibility of designing industry interventions that are effective at changing psychological determinants of safety performance.

Continuing this tradition, we partnered with an industry association that is comprised of all major prawn fishing employers in the region, and manages prawn stock sustainability in Northern Australia. The scope of our intervention included separate training events for crews and vessel captains ('skippers'), with a longitudinal study design incorporating pre-intervention, post-intervention, and one follow-up measurement.

2. Hypothesis development

To develop our guiding theoretical framework (see Fig. 1), we integrated the work of Griffin and Neal (2000) with Christian et al. (2009) meta-analytically derived model. Christian's et al. (2009) model was extended by adding the results of empirical studies specifically investigating the roles of safety control (Anderson et al., 2004; Huang et al., 2004, 2006; Snyder et al., 2008) and self-efficacy (Katz-Navon et al., 2006; Newnam et al., 2005) in predicting safety outcomes. Specifically, we modeled safety knowledge and motivation as the proximal determinants of safety behavior, and safety control and safety-specific self-efficacy as distal determinants.

Our intervention targeted these determinants directly through the training and follow-up activities. Safety performance (safety compliance and safety participation) was our primary criterion measure, and was hypothesized to improve as a result of change in the distal and proximal determinants. Based on the collective results of prior studies (Beus et al., 2016), safety performance was modeled as the direct determinant of safety outcomes such as incidents (e.g., near-misses, injuries); however, this link was not explicitly investigated as part of our study and is included to highlight the practical significance of our work.

The model advanced by Griffin and Neal (Neal et al., 2000; Griffin and Neal, 2000) specifies that the proximal determinants of safety behaviors are safety-specific motivation and knowledge. Therefore, by increasing both of these factors through a targeted intervention, the relationship with safety performance is likely to be positive. Distal determinants make further contributions to safety performance via their relationship with the proximal determinants—their relationship with on safety performance is mediated by safety knowledge and motivation (Christian et al., 2009). Taken together, our theoretically-derived model grounds this intervention study in established safety science.

In designing the current intervention, we incorporated elements of stage-learning theory (Anderson, 1985) and social learning theory (Bandura, 1977). According to the stage-learning approach, interventions typically consist of three phases: acquiring declarative knowledge, knowledge consolidation/compilation, and knowledge proceduralization (developing skills). Social learning theory is founded in observational, rehearsal, and feedback activities designed to increase the learner's self-efficacy (Bandura, 1997).

Applied to safety training, the stage- and social-learning theories have been shown to result in increased safety knowledge, safety motivation, and safety behaviors (Burke et al., 2006). Specific to the current intervention, we used a combination of expert lecture combined with demonstrations of key skills, interactive media to illustrate key concepts (such as animations), and an extensive role-play/practice session focusing on application of a safety feedback/recognition conversation process. These activities were designed to equip participants with both declarative and procedural safety knowledge, and increase the valence of safety outcomes (improving overall safety motivation as a results). Therefore, we made the following predictions:

H1. Participants' safety knowledge (H1a) and safety motivation (H1b) will improve pre-post intervention.

In addition to proximal motivational and knowledge factors, meta-analytic research has identified distal determinants of safety performance, such as safety locus of control (Christian et al., 2009). Similarly to general work locus of control, the safety-specific conceptualization (Jones and Wuebker, 1985) proposes that individuals possess a set of beliefs regarding the extent to which behavioral consequences are due to their own actions (internal locus) or those of others or the environment (external locus). A related concept is safety control (Anderson et al., 2004; Snyder et al., 2008), which is a more specific construct that refers to employees' beliefs around their ability to (1) influence safety practices and procedures, (2) demonstrate safety behaviors, and (3) control whether they are involved in safety incidents at work. Therefore, interventions that include activities designed to increase workers'

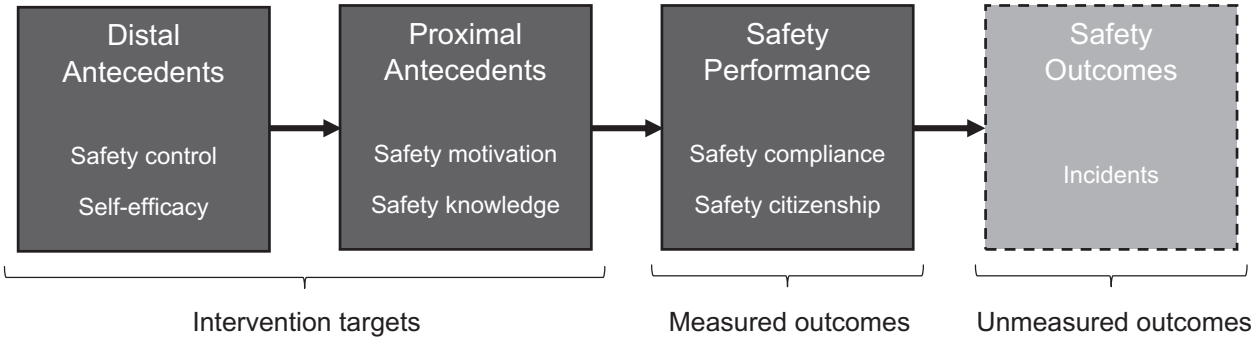

Fig. 1. Overview of the study's theoretical framework.