Enjoyment, Values, Pressure, or Something Else: What Influences Employees' Safety Behaviours?

by

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Abstract

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Abstract: A key component to maintaining a safe work environment is having employees' regularly engaging in safety behaviours. It is important to understand both the quantity and quality of motivation when trying to predict safety behaviours. There has been little investigation into the different types of employee safety motivation. Using self-determination theory, I address the question of what motivates employees to work safely. I refined and validated a scale to measure different types of safety motivation and examined the relationships between different types of safety motivation and safety behaviours across three separate studies. Study one refined and validated the multi-dimensional self-determined safety motivation (SDSM) scale (Scott, Fleming, & Kelloway, 2014) and examined the relationships between safety climate, safety motivation, and safety behaviours. Study two further refined and validated the SDSM scale and further tested the relationships between different types of safety motivation and safety behaviours across a more diverse sample. In the third study, I tested the direction of the relationships between different types of safety motivation and safety behaviours over two time periods. This research provides evidence of the reliability and validity of the SDSM scale. Overall, the results highlight the importance of autonomous forms of safety motivation in encouraging employee safety behaviours and also highlights the lack of importance that controlled forms of safety motivation have on safety behaviours, particularly external safety regulation.

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Introduction

Although safety has always been considered in high-hazard industries, there has been increasing attention to safety performance over the last several decades, and across a much broader range of industries. It is becoming increasingly common to see safety performance metrics on company scorecards and safety performance included in executive management performance evaluations. The safety performance of an organization is determined by the complex interactions among organizational, technological and individual factors. Employees play a critical role in all three of these factors. For example, employees carry out a large part of the organization's management system for identifying, controlling and mitigating risks and hazards; employees use and interact with technology on a day-to-day basis, including machines and equipment; and employees themselves perform tasks and make decisions that can impact the overall safety performance of an organization. In fact, there is a growing body of literature linking employee behaviours to occupational safety outcomes (Clarke, 2006; Hofmann & Stetzer, 1996; Neal & Griffin, 2006; Yu, 1990).

Employees perform both core safety activities that are part of the formal work procedures (i.e., safety compliance behaviours) and informal safety activities that help to create a safe work environment (i.e., safety participation behaviours; Griffin & Neal, 2000; Hofmann, Morgeson, & Gerras, 2003; Neal & Griffin, 2002). Examples of core safety activities include following safety policies and procedures and complying with occupational safety regulations. Core safety activities represent controls that have been put in place to minimize risk by addressing workplace hazards. Employee compliance

with safety policies and procedures focus mainly on meeting minimum safety standards and are often described as necessary but not sufficient for creating a safe work environment (Barling & Hutchinson, 2000; Inness, Turner, Barling, Stride, 2010). In addition to complying with safety rules and procedures, employees can also take a more proactive approach to workplace safety (Didla, Mearns, Flin, 2009). Safety participation behaviours include voluntary activities that support the company's safety program and help to develop an environment that supports and encourages employees to work safely (Neal & Griffin, 2002). Safety participation behaviours include safety citizenship behaviours (SCB) that improve the safety of others and of the organization itself (Hoffman et al., 2003). SCB's include voicing safety concerns, helping coworkers with safety issues, looking out for coworkers' safety, and keeping informed about safety issues (Hofmann et al., 2003).

There has been a great deal of attention paid in both the academic and practitioner domains to how employees behave regarding workplace safety matters. The popularity of behavioural-based safety programs is one example of this attention (Smith, 2007). Motivation is an essential factor in determining how employees behave. Both safety compliance and participation behaviours help to create a safe work environment; however, both types of safety behaviours are contingent upon employees being motivated to perform these types of behaviours. Despite the importance of motivation on determining what safety behaviours employees engage in there has been little focus on the reasons why an employee is motivated to behave safely. This is the main focus of my dissertation research. Specifically, the goals of this research program were to determine if there are empirically distinct concepts that represent different reasons, or types of

motivation for working safely and to determine if the different types of safety motivation were all equally related to employee safety compliance and participation behaviours. To introduce my research program, I first begin by reviewing the previous safety motivation literature.

Safety Motivation Literature Review

Motivating employees to work safely has been recognized as an important factor in preventing workplace safety incidents since the early 1930's (Heinrich, 1931). Despite the longstanding acknowledge of the importance of motivating employees to work safely, it has only been in the last ten to fifteen years that research has begun to systematically examine employee motivation for working safely. The increased attention to the topic of employee safety motivation since the early 2000's is highlighted in Table 1 in which I summarize this body of literature. The most common definition of employee safety motivation is *"an individual's willingness to exert effort to enact safety behaviours and the valence associated with those behaviours"* (Neal & Griffin, 2006; p. 947). Based on the use of this definition, it is clear that, to date, employee safety motivation has been defined purely in terms of the level of effort an individual is willing to exert to perform work safely.

Table 1: Summary of previous safety motivation research

Study	Design	Participants	Predictor Constructs	Criterion Constructs	Key Findings
Andriessen (1978)	Cross-sectional	270 Construction employees	SM	Carelessness, self-initiative	Expectations of supervision & accident reduction influenced careful behaviours; expectations of supervision & co-worker reactions influenced self-initiative
Griffin & Neal (2000)	Multi-study; Cross-sectional	N1=1264; N2=326 Manufacturing, mining employees	SC, SK, Compliance & participation motivation	SCB, SPB	SC influences both types of motivation & SK; both motivations & SK mediate relationship between SC & behaviour
Neal, Griffin, & Hart (2000)	Cross-sectional	525 Healthcare employees	Organizational climate, SC, SK, SM	SCB, SPB	SM influences both SCB & SPB; SM – SCB relationship stronger than SM – SPB; SM partially mediates relationship between SC & both safety behaviours
Probst & Brubaker (2001)	Multi-study; Cross-sectional; Longitudinal	N1=92; N2=76 Food processing plant employees	Job insecurity, Job satisfaction, SK, SM	SCB, injuries & accidents	Job satisfaction influences future SM; SM predicts influences SCB across time
Neal & Griffin (2006)	Longitudinal	N1=434; N2=490; N3=301 Healthcare staff	SC, SM, Negative affectivity	SCB, SPB, injuries	Found lagged effect of SC on SM after controlling for prior levels of SM; levels of SM in T2 associated with increases in SPB in T3; found reciprocal relationship between SPB and SM
Newnam, Griffin, & Mason (2008)	Cross-sectional	385 Government employees, 88 supervisors	Org. & managerial safety values, Rule violation & speeding attitudes, SE, SM	Self-reported accidents	SM predicts self-reported crashes; SM higher when perceptions of managers & supervisors' safety values are high; safety attitudes & self-efficacy related to SM

Study	Design	Participants	Predictor Constructs	Criterion Constructs	Key Findings
Larsson, Pousette, & Torner (2008)	Cross-sectional	189 Construction employees	SC, SK, SM	Personal, Interactive, & Structural behaviours	SC influences SK & SM; SM influences personal & interactive behaviours; SC influences structural behaviours
Christian, Bradley, Wallace, & Burke (2009)	Meta-analysis	N/A	SC, Leadership, Personality, Job attitudes, SM, SK	SCB, SPB, Injuries & accidents	SC moderately related to safety behaviours; found stronger effect of SC & leadership for SPB than SCB; SC more strongly related to SM than SK; Conscientiousness related to SM; SM related to SCB & SPB, SCB & SPB decreases accidents & injuries
Vinodkumar & Bhasi (2010)	Cross-sectional	1,566 Chemical factory employees	Safety management practices, SK, SM	SCB, SPB	Safety training influenced SM; SK & SM influenced SCB & SPB; different safety management practices predicted SCB than SPB
Sinclair, Martin, & Sears (2010)	Cross-sectional	535 Unionized retail employees	Perceived stakeholders' safety values, perceived hazards, safety training, SK, SM	SCB, SPB, Self-report injuries & near misses	Employees who perceived supervisors & union valued safety reported higher levels of SM; employees with higher levels of SM reported more SCB & SPB; SPB increased reported near misses; SCB but not SPB related to decreased injuries
Kath, Magley, & Marmet (2010)	Archival cross-sectional	599 grocery store employees in 97 workgroups	SC, OT, SM	SM, injuries	SC positively related to SM, OT partially mediated relationship between SC & SM, group-level SM did not significantly predict group-level injuries

Study	Design	Participants	Predictor Constructs	Criterion Constructs	Key Findings
Conchie (2013)	Multi-study; cross-sectional	N1=251; N2=220 Construction employees	SSTL, external, identified & intrinsic motivation, Trust	SCB, SCiB	Intrinsic motivation partially mediated the effect of SSTL on certain SCiBs (i.e., safety voice, whistle-blowing), but is unrelated to others (i.e., helping), identified motivation partially mediated the effect of SSTL on SCB, external motivation was not related to either SCB or SCiB
Chen & Chen (2014)	Cross-sectional	239 commercial pilots	SMS practices, morality leadership, SE, SM,	SCB, SPB	Pilot SM has a strong positive effect on SCB & SPB, SM partially mediates relationship between pilot's perceptions of SMS practices, self-efficacy & SCB & SPB, SM fully mediates relationship between morality leadership & SCB & SPB

Notes: SC = safety climate; SK = safety knowledge; SM = safety motivation; SE = Self-efficacy; OT = organizational trust; SSTL = safety-specific transformational leadership; SMS = safety management systems; SCB = safety compliance behaviours; SPB = safety participation behaviours; SCiB = safety citizenship behaviours

Research on safety motivation has largely focused on understanding how the overall amount of effort exerted and motivational strength for working safely impacts important safety outcomes. The most common outcome variable of interest in this research is self-reported employee safety behaviours. Ten of the thirteen studies summarized in Table 1 include some type of employee safety behaviours as one of the major outcome variables. This relationship between employee safety motivation and safety behaviours has been studied in a wide variety of industries, including manufacturing and processing (Griffin & Neal, 2000; Probst & Brubaker, 2001; Vinodkumar & Bhasi, 2010), mining (Griffin & Neal, 2000), healthcare (Neal et al., 2000; Neal & Griffin, 2006), construction (Conchie, 2013; Larsson et al., 2008), and retail (Sinclair et al., 2010). Overall, researchers have found a positive relationship between employee safety motivation and employee safety compliance and participation behaviours (Christian et al., 2009; Griffin & Neal, 2000; Neal et al, 2000; Sinclair et al., 2010, Vinodkumar & Bhasi, 2010). Although, how researchers define and measure safety motivation may have an impact on the results.

Different studies (i.e., Neal & Griffin, 2006; Probst & Brubaker, 2001), both examining the relationship between employee safety motivation and the extent to which employees complied with safety rules and procedures have previously found conflicting results. Probst and Brubaker (2001) concluded that safety motivation predicted employee compliance behaviours whereas Neal and Griffin (2006) found that safety compliance behaviours were not influenced by their level of safety motivation, although participation safety behaviours were. Neal and Griffin (2006) suggested the differing results of these two studies might be caused by different definitions and measures of safety motivation.

Specifically, Probst and Brubaker (2001) assessed safety motivation in terms of the effects of rewards and punishments, whereas Neal and Griffin's (2006) safety motivation measure focused on how important safety was to employees.

Despite the growing body of research on the positive relationship between employee safety motivation and safety behaviours, there is still insufficient evidence to conclude whether employee safety motivation influences both safety compliance and safety participation behaviours equally (Christian et al., 2009). In one cross-sectional study conducted in the manufacturing and mining industries, Neal et al. (2000) concluded that safety motivation had a stronger effect on employees' safety compliance behaviours than their safety participation behaviours. Contrary to this finding, Neal and Griffin (2006) found that safety motivation influenced employees' safety participation behaviours across a two-year period, but found no significant lagged relationship between safety motivation and safety compliance behaviours, suggesting that safety motivation may have a more persistent effect on employees' safety participation behaviours.

Neal and Griffin's (2006) study is one of the only safety motivation studies to utilize a longitudinal research design. In addition to finding differential effects of employee safety motivation on safety compliance and safety participation behaviours over time, the results of this study also indicate that there may be a reciprocal relationship between safety motivation and safety participation behaviours. Specifically, Neal and Griffin found that engaging in "extra-role" safety activities (i.e., safety participation behaviours) can lead to further increases in safety motivation over time. With so few longitudinal studies in this area, the causal direction of the relationship between employee safety motivation and safety behaviours is still being determined.

In addition to determining the relationship between employee safety motivation and safety behaviours, safety motivation research has also focused on identifying the factors that influence employees' level of safety motivation. There is a growing body of research demonstrating a strong relationship between the safety climate of a work environment (i.e., the shared perceptions of the importance of safety; Zohar, 1980) and employees' safety motivation (Christian et al., 2008; Griffin & Neal, 2000; Kath et al., 2010; Larson et al., 2008; Neal et al., 2000; Neal & Griffin, 2006). Similarly, perceptions of safety-specific transformational leadership (Conchie, 2013) and the safety management practices of an organization (Chen & Chen, 2014; Vinodkumar & Bhasi, 2010) have also been associated with increased employee safety motivation. Employee safety motivation has also been identified as an important mediator that explains how these organizational characteristics (e.g., safety climate, safety management practices) influence employee behaviours. For instance, employee safety motivation has been found to partially mediate the relationship between safety-specific transformational leadership and employees' safety behaviours (Conchie, 2013), and between safety climate and employee safety behaviours (Griffin & Neal, 2000; Neal et al., 2000). In addition to these organizational factors, research has also found significant relationships between employee safety motivation and a number of individual factors including job satisfaction (Probst & Brubaker, 2001), conscientiousness (Christian et al, 2009), and employee self-efficacy (Chen & Chen, 2014; Newnam et al., 2008).

The current body of research demonstrates a clear relationship between employee safety motivation and the extent to which employees engage in a variety of safety behaviours. Given this relationship, it is important to understand the reasons that motivate

an employee to work safely, as this could lead to fewer occupational injuries and accidents (Christian et al., 2009; Clarke, 2006). This is one of the shortfalls of the current body of safety motivation research. Commonly, safety motivation has been defined as a one-dimensional construct measuring the level of effort. Historically, the emphasis has been placed on how strong an employee's motivation is and how motivational strength impacts employees' safety behaviours. Very few studies have considered whether there are different reasons why employees are motivated to work safely and whether different motives, or types of motivation have differential effects on employees' safety behaviours.

It is plausible that employees are motivated to engage in safety behaviours for a number of different reasons. For instance, employees may be motivated to follow workplace safety policies and procedures because of the threat of disciplinary actions, because they observe others following them and do not want to go against the norm, or because they believe the safety policies and procedures are valuable safeguards put in place to avoid individuals from getting hurt. All of these reasons can motivate employees to follow the safety policies and procedures; however, the quality of that motivation in terms of the consistency in which it influences employee's behaviours may not be the same. For instance, employees who are motivated to follow workplace safety procedures because they believe the procedures are an important factor in injury prevention may follow the procedures more consistently than an employee who is primarily motivated by the desire to avoid being reprimanded by a supervisor or a colleague if they are caught disregarding the procedure.

One of the few motivation theories to focus on the reasons that motivate individuals and outlines several different types of motivation is self-determination theory

(Deci & Ryan, 1985). Self-determination theory is distinct from other human motivation theories because it infers that the *type* or quality of motivation is equally as important as the *amount* or quantity of motivation when trying to understand and predict human behaviour (Deci & Ryan, 1985; 2008). For this reason, self-determination theory is a useful theoretical framework to guide this research aimed at exploring whether there are different types of employee safety motivation and the extent to which these types of safety motivation influence employees' safety behaviours.

Self-Determination Theory

Self-determination theory (Deci & Ryan, 1985) builds upon Porter and Lawler's (1968) work in classifying the reasons for work behaviours as either extrinsic or intrinsic. These different reasons for our behaviour reflect two different types of motivation. Intrinsic motivation is defined as engaging in an activity for intrinsic reasons such as the activity is interesting, enjoyable, or satisfying. When intrinsically motivated, the activity itself and the emotions experienced while performing the activity is the underlying reason the behaviour occurs. Extrinsic motivation is defined as engaging in activities to achieve an outcome that is contingent upon performing the activity itself (Deci & Ryan, 1985). When extrinsically motivated, the outcome of performing the behaviour is the underlying reason the behaviour occurs.

Within the context of occupational safety, this distinction between extrinsic and intrinsic motivation may not be particularly useful in determining why employees behave safely because the majority of safety activities are not designed to be enjoyable or even interesting, but rather are designed to keep employees safe. For example, employees

typically do not enjoy wearing their personal protective equipment (PPE). In fact, employees will often complain that PPE is uncomfortable and irritating to wear, that it slows them down, and gets in the way of doing their job. Therefore, if we only considered whether employees were extrinsically or intrinsically motivated to work safely we would likely conclude that employees are generally extrinsically motivated to work safely and that they only engage in safety behaviours that have a positive consequence that they are trying to attain or a negative consequence they are trying to avoid.

Self-determination theory (Deci & Ryan, 1985); however, goes beyond categorizing motivation as either extrinsic or intrinsic and further argues that employees can experience extrinsic motivation as controlling or autonomous depending on how closely the outcome reflects the individuals' own values and goals. In other words, the distinction between extrinsic motivation that is controlled versus autonomous is based on the extent to which the individual has internalized the reasons for doing an activity or the outcome of that activity (Gagné, et al., 2010; Ryan & Deci, 2002). Deci and Ryan (1985) defined internalization as "an active, natural process in which individuals attempt to transform socially sanctioned mores or requests into personally endorsed values and self-regulations." (p. 234). As shown in Figure 1, extrinsic motivation ranges from completely externalized, in which the outcome of the behaviour is completely separate from any aspect of the individual and results in contingent-based behaviour to fully internalized, in which the outcome of the behaviour completely aligns with the individual's value set and results in self-directed behaviour.

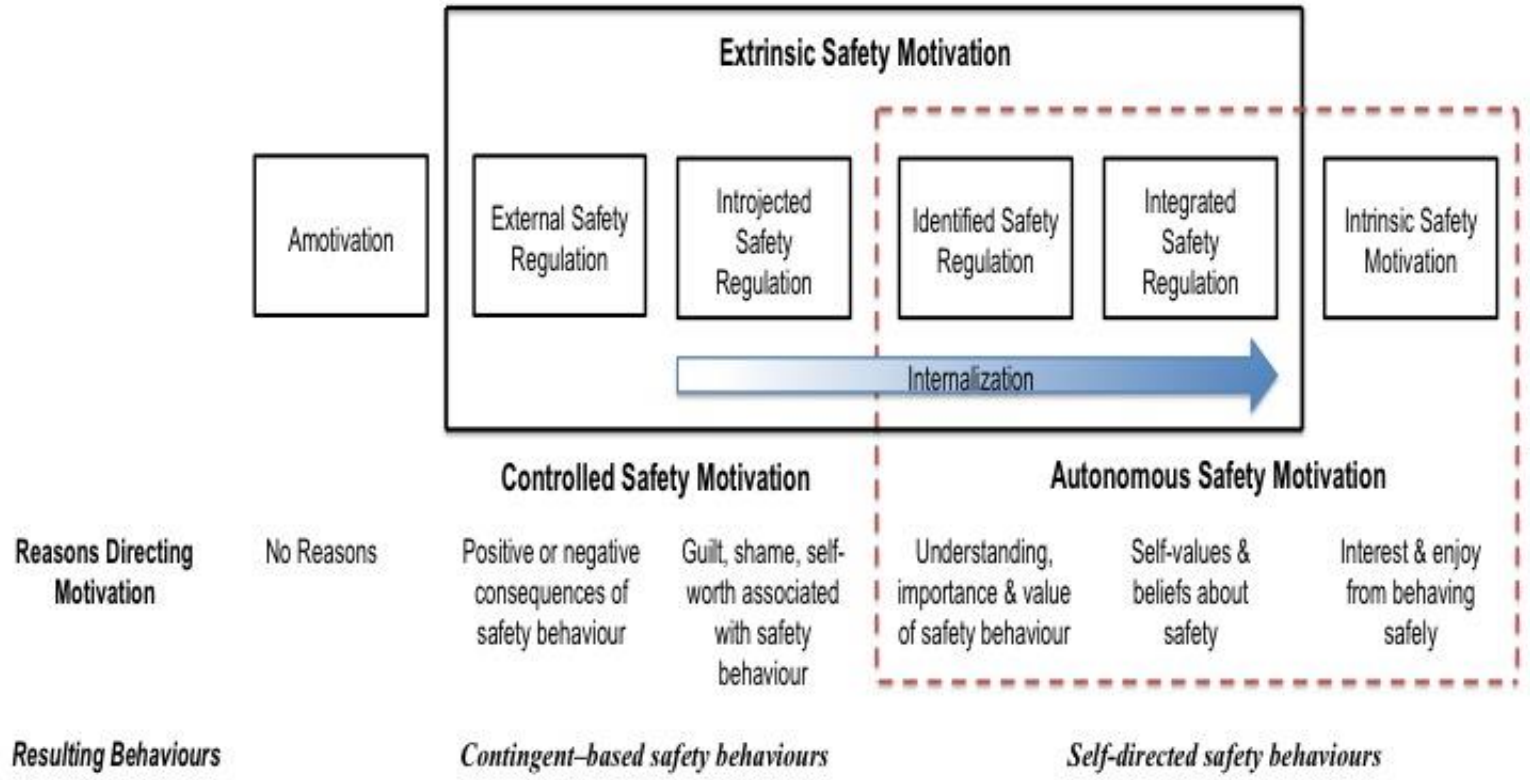


Figure 1. Types of safety motivation based on self-determination theory (Adapted from Gagné & Deci, 2005; Ryan & Deci, 2002)

According to self-determination theory the variations in the extent to which individuals internalize behaviours or the outcome of the behaviour reflect different types of motivation (Deci & Ryan, 1985; 2002; Ryan & Deci, 2000). Self-determination theory posits there are five types of motivation. These different types of motivation and how they can be applied to employee safety motivation are described in the next section.

Types of Safety Motivation In Accordance With Self-Determination Theory

At a macro level self-determination theory (Deci & Ryan, 1985), distinguishes between those who are motivated for any reason and those who are not motivated at all.

Amotivation. It is important to acknowledge that some employees could simply not be motivated to work safely. Employees who have no reason to work safely are said to be amotivated. Amotivated employees lack any motivation to work safely and therefore will be unlikely to engage in safety behaviours.

When employees are motivated to some degree to work safely, that motivation can stem from both extrinsic reasons (i.e., to achieve an outcome) and intrinsic reasons (i.e., inherent interest and satisfaction). More importantly for understanding the context in which safety behaviours are performed, extrinsic reasons for working safely can manifest in the form of both controlled and autonomous motivation.

Controlled safety motivation. Controlled motivation represents feelings of *having* to do an activity or feelings that you *should* behave in a certain way (Gagné & Deci, 2005). When employee safety motivation is controlled, safety behaviours and activities are performed because the employee feels pressured or coerced to do so. The pressure to perform safety behaviours can come from another person (e.g., supervisor,

coworker), a group (e.g., the organization), society (e.g., the occupational health and safety act), or from within the individual themselves. Controlled safety motivation can be divided into external pressure (i.e., external safety regulation) and internal pressure (i.e., introjected safety regulation) to behave safely.

External safety regulation. External regulation represents the most controlling form of motivation (Deci & Ryan, 1985; 2000). It is what people most commonly envision when they think about extrinsic motivation. Externally regulated safety behaviours require the presence of a stimulus in order for the behaviours to occur. The stimulus is typically in the form of a reward for performing work safely or a negative consequence when work is not performed to safety expectations. An example of an external reason for performing safety activities is having your annual bonus contingent upon good safety performance. This frequently occurs within the healthcare industry where hospital executives' bonuses are determined in part by achieving a minimum threshold for a set of safety metrics such as achieving a minimum score on a safety culture survey, or achieving the set target of reduction of serious safety events. Other examples of external reasons that motivate individuals to work safely include being reprimanded or witnessing others around you being reprimanded for failing to perform specific safety behaviours. There may also be pressure from external agencies such as regulators or professional associations who enforce fines for employers and employees if they are observed breaking safety regulations.

Introjected safety regulation. Introjected safety regulation is characterized as performing safety activities because there is internal pressure to do so as opposed to pressure from another person or group (Gagné & Deci, 2005). Introjected safety

regulation is most commonly experienced as guilt or shame for not behaving safely. Employees may also believe their self-worth is contingent upon being a safe worker. For example, an employee may be motivated to wear and attach their safety harness when they work at height because the employee would feel ashamed if they were the only ones not wearing a safety harness. Similarly, employees may feel a sense of guilt at putting themselves or others at increased risk when cutting corners and skipping steps in safety procedures to be more efficient.

Autonomous safety motivation. Autonomous motivation is conceptualized as a willingness to engage in an activity because there is a sense of having some influence and autonomy over the decision to perform that activity (Gagné & Deci, 2005). Autonomous safety motivation can result from both extrinsic and intrinsic reasons for working safely. Employees who are autonomously motivated to work safely take ownership over performing safety activities because they view these activities as being consistent with their own personal values, beliefs, and interests. As a result, autonomously motivated safety behaviours are self-directed and therefore, should be consistently performed.

Identified safety regulation. Identified safety regulation represents employees who are motivated to engage in safety activities because they believe a safe work environment is important and accept that performing safety activities are necessary to achieve that goal. Take for instance a group of construction workers who show up to a new worksite before their supervisor arrives and immediately begins conducting a hazard assessment before starting the new job. They do this not because they feel they have too (i.e., controlled motivation) or because this is an interesting and fun work task (i.e., intrinsic motivation), but rather because they believe the hazard assessment can provide

useful information that can help make the worksite safer and they value having the information this task provides before they begin the job. The safety activity (i.e., conducting a hazard assessment) is ultimately performed to obtain an outcome (i.e., the information it provides) so the reason motivating the employee to perform the hazard assessment is still extrinsic; however, because the employee believes the activity and the outcome it produces are important and valuable, the decision to perform the activity is autonomous and the act of performing the hazard assessment is self-directed.

Integrated safety regulation. Integrated motivation is the most autonomous form of extrinsic motivation (Ryan & Deci, 2002). As the name suggests, not only do employees value activities and the outcomes of those activities, but they also assimilate these values into other aspects of their self so that they become part of their self-identity (Gagné & Deci, 2005). Workplace safety rules, policies, procedures, and activities become internal convictions in employees with integrated safety motivation. Because employees have incorporated the value of the safety behaviour or the outcome the behaviour produces into their sense of self, they may also be more likely to perform these safety behaviors in non work-related contexts (e.g., home maintenance and repair activities).

Intrinsic safety motivation. Intrinsic safety motivation is characterized as performing safety activities such as volunteering for the joint occupational health and safety committee because the employee finds the activity enjoyable, satisfying, or interesting. Intrinsic safety motivation represents the fullest form of autonomous safety motivation, as the reason for engaging in the safety activity is completely volitional.

Self-determination theory further posits that autonomous forms of motivation (i.e., identified, integrated, and intrinsic) produce higher quality motivation and are more desirable then controlled forms (i.e., external and introjected) because autonomous motivation produces self-regulated behaviours (Ryan & Deci, 2002). This proposition is supported by empirical evidence. Autonomous motivation has been associated with improved performance and greater health and well-being (Ryan & Deci, 2002). For instance, Black and Deci (2000) found that students' autonomous motivation positively predicted academic performance. Vieira et al. (2011) demonstrated that autonomous exercise motivation was positively related to physical and mental quality of life, and negatively related to anxiety in overweight individuals participating in a long-term weight control program.

Within the workplace, autonomous types of work motivation have been associated with better employee outcomes than controlled types of motivation including increased job satisfaction (Gagné, et al., 2010; Gillet, Gagné, Sauvagere, and Fouquereau, 2013; Van den Broeck, Lens, De Witte, Hans, Van Coillie, 2013), organizational commitment (Gagné, et al., 2010; Gagné, et al., 2015), work effort (De Cooman, Stynen, Van den Broeck, Sels, De Witte, 2013), and decreased turnover intention (Gagné, et al., 2010; Gagné, et al., 2015, Gillet et al., 2013) psychological distress (Trepanier, Fernet, & Austin 2013), burnout and work strain (Fernet, Austin & Vallerand 2012, Gagné, et al., 2014; Van den Broeck, et al., 2013). Gagné, et al., 2015 concluded that the pattern of correlations between the types of motivation and various work outcomes measured (e.g., burnout, turnover intention, organizational commitment, etc.) followed the expected pattern of results with the correlations becoming stronger in the expected direction as you

looked across the types of motivation ranging from external regulation to intrinsic motivation.

Understanding the types of motivation that are most associated with behavioural outcomes is particularly important in the domain of workplace safety. A large part of workplace safety promotion and prevention depends on human involvement. As a result, many safety management and improvement strategies focus on promoting or changing specific employee behaviours. The success of these strategies is depended upon a clear understanding of what motivates employees to work safely.

To date, only two studies have directly examined different types of safety motivation. In a study investigating the mediating role of safety motivation on the relationship between supervisors' safety-specific transformational leadership and employee safety behaviours Conchie (2013) examined the effects of three types of safety motivation. Using self-determination theory as a general framework for specifying different types of motivation, Conchie chose to focus on external regulation, identified regulation and intrinsic motivation, but excluded the assessment of amotivation, introjected regulation, and integrated regulation from this study. Conchie found that these three types of safety motivation differentially mediated the relationship between supervisors' safety-specific transformational leadership and employee safety behaviours. Specifically, intrinsic safety motivation mediated the relationship between safety-specific transformational leadership and employee safety citizenship behaviours, while identified safety regulation mediated the relationship with employee safety compliance behaviours. External safety regulation was not significantly related to either type of employee

citizenship or compliance behaviours, or to supervisors' safety-specific transformational leadership.

The second known study to incorporate self-determination theory into safety motivation research and examine different types of safety motivation was Scott, Fleming, and Kelloway (2014), who developed a multi-dimensional measure of employee safety motivation. The instrument developed by Scott et al. assessed all five types of motivation specified by self-determination theory (i.e., external, introjected, identified, integrated, and intrinsic), as well as amotivation. As part of the evaluation of their instrument, Scott et al. also examined the extent to which each type of safety motivation predicted employees' safety compliance and safety participation behaviours. Three out of the six types of safety motivation (i.e., introjected, identified, and intrinsic) significantly predicted self-reported safety compliance behaviours. Only intrinsic safety motivation significantly predicted self-reported engagement in safety participation behaviours.

The results from Conchie (2013) and Scott et al. (2014) emphasize the importance of moving beyond only examining how the strength of employee safety motivation relates to safety behaviours, and demonstrates the value in examining the different reasons that motivates employees to work safely. The results of these two studies also highlight the utility of using self-determination theory to identify the different reasons employees would be motivated to working safely.

Current Research

Despite the empirical evidence supporting self-determination theory's proposition that the quality (or type) of motivation is equally important as the amount of motivation,

and the general acknowledgement from the broader psychological field that there are often different reasons that motivate individual behaviours, occupational safety researchers have done relatively little investigation into the different reasons that motivate employees to work safely. Therefore, my intention in this dissertation is to gain a better understanding of the different reasons that motivate employees to work safely and the specific mechanisms by which different types of motivation influence employee safety behaviours so that this information can inform the design of more effective workplace safety improvement programs.

Specifically, I had four goals for this research. The first goal was to further refine and validate the multi-dimensional employee safety motivation scale originally designed by Scott et al. (2014). The continued scale refinement and validation process will help determine the empirically distinct types of safety motivation that can be measured. The second goal of this research was to investigate the relationship between employee safety climate perceptions and different types of employee safety motivation, as safety climate perceptions have been identified as an important predictor of safety performance (Christian et al., 2009). The third goal of this research was to determine if each distinct type of employee safety motivation is equally related to employee safety compliance and safety participation behaviours. The fourth and final goal of this research was to provide evidence of the direction of the relationships between the different types of employee safety motivation and safety behaviours.

To achieve these four goals I conducted three research studies were conducted. Study one builds upon the work of Scott et al. (2014) to further develop a scale of self-determined safety motivation and determine if the different types of safety motivation

outlined within self-determination theory are empirically distinct (Goal 1). Furthermore, study one also examines the relationship between each type of safety motivation and employees' safety climate perceptions (Goal 2) and employees' safety compliance and safety participation behaviours (Goal 3). The second study also builds upon study one by further examining the empirically distinct types of safety motivation (Goal 1) and the relationships between these types of motivation and employee safety behaviours using a more diverse sample to examine the generalizability of these relationships across a range of work environments (Goal 3). Study three focuses on examining the relationships between different types of safety motivation and safety behaviours over time to determine the direction of these relationships (Goal 4).

Study 1

The purpose of this study was to explore the utility of using self-determination theory (Deci & Ryan, 1985) as a framework for studying and measuring employee safety motivation. Since the first publication of self-determination theory in the 1980's several instruments have been developed to assess the different types of motivation outlined in the theory. Table 2 lists the most frequently cited instruments used to measure self-determination theory's types of motivation.

Table 2: List of motivation instruments based on self-determination theory

Reference	Instrument	Subscales
Ryan & Connell (1989)	Academic Self-Regulation Questionnaire	1. External 2. Introjected 3. Identified 4. Intrinsic
Ryan & Connell (1989)	Prosocial Self-Regulation Questionnaire	1. External 2. Introjected 3. Identified
Vallerand, Pelletier, Blais, Brière, Sénécal, & Vallières (1992)	Academic Motivation Scale	1. Amotivation 2. External regulation 3. Introjected regulation 4. Identified regulation 5. Intrinsic motivation – knowledge 6. Intrinsic motivation – accomplishment 7. Intrinsic motivation – stimulation
Vansteenkiste, Lens, De Witte, De Witte, & Deci (2004)	Job Search Self-Regulation Questionnaire	1. Autonomous job search 2. Controlled job search 3. Amotivation to search 4. Autonomous motivation not-to-search 5. Controlled motivation not-to-search
Levesque, Williams, Elliot, Pickering, Bodenhamer, & Finley (2007)	Treatment Self-Regulation Questionnaire	1. Amotivation 2. External regulation 3. Introjected regulation 4. Autonomous motivation

Reference	Instrument	Subscales
Tremblay, Blanchard, Taylor, Pelletier, & Villeneuve (2009).	Work Extrinsic and Intrinsic Motivation Scale	1. Amotivation 2. External regulation 3. Introjected regulation 4. Identified regulation 5. Integrated regulation 6. Intrinsic motivation
Gagné, et al. (2010)	Work Motivation Scale	1. External regulation 2. Introjected regulation 3. Identified regulation 4. Intrinsic motivation
Scott et al. (2014)	Self-determined Safety Motivation Scale	1. Amotivation 2. External 3. Introjected 4. Identified 5. Integrated 6. Intrinsic
Gagné et al. (2015)	Multidimensional Work Motivation Scale	1. Amotivation 2. External regulation – social 3. External regulation – material 4. Introjected regulation 5. Identified regulation 6. Intrinsic motivation

It is important to note that there is variation in the motivational types researchers have previously measured. For instance, some instruments include a subscale of amotivation (Gagné et al. 2015; Scott et al., 2014), whereas others do not (Gagné et al., 2010). Although self-determination theory makes a theoretical distinction between identified and integrated regulation, only two of the instruments listed in Table 2 include a distinct integrated regulation subscale. Gagné et al. (2015) argue that integrated regulation has not been found to account for unique variance in outcomes above other forms of autonomous motivation and therefore, should not be included in measures of motivation. The results from Scott et al. (2014) support Gagné et al.'s argument, as the integrated regulation subscale was the factor with the most cross-loaded items and was not a significant predictor or employee's safety behaviours.

There are also substantial differences in the motivational models previous instruments have used. For example, some researchers have chosen to only measure the two higher order motivational factors of controlled and autonomous motivation (Vansteenkiste, et al., 2004), whereas others have determined there is value in measuring the more granular types of motivation (e.g., external, introjected, identified, etc.; Gagné et al. 2015; Ryan & Connell, 1989). Similarly, Levesque et al. (2007) found empirical support for four distinct motivational regulations of health behaviours (i.e., tobacco use, diet, and exercise), including amotivation, external, introjected, and autonomous regulations, which combined identified regulation and intrinsic motivation together.

The Self-Determined Safety Motivation (SDSM) scale developed by Scott et al., (2014) is one of the most recent instruments developed and was designed specifically to measure different types of employee safety motivation from a self-determination theory

perspective. Although initial psychometric testing of the SDSM scale showed good results, Scott et al. recommended further scale refinement and validation. Therefore, this study will build upon the previous work of Scott et al. by revising the SDSM scale and tested a multi-dimensional measure of safety motivation. Given the consensus of self-determination theory researchers on the lack of the contribution integrated regulation has on understanding human motivation and behaviour, this type of motivation was excluded from the revised SDSM scale. Five unique types of safety motivation was assessed in this study: 1) Amotivation, 2) External Regulation, 3) Introjected Regulation, 4) Identified Regulation, 5) Intrinsic Motivation.

Furthermore, given that various models of motivational regulations that have been empirically supported in previous research and because there has been limited research assessing different types of safety motivation a number of alternative safety motivation models were examined. These models are outlined in hypothesis one:

> **Hypothesis 1:** Amotivation, external safety regulation, introjected safety regulation, identified safety regulation, and intrinsic safety motivation are empirically distinct constructs and will reflect a better fitting model than: (1) A four-factor safety motivation model including: amotivation, external, introjected, and autonomous safety motivation (combined identified and intrinsic), (2) A four-factor safety motivation model including: amotivation, external, internalized extrinsic (combined introjected and identified), and intrinsic safety motivation, (3) A three-factor safety motivation model including: amotivation, controlled motivation (combined external and

introjected, and autonomous (combined identified and intrinsic), and (4) A two-factor safety motivation model including: amotivation and motivation (combined all other types of motivation).

The second objective of this study was to build upon previous research examining the relationships between safety climate perceptions, employee safety motivation, and employee safety behaviours. Specifically, this study aimed to examine how different types of employee safety motivation relate to both safety climate perceptions and to employee safety behaviours. The relationships between safety climate, safety motivation, and safety behaviours have been a focus in occupational health psychology research for over a decade (e.g., Christian et al., 2009; Griffin & Neal, 2000; Neal et al., 2000; Neal & Griffin, 2006).

Much of this research has stemmed from Griffin and Neal's (2000) model of workplace safety. This model specifies that employee safety motivation is a proximal determinant of two main types of employee safety behaviours (i.e., compliance and participation) and distal factors such as safety climate have an indirect effect on employee's safety behaviours through influencing their safety motivation (Griffin & Neal, 2000; Neal & Griffin, 2002; 2003). Further evidence for this model was found in a meta-analysis conducted by Christian et al. (2009). The results from the meta-analysis confirmed that the relationship between safety motivation and safety behaviours was stronger than the relationship between safety climate and safety behaviours, with safety climate indirectly influencing safety behaviours through its effect on employee safety motivation (Christian et al., 2009).

The majority of research testing this model has viewed safety motivation as a one-dimensional construct and has not examined how the relationships between safety climate, safety motivation, and safety behaviours may change depending on the type of motivation assessed. Thus, the current research expands the study of the relationships between safety climate, safety motivation, and safety behaviours to account for five types of safety motivation (i.e., amotivation, external safety regulation, introjected safety regulation, identified safety regulation, and intrinsic safety motivation).

Hypothesized Relationships between Study Variables

Safety climate perceptions reflect employees' perceptions of the relative importance of safety in an organization (Zohar, 2003). Organizations can demonstrate the importance of safety to employees through a number of different mechanisms. For example, one of the most common ways organizations try to demonstrate the importance and the priority of safety is by having and strictly enforcing safety policies and procedures. When safety policies and procedures are enforced, the organization is communicating to employees what tasks they are to complete, how to complete the task in a safe way, and what the consequences are for non-compliance with the policies and procedures (Zohar & Luria, 2005). This mechanism for communicating the importance and value of safety could be viewed as quite controlling, which may manifest as a positive relationship between safety climate perceptions and both external safety regulations and introjected safety regulations.

Another mechanism that organizations use to demonstrate the importance of safety to employees is providing opportunities for employees to learn and develop into

safe workers and safety leaders. How effective organizations are in supporting employee development and involvement in safety activities can influence employee perceptions of the relative importance of safety. By providing training and development opportunities to improve safety, organizations help instill the value of safety in employees. Therefore, positive safety climate perceptions may also facilitate employees internalizing of the value of safety, resulting in a positive relationship with identified safety regulation.

When organizational members (e.g., supervisors, safety leaders) continuously talk about workplace safety as a way to demonstrate the importance of and organizational commitment to safety, employees may become more interested in safety as they learn more from the organization, and therefore safety climate perceptions may also be positively related to intrinsic safety motivation. Finally, one would anticipate an inverse relationship between employee safety climate perceptions and amotivation, such that if employees have positive safety climate perceptions (i.e., perceive that safety is an organizational priority and value) employees are less likely to be amotivated (i.e., lack any motivation for working safely).

The relationships between employee safety climate perceptions and each of the five types of safety motivation are summarized below and illustrated in figure 2 on the next page:

> **Hypothesis 2:** Safety climate perceptions will be negatively related to amotivation and positively related to external, introjected, identified, and intrinsic forms of safety motivation.

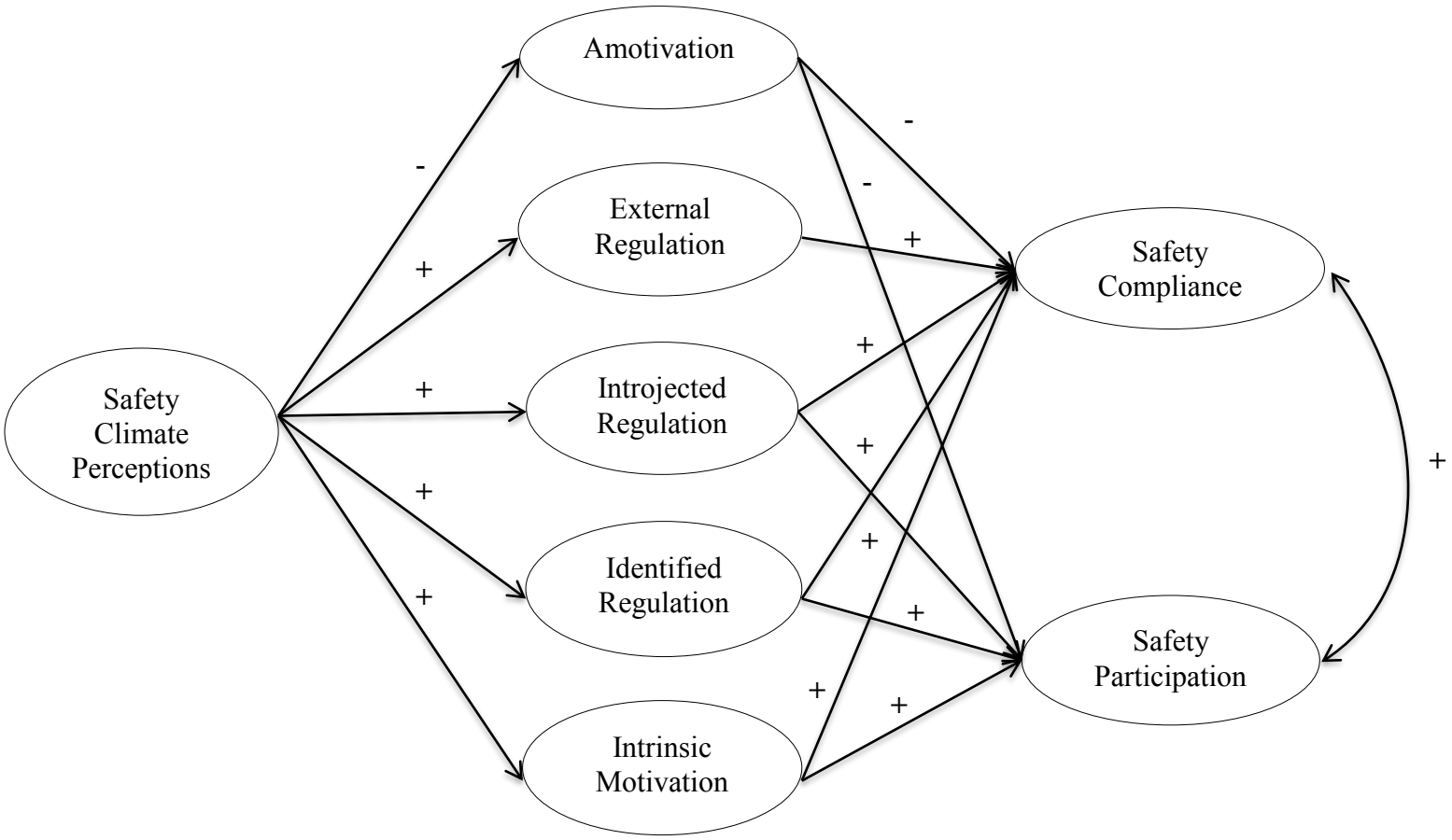


Figure 2. Study one hypothesized relationships between safety climate perceptions, five types of safety motivation, and safety behaviour

Previous research has found that the level of safety motivation influences the extent to which employees engage in safety behaviours at work (Christian et al., 2009; Neal & Griffin, 2006; Probst & Brubaker, 2001). Furthermore, the level of safety motivation has been found to have a stronger relationship with employee safety behaviours than more distal factors such as safety climate (Christian et al, 2009). To date, there has been limited research investigating whether different types of safety motivation have equal influence on employee safety compliance and participation behaviours. Both safety compliance and participation behaviours help to create a safe work environment and both are contingent upon employees being motivated to perform the behaviours. In other words, if employees are not motivated to work safely (i.e., amotivated), they are unlikely to perform either safety compliance or participation behaviours.

Safety compliance behaviours capture those behaviours employees do at work that the organization has identified as mandatory behaviours to ensure a safe work environment. Because safety compliance behaviours are required behaviours, employees may feel both external and internal pressure to perform them. This may be particularly true in the presence of a stimulus which is a reminder that the behaviour is required by the organization, such as a supervisor checking to see if employees are wearing the proper safety equipment or reminding employees about the mistakes they made the last time they did not follow a particular safety procedure. Therefore, controlled forms of motivation (i.e., external and introjected regulations) should be positively related to compliance-based safety behaviours.

Alternatively, employees may also understand the rationale for why the safety rules and procedures were created by the organization and appreciate that these controls

help keep individuals, including themselves free of harm while at work. Therefore, identified regulation should also be positively related to safety compliance behaviours. Similarly, if employees are personally interested in workplace safety and get personal satisfaction from working safely, they should also be more likely to follow safety policies and procedures. As a result, one should expect to see a positive relationship between intrinsic safety motivation and safety compliance behaviours.

On the other hand, safety participation behaviours are voluntary behaviours employees perform to help improve the overall safety of the work environment. Because of the voluntary nature of these safety behaviours, there should not be any external rewards or negative consequences attached to performing these behaviours. Therefore, there should not be a significant relationship between external safety regulation and safety participation behaviours. Although employees should not feel external pressure to perform safety participation behaviours, they may place pressure on themselves to engage in safety participation behaviours. For example, Mullen (2004) found that one of the factors that influenced employees' safety behaviours at work was the desire to maintain a specific image. Some employees who Mullen interviewed reported feeling the need to maintain a "macho" image and an image of a competent worker. Employees may also place the same internal pressure to maintain and portray and image of being a safe worker. Therefore, I hypothesize that introjected safety regulation will have positive relationship with safety participation behaviours.

Due to the voluntary nature of safety participation behaviours, these behaviours should primarily be self-directed and motivated by autonomous reasons, such as safety being a personal value of the employee, or having a personal interest in workplace safety.

Therefore, I hypothesized that both identified safety regulation and intrinsic safety motivation should both be positively related to safety participation behaviours. Furthermore, one of the main propositions of self-determination theory (Deci & Ryan, 1985) is that autonomous forms of motivation produce more consistent and higher quality behaviours. Based on this proposition, I expected that identified safety regulation and intrinsic safety motivation would be more strongly related to both safety compliance and safety participation behaviours than either external or introjected safety regulations. The relationships described above are summarized in the following hypotheses:

Hypothesis 3(a): Amotivation will be negatively related to employee safety compliance and participation behaviours.

Hypothesis 3(b): External safety regulation, introjected safety regulation, identified safety regulation, and intrinsic safety motivation will be positively related to employee safety compliance behaviours.

Hypothesis 3(c): Introjected safety regulation, identified safety regulation, and intrinsic safety motivation will be positively related to safety participation behaviours.

Hypothesis 3(d): Identified safety regulation and intrinsic safety motivation will be more strongly related to safety compliance behaviours than external safety regulation or introjected safety regulation and more strongly related to safety participation behaviours than introjected safety regulation.

Methods

Participants and Procedure

For this study, I used a subsection of data collected as part of a larger study designed to benchmark safety performance across a segment of the petrochemical industry and evaluate the effectiveness of a safety intervention. Only data relevant to this measures listed below were analyzed and reported for this study. Survey data from 349 contract employees from the petrochemical industry within Ontario, Canada was included in this research study. Respondents were from a variety of trade occupations common to the petrochemical industry. The most common occupations reported were: carpenter (N = 41), electrician (N = 38), boilermaker (N = 34), laborer (N = 32), pipefitter (N = 30), steamfitter (N = 18), insulator (N = 17), and millwright (N = 16). The majority of respondents were male (M = 313, F = 10, Unidentified = 26). Participants worked an average of 39 hours per week (M = 39.2, SD = 5.7) and were employed at their current job on average for five years (M = 4.8, SD = 8.2).

Measures

In addition to providing basic demographic information, participants completed the following scales. A list of items for each subscale can be found on page 114 (see Appendix A).

Safety climate perceptions. Safety climate perceptions were measured using Zohar and Luria's (2005) 16-item group-level safety climate scale. Participants indicated the extent to which they agreed with each of the 16 statements using a 5-point scale (1 =

strongly disagree; 5 = strongly agree). The group-level safety climate scale demonstrated good internal reliability (α = .95, with item-total correlations ranging from r = .59 to .80).

Self-determined safety motivation. A modified version of Scott et al.'s (2014) self-determined safety motivation (SDSM) scale was used to assess five different types of safety motivation. As recommended by Scott et al., the SDSM scale was adapted to include aspects of the Motivation At Work Scale (MAWS; Gagné et al., 2010) and the MAWS-R (personal communication Gagné Dec 1, 2009) to address previous findings of a small number of cross-loaded items in the original SDSM scale. Participants completed the modified version of the SDSM scale, which included the following item stem *"Why do you put effort into working safely?",* and included 21 items measuring five types of safety motivation: Intrinsic safety motivation (e.g., *"Because safety interests me"*), Identified safety regulation (e.g., *"Because I value working in a safe environment"*), Introjected safety regulation (e.g., *"Because I feel bad about myself when I don't work safely"*), External safety regulation (e.g., *"In order to get approval from others' (e.g., supervisor, colleagues, family, clients)"*), and Amotivation (e.g., *"I don't because working safely is not worth the effort"*). Respondents used a 5-point scale (1 = Not at all for this reason; 5 = Exactly for this reason) to indicate the extent to which each item described a reason why they worked safely. Psychometric properties of this scale are described in detail in the Results section below.

Safety behaviours. Two subscales from Neal et al. (2000) were used to measure the types of safety behaviours employees engage in at work. Safety compliance behaviours were assessed using three items (e.g., *"I use the correct safety procedures for carrying out my job"*; α = .89, with item-total correlations ranging from r = .75 to .81).

Safety participation behaviours were assessed using three items (e.g., *"I promote the safety program within the organization"*; α = .84, with item-total correlations ranging from r = .67 to .77). Participants indicated the extent to which they agreed with each statement using a 5-point scale (1 = strongly disagree; 5 = strongly agree).

Results

Prior to testing the hypotheses, the data were screened for missing data, data entry errors, outliers, linearity, normality, and multicollinearity. Five individuals responded to less than half of the survey. These surveys were classified as incomplete and removed from all analyses. Further inspection of the data revealed an additional 14 participants responded in an inconsistent manner, such that the same response option was chosen consistently for both positive and negatively worded items or only one response option was selected for the majority of the survey questions. These 14 respondents were deleted from all analyses, resulting in a final sample of N = 349. Frequencies and descriptive statistics were run for each item using SPSS 20.0 (IBM Corp, 2011). Six items from the SDSM scale had leptokurtic distributions with substantially high kurtosis values (i.e., greater than three; Tabachnick & Fidell, 2006). To minimize the effect of non-normality on the results of the Structural Equation Model (SEM), MLM robust estimates were used. MLM is a maximum likelihood estimation method that uses standard errors and a mean-adjusted chi-square test (also known as the Satorra-Bentler chi-square) that is robust to non-normality (Muthén & Muthén, 1998-2012). Listwise deletion was used to deal with missing data. Scale descriptive statistics are reported in Table 3.

Table 3: Study 1 Scale Means, Standard Deviations, Reliabilities, and Correlations

	Mean	**SD**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Safety Climate Perceptions	**3.87**	**.65**	*(.95)*							
2. Amotivation	**1.35**	**.66**	- .07	*(.78)*						
3. External Safety Regulation	**3.02**	**1.12**	.06	.14*	*(.70)*					
4. Introjected Safety Regulation	**3.08**	**.98**	.14*	.00	.36**	*(.64)*				
5. Identified Safety Regulation	**4.33**	**.69**	.20**	- .21**	.12*	.40**	*(.77)*			
6. Intrinsic Safety Motivation	**3.51**	**.96**	.13*	- .02	.15**	.52**	.59**	*(.67)*		
7. Compliance Behaviour	**4.32**	**.63**	.40**	- .12*	.05	.19**	.50**	.37**	*(.89)*	
8. Participation Behaviour	**4.08**	**.70**	.31**	- .11	.05	.21**	.48**	.41**	.65**	*(.84)*

Note * $p < .05$; ** $p < 0.01$ (2-tailed).
Scale reliabilities presented along diagonal in parentheses
Listwise N = 302

Prior to modeling the relationships between employee safety climate perceptions, safety motivation, and safety behaviours, I first examined whether amotivation, external safety regulation, introjected safety regulation, identified safety regulation, and intrinsic safety motivation were empirically distinct constructs (Hypothesis 1) by conducting a confirmatory factor analysis (CFA) using MPLUS (Muthén & Muthén, 1998-2011) and specifying a five factor model in which the factors were allowed to correlate.

The Chi-square statistic, Akaike's Information Criterion (AIC), Comparative Fit Indix (CFI), Tucker-Lewis Fit Index (TLI), Root Mean Squared Error Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) were evaluated to determine the fit of the hypothesized model. I used recommendations from Byrne (2012), Hu & Bentler (1999), and MacCallum et al. (1996) to set the criteria for evaluating the fit of each model. CFI values greater than .95 were considered to represent a well-fitting model. Although TLI values can extend outside the range of zero to one, Byrne (2012) recommends evaluating values using similar criteria as the CFI (i.e., greater than .95). RMSEA values less than .06 indicate good fit (Hu & Bentler, 1999) and values ranging from .08 to .10 indicates mediocre fit (MacCallum et al., 1996). SRMR values represent the average value across all standardized residuals and a well-fitting model is indicated by a value of .05 or less (Bryne, 2012).

As specified in hypothesis one, the five factor model was also compared to four alternative models: (1) a four-factor model that combines items measuring intrinsic safety motivation and identified safety regulation into one autonomous motivation factor, (2) a four-factor model that combines items measuring introjected and identified safety regulations into an internalized extrinsic safety motivation factor, (3) a three-factor model

of amotivation, controlled motivation (combining external and introjected safety regulation), and autonomous motivation (combing identified safety regulation and intrinsic safety motivation), and (4) a two factor model that includes the amotivation subscale and one general motivation factor, combining all other items measuring any form of motivation together. The competing models of safety motivation were compared using the Satorra-Bentler (SB) chi-square difference test (Satorra & Bentler, 2010). The SB chi-square difference test is an appropriate method for comparing models because all alternative models are nested within the hypothesized five-factor model of safety motivation.

Evaluating the Self-Determined Safety Motivation Model

The results from a confirmatory factor analysis (CFA) modeling the hypothesized five-factor, 21-item model of safety motivation showed that 20 of the 21 items were significant indictors of the hypothesized latent factors. One item "In order to avoid injury" was not a significant indicator of the hypothesized external safety motivation latent factor. This result is consistent with the preliminary results reported by Scott et al., (2014). This item was removed and the model was rerun. The five-factor 20 item safety motivation model was a poor fit of the data ($\chi^2(160) = 425.56$, $p < .001$; CFI = .86; TLI = .83; RMSEA = .07, 90% C.I. = [.06, .08], PCLOSE < .001). There are two plausible explanations for the model misfit. First, amotivation, external safety regulation, introjected safety regulation, identified safety regulation, and intrinsic safety motivation are not empirically distinct constructs and therefore one of the alternative models of the safety motivation outlined in hypothesis one would be a better explanation of the

different types of safety motivation. Alternatively, the modifications made to Scott et al's. (2014) SDSM scale may not have fully addressed the issue of cross-loading items. Further analysis was conducted to determine the likelihood of both these reasons for the model misfit.

To start, I compared the hypothesized five-factor model of safety motivation to the four alternative models specified in hypothesis one. Results showed that the four-factor model that combined introjected and identified safety regulations into an internalized extrinsic safety regulation latent factor and included latent factors of amotivation, external safety regulation, and intrinsic safety motivation had a similar fit to the hypothesized five factor model ($\chi^2(164) = 453.60$, $p < .001$; CFI = .85; TLI = .82; RMSEA = .08, 90% C.I. = [.07, .08], PCLOSE < .001). However, the original hypothesized five-factor structure was the best fitting model compared to all the alternative models (see Table 4 and 5).

Table 4: Model Fit Indices for Hypothesized and Alternative 20-Item SDSM Models

Model	χ^2	*Df*	CFI	TLI	RMSEA	RMSEA 90% CI	PCLOSE	SRMR
Hypothesized 5 Factor Model (Amot, Ext, Intro, Id, Intrin)	425.56	160	.86	.83	.07	.06 - .08	.000	.07
4 Factor Model (Amot, Ext, Intro, combined Id & Intrin)	493.28	164	.82	.80	.08	.07 - .08	.000	.08
4 Factor Model (Amot, Ext, combined Intro & Id, Intrin)	453.60	164	.85	.82	.08	.07 - .08	.000	.08
3 Factor Model (Amot, combined Ext & Intro, combined Id & Intrin)	694.42	167	.72	.68	.10	.09 - .11	.000	.10
2 Factor Model (Amot, all other factors combined)	706.51	169	.71	.68	.10	.09 - .11	.000	.10

Amot = Amotivation; Ext = External safety regulation; Intro = Introjected safety regulation; Id = Identified safety regulation; Intrin = Intrinsic safety motivation

Table 5: SB Chi-square Difference Test for 20-Item SDSM Model Comparison

Comparison	SB χ^2 Difference	df Difference	p-value	AIC Difference (5-Factor – Alternative)
5-Factor vs. 4-Factor (Autonomous Factor)	53.67	4	< 0.001	- 79.17
5-Factor vs. 4-Factor (Internalized Extrinsic)	25.18	4	< 0.001	- 28.84
5-Factor vs. 3-Factor	236.31	7	< 0.001	- 318.08
5-Factor vs. 2-Factor	254.18	9	< 0.001	- 329.34

Based on the SB chi-square difference results the hypothesized five-factor model was retained as the best fitting model. Although the hypothesized five-factor SDSM model was determined as the best fitting model compared to the alternative models, the overall fit of the five-factor model was poor. Next, I examined if removing potential cross-loading items would improve the overall fit of the model by examining the modification indices of the hypothesized five-factor safety motivation model. The modification indices revealed several cross-loading items. Furthermore, inspection of the parameter estimates revealed that although all parameter estimates were significant indicators of the latent factor, several items were weak indicators, with the latent variable accounting for a small proportion of variance in the observed variable (e.g., R^2 values < .20). I simplified the five-factor safety motivation model by deleting items that

substantially cross-loaded on a second factor or were poor indicators of the hypothesized latent factor and re-evaluated the model fit to determine if these changes significantly improvements to the model fit.

Following model re-specification best practices outlined by Byrne (2012) and Tabachnick & Fidell (2006) only one model modification was completed at a time. I started by deleting the highest cross-loaded item and re-evaluated the model after each modification was made. Using this process four items were deleted: *"Because it makes me happy"* from intrinsic safety motivation; *"Because I take pride in working safely"* from introjected safety regulation*; "In order to get a reward (e.g., praise, bonus, prize)"* from external safety regulation; and *"Because I believe it is important to put effort into working safely"* from identified safety regulation. One cross-loaded item *("Because I feel good about myself when I work safely"*) was modeled and retained because it was one of only three introjected safety motivation items[1]. Removing this item would mean that introjected safety motivation only had two indicator variables. Modeling a latent factor with only two indicators is not recommended as it can produce an unidentified model and unreliable error estimates (Byrne 2012). The results of these modifications produced a five-factor model comprised of 16-items that indicated a moderate fit to the data ($\chi^2(93) = 167.71$, $p < .001$; CFI = .94; TLI = .92; RMSEA = .05, 90% C.I. = [.04, .06], PCLOSE = .47; SRMR = .05). The absolute fit indices (i.e., RMSEA and SRMR) indicate a good fit to the data; however, both incremental indices (i.e., CFI and TLI) are slightly lower than the accepted cut-off standard of .95 (Hu & Bentler, 1999).

[1] This item significantly cross-loaded on identified safety motivation. Introjected and identified safety regulations are similar in that they are both internalized forms of extrinsic safety motivation.

To confirm that the reduced five-factor model was still superior to the alternative models tested previously, I reran the comparison of the five-factor model to the four alternative models. The modifications did not change the results of the model comparisons; the proposed five-factor model was the best fitting model (see Table 6). All latent factors in the five-factor model accounted for a significant amount of variance in each indicator and all parameter estimates were significant (see Table 7). The results of the CFA analysis of the SDSM scale and chi-square difference testing of alternative models provide support for hypothesis one.

Table 6: SB Chi-square Difference Test for Revised 16-Item SDSM Model Comparison

Comparison	SB χ^2 Difference	df Difference	p-value	AIC Difference (5-Factor – Alternative)
5-Factor vs. 4-Factor (Autonomous Factor)	29.92	4	< 0.001	- 39.48
5-Factor vs. 4-Factor (Internalized Extrinsic)	105.23	5	< 0.001	- 116.43
5-Factor vs. 3-Factor	92.55	7	< 0.001	- 118.85
5-Factor vs. 2-Factor	279.37	10	< 0.001	- 332.26

Table 7: Standardized Parameter Estimates of the Five-Factor 16-Item SDSM CFA Model

Variables	**Amotivation**	**External**	**Introjected**	**Identified**	**Intrinsic**	***R^2***
Why do you put effort into working safely?						
I don't, because it doesn't make a difference whether I work safely or not	.62					***.38***
I don't, because safety is not a priority in my workplace	.69					***.48***
I don't, because safety is not a priority for me	.73					***.53***
I don't, because working safely is not worth the effort	.64					***.40***
Because I risk losing my job if I don't		.48				***.23***
In order to avoid being criticized by others (e.g., supervisor, colleagues, family, clients…)		.78				***.60***
In order to get approval from others' (e.g., supervisor, colleagues, family, clients…)		.80				***.63***
Because otherwise I will feel guilty			.52			***.27***
Because I feel bad about myself when I don't work safely			.83			***.69***
Because I feel good about myself when I work safely			.35	.46		***.48***

Variables	**Amotivation**	**External**	**Introjected**	**Identified**	**Intrinsic**	***R²***
Why do you put effort into working safely?						
Because I personally value safety				.71		***.50***
Because I value working in a safe environment				.70		***.50***
Because putting effort into working safely is important to me				.80		***.64***
Because I have fun while working safely					.45	***.20***
Because I enjoy working safely					.74	***.55***
Because safety interests me					.74	***.55***

Notes: All estimates significant at p < .001; Listwise N = 317

Relationships Between Safety Climate Perceptions, Motivation, and Behaviours

The relationships described in hypotheses two and three (refer back to Figure 2) were tested using structural equation modeling (SEM). Following Bryne's (2012) recommendation, prior to conducting the structural model, I first tested the fit of the measurement model. Results from the measurement model, containing all observed indicators and respective latent factors indicated that the measurement model fit the data well ($\chi^2(636) = 851.82$, $p < .001$; CFI = .96; TLI = .95; RMSEA = .03, 90% C.I. = [.03, .04], PCLOSE = 1.00), As shown in Table 8, all parameter estimates were significant.

Table 8: Standardized Parameter Estimates of Study One Measurement Model

Variables	Safety Climate	Amot	Ext	Intro	Ident	Intrin	Safety Comp	Safety Part
Makes sure we receive all the equipment needed to do the job safely	.65							
Frequently checks to see if we are all obeying the safety rules	.78							
Discusses how to improve safety with us	.82							
Uses explanations (not just orders) to get us to act safely	.82							
Emphasizes safety procedures when we are working under pressure	.83							
Frequently tells us about the hazards in our work	.74							
Refuses to ignore safety rules when work falls behind schedule	.53							
Is strict about working safely when we are tired or stressed	.80							
Reminds workers who need reminders to work safely	.81							
Makes sure we follow all the safety rules (not just the most important ones)	.79							
Insists that we obey safety rules when fixing equipment or machines	.78							
Says a good word to workers who pay special attention to safety	.70							
Is strict about safety at the end of the shift, when we want to go home	.74							

Variables	Safety Climate	Amot	Ext	Intro	Ident	Intrin	Safety Comp	Safety Part
Spends time helping us learn to see the problems before they arise	.81							
Frequently talks about safety issues throughout the work week	.76							
Insists we wear our protective equipment even if it is uncomfortable	.61							
I don't, because it doesn't make a difference whether I work safely or not		.62						
I don't, because safety is not a priority in my workplace		.67						
I don't, because safety is not a priority for me		.74						
I don't, because working safely is not worth the effort		.63						
Because I risk losing my job if I don't			.50					
In order to avoid being criticized by others (e.g., supervisor, colleagues, family, clients…)			.80					
In order to get approval from others' (e.g., supervisor, colleagues, family, clients…)			.77					
Because otherwise I will feel guilty				.51				
Because I feel bad about myself when I don't work safely				.82				
Because I feel good about myself when I work safely				.34	.47			

Variables	Safety Climate	Amot	Ext	Intro	Ident	Intrin	Safety Comp	Safety Part
Because I personally value safety					.72			
Because I value working in a safe environment					.69			
Because putting effort into working safely is important to me					80			
Because I have fun while working safely						.46		
Because I enjoy working safely						.75		
Because safety interests me						.75		
I use all the necessary safety equipment to do my job							.81	
I use the correct safety procedures for carry out my job							.88	
I ensure the highest levels of safety when I carry out my job							.89	
I promote the safety program within the organization								.79
I put in extra effort to improve the safety of the workplace								.88
I voluntarily carry out tasks or activities that help to improve workplace safety								.78

Given the good fit of the measurement model, I proceeded to test the structural equation model. The proposed structural equation model illustrated in figure 2 hypothesized that safety climate perceptions would be negatively related to amotivation (i.e., employee's lack of motivation to work safely), and that amotivation would in turn be negatively related to both employee safety compliance and safety participation behaviours. Conversely, safety climate perceptions would be positively related to external, introjected, identified, and intrinsic forms of safety motivation. In turn these four forms of safety motivation would positively influence employees' safety compliance behaviours, whereas only introjected, identified, and intrinsic safety motivation would positively influence employees' safety participation behaviours. I also hypothesized that autonomous forms of motivation (i.e., identified safety regulation and intrinsic safety motivation would have a stronger relationship with both types of safety behaviours than controlled forms of motivation (i.e., external and introjected safety regulations).

Results of the structural equation model shows a moderate fit to the data ($\chi^2(649) = 1146.93$, $p < .001$; CFI = .90; TLI = .90; RMSEA = .05, 90% C.I. = [.05, .06], PCLOSE = .43). Contrary to the hypothesized relationships, safety climate perceptions were not a significant predictor of amotivation, and amotivation did not significantly predict employees' safety compliance or participation behaviours, although these relationships were in the expected direction (i.e., negative). The path from safety climate perceptions to external safety regulation was quite small and barely met the criteria of statistical significance with a p-value of exactly .05. External safety regulation was also not a significant predictor of employees' safety compliance behaviours, nor was introjected

safety motivation a significant predictor of employees' safety compliance or participation behaviours as originally hypothesized (see Appendix B).

Based on the moderate fit of the model and the non-significant paths, I conducted a post hoc analysis to determine if the inclusion of additional parameters would increase the model fit. Only modification indices aligned with the goal of this research were considered. Therefore, paths leading from the dependent factors to the independent factors or reciprocal paths were ignored. I followed Byrne's (2012) recommendation of evaluating model re-specification one parameter at a time during the post hoc analysis. Evaluation of each model modification was conducted using the SB chi-square difference test.

Inspection of the modification indices revealed only one additional path from safety climate perceptions to safety compliance would be appropriate to model. The addition of this path slightly improved the model fit ($\beta = 21$, $p < .001$; $\chi^2(648) = 1131.32$, $p < .001$; CFI = .91; TLI = .90; RMSEA = .05, 90% C.I. = [.05, .06], PCLOSE = .52). The additional path from safety climate perceptions directly to safety compliance behaviours also caused the path from safety climate perceptions to external safety motivation to decrease and become non-significant. Results of the SB scaled chi-square difference test revealed that the model with the additional path was significantly better than the hypothesized model and should be retained (SB $\Delta\chi^2_{diff}(1) = 15.61$, $p < .001$). I also tested whether safety climate perceptions had a direct effect on safety participation behaviors. This path was also significant ($\beta = .22$, $p < .01$) and its addition slightly improved the model fit ($\chi^2(647) = 1118.62$, $p < .001$; CFI = .91; TLI = .90; RMSEA = .05, 90% C.I. = [.04, .05], PCLOSE = .60). The SB scaled chi-square difference test

indicated that this model was significantly better than the previous model (SB $\Delta\chi^2_{diff}(1) = 23{,}39$, $p < .001$).

As the last step in the post hoc analysis, the model was trimmed of all originally hypothesized paths that were not significant (Byne, 2012). This included the removal of the amotivation and external safety motivation latent factors, as these factors were not significantly related to either safety climate perceptions or either type of safety behaviours. In addition, the paths from introjected safety regulation to safety compliance and safety participation behaviours were also deleted from the final trimmed model. This model is shown in figure 3 on the next page and has a moderate fit to the data ($\chi^2(421) = 757.76$, $p < .001$; CFI = .93; TLI = .92; RMSEA = .05, 90% C.I. = [.05, .06], PCLOSE = .45). Because the post hoc models were not nested within the hypothesized model, I compared the fit of these models using AIC values.

Results of the model comparison test indicate that the trimmed model was a better fit to the data with a substantially smaller AIC value (ΔAIC = 8618.59); therefore, the trimmed model was retained (see Table 9 for fit indices of competing structural models). All parameters in the trimmed model were significant. The R-squared values indicate that safety climate perceptions explained a limited amount of variance in introjected safety regulation (2.9%), identified safety regulation (5.0%), and intrinsic safety motivation (4.0%). Taken together, safety climate perceptions, identified safety regulation, and intrinsic safety motivation explained 41.1% of the variance in employee safety compliance behaviours and 34.2% of the variance in employee safety participation behaviours.

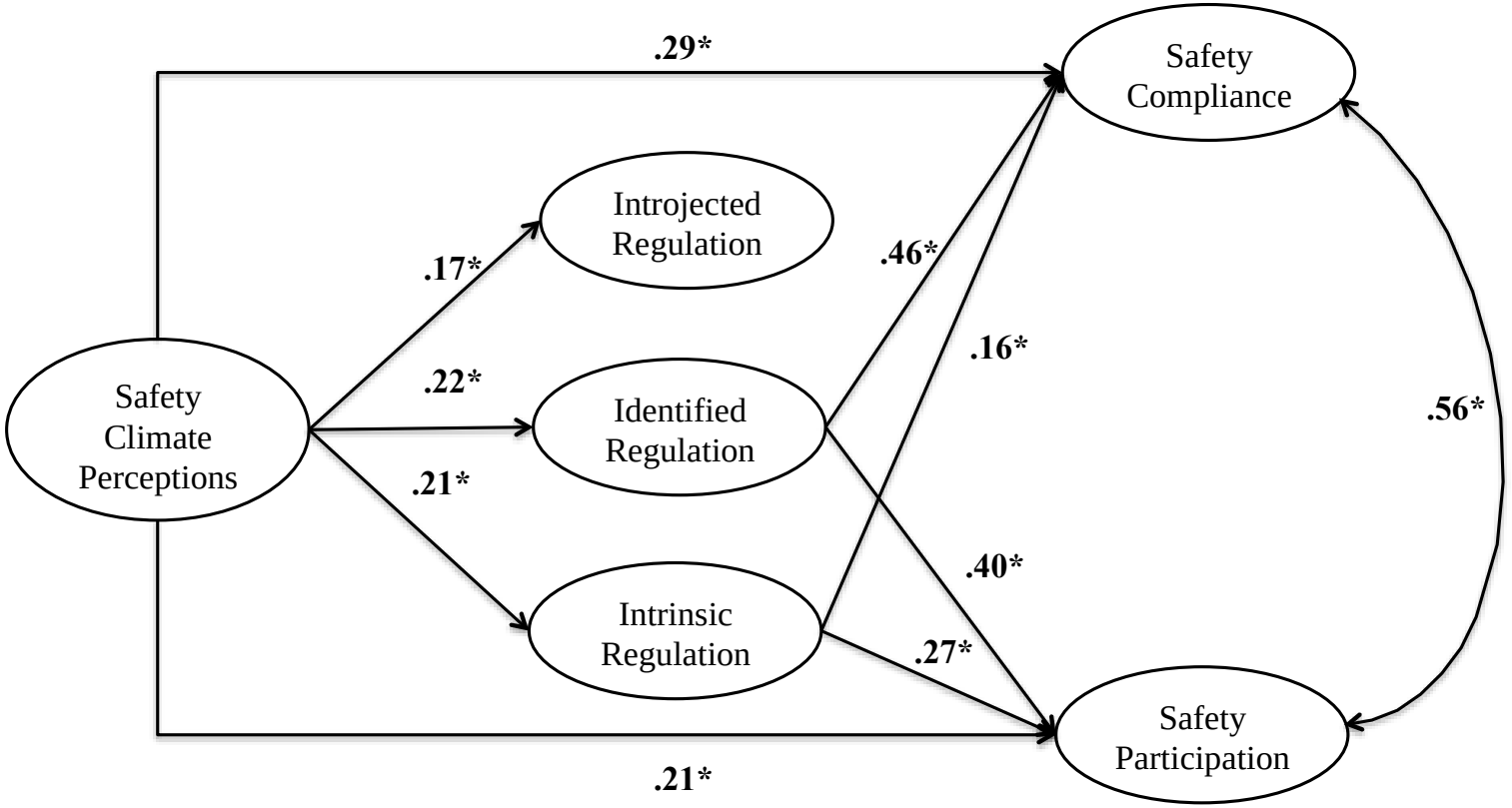


Figure 3: Study one final trimmed structural equation model

Table 9: Fit Indices and Difference Tests for Competing Structural Models

Model	**χ^2**	***df***	**CFI**	**TLI**	**RMSEA**	**RMSEA 90% CI**	**PCLOSE**	**SRMR**	**AIC**	**SBχ^2_{diff}**	***Δdf***	**ΔAIC**
Hypothesized Structural Model	1146.93	649	.90	.90	.05	.05 - .06	.43	.10	25162.01			
Post Hoc Model I *(safety climate to compliance path)*	1131.32	648	.91	.90	.05	.05 - .06	.52	.09	25145.90			
Diff between post hoc model and hypothesized model										15.61	1	16.11
Post Hoc Model II *(safety climate to participation path)*	1118.62	647	.91	.90	.05	.04 - .05	.60	.09	25134.04			
Diff between post hoc model I & II										26.39	1	11.86
Trimmed Structural Model	519.48	264	.93	.92	.06	.05 - .06	.11	.11	16543.42			
Diff between post hoc model II and trimmed model												8618.59

Discussion

The purpose of this study was twofold. The first objective of this study was to test whether different types of employee safety motivation based on the self-determination theory framework could be measured as empirically distinct constructs. The second objective of this study was to examine the relationships between safety climate perceptions, different types of employee safety motivation, and safety behaviours.

Self-determination theory has been applied in many different contexts including education (Kusurkar, Ten Cate, Vos, Westers, & Croiset, 2012) and healthcare (Williams, Gagné, Mushlin, & Deci, 2005; Williams, Patrick, Niemiec, Williams, Divine, Lafata, et al., 2009) to measure and explain the reasons that motivate individuals to engage, or not engage in specific behaviours (e.g., academic performance, lifestyle changes after a poor health diagnosis, diabetes management). More recently, this theoretical framework has been used within the work environment to guide the measurement of employee work motivation, in addition to examine the relationship between work motivation and various employee outcomes such as job satisfaction, turnover intentions, and employee well-being (Gagné et al., 2010). One sub-facet of work motivation that has received attention over the years is employee safety motivation. To date, safety motivation research has primarily focused on how motivated employees are to work safely rather than on why employees are motivated to work safely. As a result, there has been little attention given to understanding the reasons that motivate employees to engage in safety behaviours. The current study aimed to build on previous safety motivation research by testing a multi-

faceted measure of employee safety motivation that can be used to identity both the type and level of motivation for working safely.

Consistent with self-determination theory (Deci & Ryan, 2002) the results of this study supported the hypothesized five-factor model of self-determined safety motivation that included: (1) Amotivation (i.e., lacking motivation completely), (2) External safety regulation (i.e., motivation stemming from positive or negative consequences enforced by the external environment), (3) Introjected safety regulation (i.e., internal pressures an individual places on themselves for behaving in a safe manner while at work), (4) Identified safety regulation (i.e., believing in the importance and value of working safely), and (5) Intrinsic safety motivation (i.e., personal interest and fulfillment from working safely).

The 21-item revised Self-Determined Safety Motivation (SDSM) scale administered for this study was reduced to 16 items to eliminate substandard performing items (e.g., low parameter estimates, cross-loadings). The reduced 16-item SDSM scale produced a decent fitting measurement model. This measurement model was compared to several plausible alternative models that have been suggested in previous literature. When compared to the four alternative models, the five-factor SDSM model was determined to be the best fitting model. Although this measurement model achieved decent fit indices, further improvements to the scale may be beneficial. Specifically, both introjected safety regulation and intrinsic safety motivation factors had internal reliability estimates slightly below .70. Moreover, one introjected safety regulation item did significantly cross-load on the identified safety regulation factor. This item was retained in the measurement model because there were a minimum number of measured indicators of introjected

safety regulation. Further construct clarity, particularly between introjected and identified safety regulations, and additional item development and refinement may further improve the psychometric properties of this scale.

The second aim of this study was to test the relationships between employees' safety climate perceptions, safety motivation, and self-reported safety behaviours. Safety climate perceptions have been previously found to significantly influence employees' safety motivation (Christian et al., 2009). For this study, I hypothesized that safety climate perceptions would be uniquely and positively related to all four types of active safety motivation (i.e., external, introjected, identified, and intrinsic) and negatively related to the absence of being motivated to work safely (i.e., amotivation). This hypothesis was partially supported. Safety climate perceptions did significantly predict introjected, identified, and intrinsic types of safety motivation. The more positive employees' perceptions are of the commitment and value placed on safety, the more likely they will be motivated to work safely for internalized reasons.

Although the relationships between safety climate perceptions and external safety regulation and amotivation were in the hypothesized direction, these relationships were ultimately not statistically significant. Based on the results of this study, there does not appear to be a relationship between employees' perceptions of the level of commitment and value placed on safety (i.e., safety climate) and being motivated for external reasons. There does however, appear to be a significant and positive relationship between the extent to which employees perceive commitment and importance of safety within the organization and the extent to which they internalize the importance and value of safety

themselves as safety climate perceptions were significantly and positively related to introjected, identified, and intrinsic forms of safety motivation.

This study also examined the relationships between the five types of safety motivation and self-reported safety compliance and participation behaviours. I hypothesized that employees who lack of safety motivation would be less likely to engage in both safety compliance and participation behaviours (hypothesis 3a), employees who are motivated for any reason will comply with safety policies and procedures (hypothesis 3b), that employees' who internalize the reasons for working safely will engage in safety participation behaviours (hypothesis 3c), and that autonomous forms of safety motivation will produce stronger relationships with both types of safety behaviours (hypothesis 3d).

The results of this study did not support hypothesis 3a. This study found no relationship between amotivation and either type of employee safety behaviour. Although the relationships between amotivation and employee safety compliance and safety participation behaviours were in the hypothesized negative direction, both regression weights were close to zero and not statistically significant. The results did provide partial support for both hypotheses 3b and 3c. Two types of safety motivation were uniquely related to employee safety compliance and safety participation behaviours. Specifically, identified safety regulation and intrinsic safety motivation were positively associated with both employee safety compliance and safety participation behaviours. Based on the results of this study, it appears that only autonomous forms of employee safety motivation uniquely influence employees' safety behaviours, thus providing support for hypothesis 3d. The pattern of correlations between each type of safety motivation and the

two types of safety behaviours provides further support for hypothesis 3d. Specifically, the correlations between identified safety regulation and intrinsic safety motivation and safety compliance behaviours ($r = .50$, $p < .01$; $r = .37$, $p < .01$) were stronger than the correlation between external and introjected regulations and safety compliance behaviours ($r = .05$, ns; $r = .19$, $p < .01$). Furthermore, the correlations between identified safety regulation and intrinsic safety motivation with safety participation behaviours ($r = .48$, $p < .01$; $r = .41$, $p < .01$) was stronger than the correlation between introjected safety regulation and safety participation behaviours ($r = .21$, $p < .01$). These results are consistent with the proposition of self-determination theory that specifies autonomous motivation is a higher quality motivation, producing a more sustained individual effort and behaviour (Deci & Ryan, 1985; Deci & Ryan, 2000; Ryan & Deci, 2002).

Amotivation, external safety regulation, and introjected safety regulation did not uniquely influence either employee safety compliance or participation behaviours. These findings go against the popular belief that a key motivational tactic for encouraging employees to work safely is providing them with external incentives such as rewards for safe behaviour and negative consequences for unsafe behaviour. These results are consistent with the findings from Conchie (2013), who found that external safety regulation was not a significant predictor of either safety compliance or safety citizenship behaviours. The results from this study suggests that employee safety behaviours both in terms of complying with safety policies and procedures and engaging in extra-role behaviours that help promote and maintain a safe work environment are influenced by the extent to which employees have internalized the value and outcome these behaviours

produce and the extent to which employees view these behaviours as intrinsically interesting and enjoyable.

Theoretical and Practical Implications

This study makes several contributes to the field of occupational health psychology. First, this was one of the first studies to apply self-determination theory (Deci & Ryan, 1985) to the topic of employee safety motivation and safety behaviours. The results from this research support the continued use of the self-determination theoretical framework for understanding employee safety motivation and behaviour. The second contribution this research makes to the field is confirming previous findings that safety climate influences employees' motivation to work safely (Christian et al., 2009), and expanded this knowledge by identifying two specific forms of autonomous safety motivation (i.e., identified safety regulation, intrinsic safety motivation) as being most influenced by a positive safety climate. Based on the results from this study, an additional benefit of having a positive safety climate may be more autonomously motivated employees who engage in self-initiated safety behaviours and activities while at work.

Finally, this study provides some insight into what employers should focus on when trying to motivate employees to comply with company safety policies and procedures and get them engaged in participatory safety activities (e.g., volunteer to participate in health and safety committees, pointing out potential safety hazards to coworkers). Based on the results of this study, a key factor to encouraging employees to engage in safety compliance and safety participation behaviours is building autonomous safety motivation where employees identify with the importance and value of workplace

safety, have a personal interest in safety, and get some personal fulfillment from safety activities. Therefore, organizations may see benefit in activities designed to promote and encourage autonomous safety motivation. This study has identified establishing a strong safety climate as a potential organizational activity that may influence employees' autonomous safety motivation.

Limitations

As with all research, this study has several limitations that should be noted. First, all measures used in this study were self-report and although participants were assured their responses were anonymous and would be kept confidential, self-report measures are nonetheless susceptible to social desirability responding. Furthermore, given the number of occupations requiring low education levels (e.g., laborer, pipefitter, steamfitter) surveyed for this study, there were some concerns over the comprehension level of the targeted sample as individuals in these occupations tend to report low reading levels (Kirsch, Jungeblut, Jenkins, Kolstad, 2002). The survey was informally reviewed for reading level during the survey design phase of this study and a comprehensive review of the survey data was completed during data entry in an attempt to identify random response patterns that may have been the result of a lack of content comprehension. An additional limitation to this study is the sole reliance on cross-sectional data; thus, the results from this study do not inform us as to the possible direction of the relationships between safety climate perceptions, employee safety motivation, and safety behaviours. Finally, this research was conducted using a sample from only one industry; specifically,

the petrochemical industry, and therefore; the results may not be generalizable to a wider of industries and job types.

Study two will build on this study, and in doing so addresses a number of these limitations, including using a more diverse sample of respondents from a variety of occupations and industries.

Study 2

There were two main objectives for this study. First, given the relative newness of assessing employee safety motivation using the SDSM scale, the first goal of this study was to continue to refine this scale and improve the psychometric properties of the instrument. Based on the results from study one, the focus of the refinement efforts was to increase the sub-scale reliabilities and to eliminate the remaining cross-loaded item. Furthermore, following previous research (e.g., Gagné et al., 2010, Ryan & Connell, 1989), the amotivation subscale was eliminated from the SDSM scale (see Measures section for more detailed explanation). The second objective of this study was to confirm the relationships found between different types of safety motivation and safety behaviours found in study one using a different and more diverse sample of employees. The results from study one highlighted the importance of autonomous forms of safety motivation on employee's safety compliance and safety participation behaviours. Those results add to a growing body of literature that has demonstrated the importance of autonomous forms of motivation to a number of key behavioural and organizational outcomes (Gagné et al., 2015; Güntert, 2015), all supporting one of the main propositions of self-determination theory (Ryan & Deci, 2002).

Specifically, I attempted to confirm that only identified safety regulation and intrinsic safety motivation predicted employees' safety compliance and safety participation behaviours and that external and introjected safety regulations do not predict employees' safety behaviour (see figure 4). Confirming these non-significant relationships is equally as important as confirming the significant results because traditionally practices aimed at changing safety behaviours at work have focused on building external safety regulation by providing incentives for safe work behaviours or negative consequences for unsafe behaviours (McAfee & Winn, 1989).

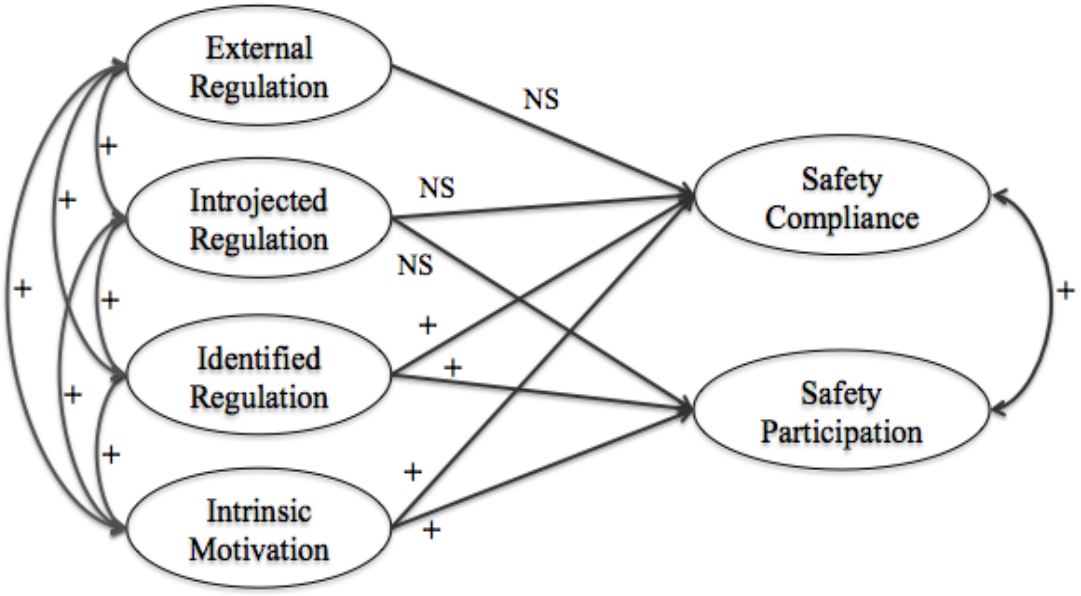


Figure 4: Study two hypothesized relationships between four types of safety motivation and safety behaviours

Hypothesis 1(a): Identified safety regulation and intrinsic safety motivation will significantly predict both employee safety compliance behaviours and safety participation behaviours.

Hypothesis 1(b): External safety regulation will not significantly predict employee safety compliance behaviours, nor will introjected safety regulation significantly predictor either employee safety compliance or participation behaviours.

Methods

Participants and Procedure

A marketing research firm located in Halifax, Nova Scotia was used to recruit participants for this research study. During the participant recruitment process, the firm used a telephone script which included a brief overview of the purpose of research project, a description of what participants would be asked to do for this study, and three eligibility questions. In order to be eligible to participate in this study, individuals were required to be a minimum of 18 years old, be employed, and have access to the Internet to complete the electronic survey for this study. During the initial recruitment phase, individuals invited to participate in this study were also informed of the participation incentive consisting of three prize draws for $100.00 each. The firm contacted a total of 9,298 individuals, of which 1,100 agreed to participate in the study, resulting in an 11.8% success rate.

The survey was sent to all 1,100 participants who were recruited to participate in the study via email in September 2011. Of the 1,100 participants, 9 emails were invalid and two individuals excluded themselves from the study upon receiving the email invitation. A total of 474 individuals completed the survey, resulting in a response rate of

43.5%. Participants were from a wide range of industries including many non-safety critical industries that have very few potential workplace safety hazards (e.g., Finance, Arts and Entertainment). As workplace safety is the sole focus on this research, respondents from the non-safety critical industries were eliminated from the study. This resulted in a reduced sample of 281 respondents, dropping the response rate to 25.8%.

The most common industries respondents worked in were: Healthcare (33.1%), Construction (11.4%), Retail (10.3%), Food Services/Accommodation (10.0%), Manufacturing (9.6%), and Transportation/Warehousing (8.5%). There were roughly similar numbers of male and female respondents (Male = 129, Female = 142, Unidentified = 10) and the mean age of respondents was 44.3 years (SD = 10.3). The majority of respondents worked full-time (75.4%) and the average number of hours worked per week was 41 hours (M = 40.7, SD = 13.2). Respondents were employed at their current job an average of 10 years (M = 10.4, SD = 8.6).

Measures

In addition to providing basic demographic information, participants completed the following two scales (see Appendix C for a list of all survey items).

Self-determined safety motivation. Four subscales of the SDSM scale from study one were used in this study to measure different types of safety motivation. The Amotivation subscale was removed from the SDSM scale for several reasons. First, several participants from study one commented on the survey that the amotivation items were hard to understand and answer. The amotivation subscale was also not significantly correlated with employee safety climate perceptions, nor either safety behaviours in study

one. Furthermore, amotivation is unique from the other four subscales of the SDSM survey as it measures a lack of motivation as opposed to an active type of motivation (Gagné et al., 2010). Therefore, it is often not included in measures of motivation based on self-determination theory (e.g., Ryan & Connell, 1989; Vansteenkiste et al., 2004). For this study the focus was on measuring and understanding the relationships between active types of safety motivation and employee's engagement in workplace safety behaviours.

The SDSM scale included the item stem "Why do you put effort into working safely?" with 23 items measuring four types of safety motivation: Intrinsic safety motivation (e.g., *"Because safety interests me"*), Identified safety regulation (e.g., *"Because I value working in a safe environment"*), Introjected safety regulation (e.g., *"Because I feel bad about myself when I don't work safely"*), and External safety regulation (e.g., *"In order to get approval from others' (e.g., supervisor, colleagues, family, clients)"*). The 23 items were comprised of all items from study one that were significant indictors of the hypothesized latent factors, plus seven additional items that were added to the SDSM scale to optimize the factor structure and internal reliability of the scale from what was obtained previously. Of the seven new items, two measured intrinsic safety motivation, two assessed identified safety regulation, one assessed introjected safety regulation, and two measured external safety regulation. These items were adapted from the recently developed and validated Multidimensional Work Motivation Scale (MWMS, Gagné et al., 2015). For all items, respondents used a 5-point scale (1 = Not at all for this reason; 5 = Exactly for this reason) to indicate the extent to

which each item described a reason why they worked safely. Psychometric properties of this scale are described in detail in the Results section below.

Safety behaviours. Two subscales from Neal et al. (2000) were used to measure the type of safety behaviours employees engage in at work. Safety compliance behaviours were assessed using three items (e.g., *"I use the correct safety procedures for carrying out my job"*; α = .90). Safety participation behaviours were assessed using three items (e.g., *"I promote the safety program within the organization"*; α = .81). Participants indicated the extent to which they agreed with each statement using a 5-point scale (1 = strongly disagree; 5 = strongly agree).

Results

Prior to any analysis, all data was screened for missing data, data entry errors, outliers, linearity, normality, and multicollinearity.

SDSM Scale Revisions

The goal of adding new items to the SDSM scale in this study was to address the scale limitations identified from study one. Specifically, these changes aimed to improve the reliability of the four SDSM subscales and identify a set of items that are stronger indicators of each of the four constructs measured, and which do not cross load on multiple dimensions. To test the impact of the changes made to the SDSM scale a confirmatory factory analysis (CFA) was performed using MPLUS v.6.11 (Muthén & Muthén, 1998-2011) in which all factors were allowed to correlate.

Prior to running the CFA, frequencies and descriptive statistics were run for each of the SDSM items using SPSS 20.0 (IBM Corp, 2011). Similar to study one, five items had kurtosis values of greater than three. To minimize the effect of non-normality on the results, maximum likelihood estimation (MLM) was used. Listwise deletion was used to deal with missing data. The same fit indices used in study one (i.e., chi-square statistic, CFI, TLI, and RMSEA) were used in this study to evaluate the overall fit of the CFA model.

The four-factor, 23-item safety motivation model was a poor fit of the data ($\chi^2(224) = 634.91$, $p < .001$; CFI = .83; TLI = .81; RMSEA = .09, 90% C.I. = [.08, .10], PCLOSE < .001), although all items were significant indictors of the hypothesized latent factors. The poor fit of this model is consistent with the results of the first CFA model from study one, which included many of the same items. Similar to the results of study one, the modification indices revealed several opportunities to simplify the factor structure and improve the model fit. I used the same process as described in study one to test the effects of modifying the factor structure (i.e., testing one modification at a time). During the modification process items were removed based on one of the following criteria: modification indices revealed cross-loaded items, item contributed less than 20% variance to the latent variable, or scale reliability stayed the same or improved with the deletion of the item.

In total, ten items were deleted from the model including three items that were also deleted in study one: *"Because it makes me happy"* from intrinsic safety motivation, *"Because I take pride in working safely"* from introjected safety regulation, and *"In order to avoid injury"* from external safety regulation. Three items included in the final

version of the SDSM scale from study 1 were also deleted: the introjected safety regulation item that cross-loaded on the identified safety regulation factor in study one: *"Because I feel good about myself when I work safely"*, one item from external safety regulation *"In order to get approval from others"*, and one item from intrinsic safety motivation: *"Because I have fun while working safely"*. These three items were deleted because several of the newer items added for this study performed better. Finally, four of the newly added items did not perform well and were also deleted: *"Because I get satisfaction from working safely"* from intrinsic safety motivation, *"Because working safely has personal significance to me"* and *"Because working safely aligns with my personal values"* from identified safety regulation, and *"Because others (e.g., supervisors, colleagues, family, clients) will respect me more"* from external safety regulation.

The results of these modifications produced a four-factor model comprised of 14-items which achieved a similar fit to the data as in study one ($\chi^2(71) = 149.38$, $p < .001$; CFI = .94; TLI = .92; RMSEA = .07, 90% C.I. = [.05, .08], PCLOSE = .04). Both the absolute fit indices and the incremental indices show decent fit to the data. All latent factors in the four-factor model accounted for a significant amount of variance in each indicator and all parameter estimates were significant (see Table 10). In addition, the reliability estimates of each subscale improved from study one (see Table 11).

Table 10: Standardized Parameter Estimates of the Four-Factor 14-Item SDSM CFA Model

Variables	**External**	**Introjected**	**Identified**	**Intrinsic**	***R^2***
Why do you put effort into working safely?					
Because I risk losing my job if I don't	.55				***.30***
In order to avoid being criticized by others (e.g., supervisor, colleagues, family, clients)	.82				***.67***
In order to get a reward	.44				***.20***
Because other people (e.g., supervisor, colleagues, family, client) pressure me to work safely	.73				***.53***
Because otherwise I will feel guilty		.59			***.34***
Because I feel bad about myself when I don't work safely		.80			***.64***
Because I would be ashamed of myself if I didn't work safely		.65			***.43***
Because I personally value safety			.64		***.41***
Because I value working in a safe environment			.62		***.39***
Because putting effort into working safely is important to me			.77		***.59***
Because I believe it is important to put effort into working safely			.82		***.68***
Because I enjoy working safely				.75	***.56***
Because safety interests me				.73	***.53***
Because I take pleasure in working safely				.90	***.81***

Notes: All estimates significant at p < .001; Listwise N = 249

Table 11: Study 2 - Survey 1 Scale Means, Standard Deviations, Reliabilities, and Correlations

	Mean	SD	1	2	3	4	5	6
1. External Safety Regulation	**2.20**	**.96**	*(.72)*					
2. Introjected Safety Regulation	**2.87**	**1.15**	.46**	*(.71)*				
3. Identified Safety Regulation	**4.65**	**.56**	.05	.31**	*(.80)*			
4. Intrinsic Safety Motivation	**3.91**	**1.09**	.09	.43**	.62**	*(.84)*		
5. Compliance Behaviour	**4.41**	**.69**	.01	.25**	.50**	.36**	*(.93)*	
6. Participation Behaviour	**4.13**	**.75**	.02	.29**	.43**	.41**	.50**	*(.83)*

Note * $p < .05$; ** $p < 0.01$ (2-tailed).
Scale reliabilities presented along diagonal in parentheses
Listwise N = 249

Relationship Between Types of Safety Motivation and Safety Behaviours

The relationships described in hypotheses one were tested using structural equation modeling (SEM). Hypothesis one specified only autonomous forms of safety motivation; specifically identified safety regulation and intrinsic safety motivation would be significant predictors of safety compliance and participation behaviours. Following Bryne's (2012) recommendation, prior to conducting the structural model, I first tested the fit of the measurement model. Results from the measurement model, containing all observed indicators and respective latent factors indicated that the measurement model fit the data well ($\chi^2(155) = 248.55$, $p < .001$; CFI = .96; TLI = .95; RMSEA = .05, 90% C.I.

= [.04, .06], PCLOSE = .52), and all parameter estimates were significant. Given the good fit of the measurement model, I proceeded to test the structural equation model, which included all four forms of safety motivation (i.e., external, introjected, identified, and intrinsic) predicting employee's safety compliance behaviour and introjected, identified, and intrinsic safety motivation predicting employee's safety participation behaviours.

Results of the structural equation model show a good fit to the data ($\chi^2(156) = 249.74$, $p < .001$; CFI = .96; TLI = .95; RMSEA = .05, 90% C.I. = [.04, .06], PCLOSE = .53). Similar to study one and as hypothesized, the path between external safety regulation and safety compliance and the paths between introjected safety regulation and safety compliance and safety participation were not significant (see Appendix D). Unlike study one and contrary to what I hypothesized, only identified safety regulation was a significant predictor of safety compliance behaviours. The relationship between intrinsic safety motivation and safety compliance behaviours was not significant. Furthermore, only intrinsic safety motivation was a significant predictor of safety participation behaviours. The relationship between identified safety regulation and safety participation behaviours was not significant.

Interestingly, the results indicated that the path between intrinsic safety motivation and safety compliance behaviours, although not significant was a negative relationship, which was the opposite direction of what I hypothesized and found in the previous study. The direction of this path was unexpected as the bivariate correlation between these two variables was positive and significant. I concluded that this result might be a consequence of negative suppression given the sign reversal of the coefficient

and the relatively high covariance between intrinsic safety motivation and identified safety regulation (.77) and introjected safety regulation (.62). To test whether this had an effect on the other path coefficients in the model I re-ran the model without the path between intrinsic safety motivation and safety compliance behaviours. Overall, the results stayed the same. All path coefficients were similar in size, direction, and significance (see Appendix E). Therefore, I proceeded with trimming the remaining non-significant paths from the model (see figure 5). Results of the trimmed model indicated the similar good model fit ($\chi^2(161) = 252.77$, $p < .001$; CFI = .96; TLI = .95; RMSEA = .05, 90% C.I. = [.04, .06], PCLOSE = .60). A chi-square difference test, confirmed that both the hypothesized and trimmed models fit the data equally well ($\chi^2_{diff}(5) = 4.20$, $p = .52$) so the more parsimonious model was obtained. Identified safety regulation explained 58% of the variance in safety compliance behaviours, whereas intrinsic safety motivation explained 62% of the variance in safety participation behaviours.

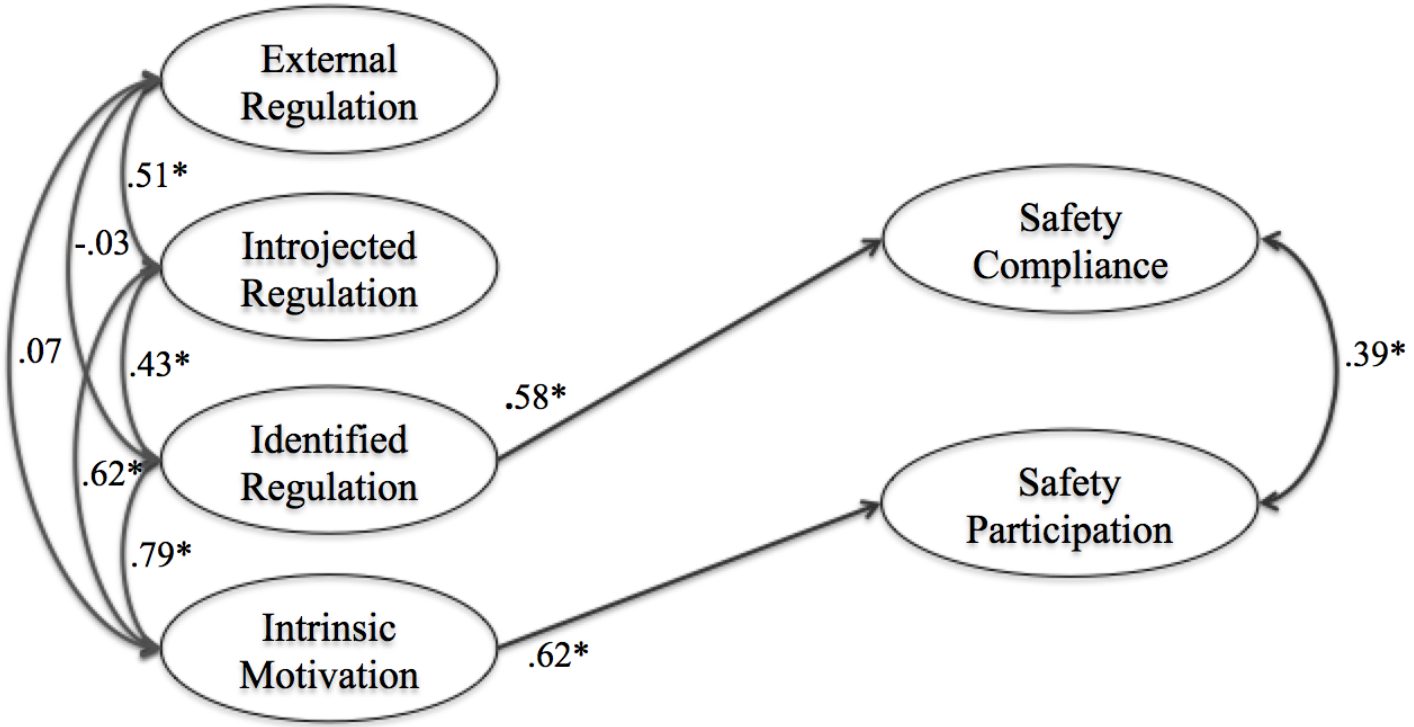


Figure 5: Study two trimmed SEM results

Discussion

The purpose of this study was twofold. First, this study aimed to investigate whether modifications to the SDSM scale improved the psychometric properties. Second, this study endeavored to replicate the findings from study one which indicated that only identified and intrinsic safety regulations were motivators for employees engaging in safety compliance and safety participation behaviours across a much broader range of safety critical industries.

Two main modifications were made to the SDSM scale in this study. First, the amotivation sub-scale was removed from the instrument. Although the amotivation subscale was found to be latent factor with good internal consistency in study one, several respondents in that study commented that the items assessing amotivation were hard to understand. This was likely due, in part because amotivation is unique from the other four types of motivation measured in the SDSM scale as it represents a lack of motivation instead of a specific type of motivation. This is the main reason why other researchers have opted to not measure it (Gagné, et al., 2010). The second modification to the SDSM scale was the addition of seven new items that were created to improve the overall psychometric properties of the SDSM scale.

The SDSM scale was reduced to a set of the 14 highest performing items measuring four types of safety motivation (i.e., external, introjected, identified, and intrinsic) The final 14-item SDSM scale was achieved by eliminating substandard performing items (e.g., items with low parameter estimates, cross-loaded items, items that impacted the internal consistency). The 14-item SDSM scale produced a satisfactory

model fit that was consistent with the model fit obtained from study one. More importantly, the modifications made during this study achieved the study goal of eliminating all cross-loaded items and improving the internal consistency of each of the four subscales. Specifically, the internal consistency for external safety regulation improved from $\alpha = .70$ in study one to $\alpha = .72$ in study two. Introjected safety regulation improved from $\alpha = .64$ to $\alpha = .71$. Identified safety regulation also improved from $\alpha = .77$ to $\alpha = .80$. Intrinsic safety motivation saw the biggest improvement in internal consistency with an increase from $\alpha = .67$ in study one to $\alpha = .84$ in study two.

The pattern of correlations between the four types of safety motivation are also similar to that found in study one, with the highest correlation found between identified safety regulation and intrinsic safety motivation (i.e., the two types of autonomous motivation). The second highest correlation was between external safety regulation and introjected safety regulation (i.e., the two types of controlled motivation). Moreover, external safety regulation was not significantly correlated with the other two autonomous types of safety motivation. These correlations provide further support that the data accurately represents the theoretical framework outlined in self-determination theory (Deci & Ryan, 1985).

This study also examined the relationships between the four types of safety motivation and self-reported safety compliance and participation behaviours. It was hypothesized that only identified safety regulation (e.g., valuing and believing in the importance of being safe at work) and intrinsic safety motivation would be associated with increased compliance and safety participation behaviours (hypothesis 1a). External

regulation and introjected safety regulations does not significantly predict employees' safety behaviours (hypothesis 1b).

Consistent with study one, only the two autonomous forms of safety motivation (i.e., identified safety regulation and intrinsic safety motivation) predicted employees' safety behaviours. Hypothesis 1b was fully supported; neither external nor introjected safety regulation was predictive of employees' safety compliance or safety participation behaviours. Hypothesis 1a was partially supported. When examining the relationships between different forms of autonomous safety motivation and safety behaviours this study found that each type of autonomous motivation only predicted one type of safety behaviour. Specifically, identified safety regulation only significantly predicted employee's safety compliance behaviours and intrinsic safety motivation only significantly predicted employee's safety participation behaviours.

Theoretical and Practical Implications

Overall, the results of this study highlight the importance of recognizing employees can be motivated to engage in workplace safety best practices for different reasons. The results of this study provide additional evidence of the value that self-determination theory can provide the field of occupational health psychology, particular in understanding what motivates employees to engage in safe behaviours at work. Furthermore, this research demonstrates that the reasons that underpin employees' safety motivation and define different types of safety motivation can be measured. Knowing the reasons that motivate employees to engage in safety activities and that regulate their

behaviour at work is particularly important when designing safety improvement interventions.

This research provides further evidence that an effective way for organizations to encourage employee engagement in safe behaviours at work is to promote and demonstrate the value and importance of workplace safety and to find ways to capture the interest of employees. Based on the results of this study, not all forms of autonomous safety motivation may produce the same quality or type of employee safety behaviours. Specifically, focusing on ways to promote identified safety regulation may be particularly important for addresses non-compliance issues whereas focusing on ways promote intrinsic safety motivation may be better for encouraging employees' participation in promoting a safe work environment such as pointing out a safer way for a colleague to perform a task. Finally, this research provides further evidence that external safety regulation does not significantly predict employee safety compliance or participation behaviours. Based on this finding, it can be concluded that motivational strategies focused only on external rewards or punishments are unlikely to be effective at promoting employee safety behaviours at work.

Limitations

As with all research, there are a number of limitations to this study. This study was able to improve the psychometric properties of the SDSM scale and test that scale using on a broad sample of employees across a diverse group of occupations and safety critical industries. Given there were a number of changes made to the SDSM scale, future research is stilled required to confirm the factor structure and further validate the

instrument. As with study one, this study also used self-reported measures of motivation and behaviour. The SDSM scale asks individuals about the reasons why they put effort into working safely. While individuals would best know why they put effort into working safely, self-reported measures can be susceptible to social desirability and memory biases (Holtgraves, 2004; Scollon, Kim-Prieto, & Diener, 2003) and these factors may have been present within this study.

Possible suppression effects may have been present within this study and impacted the results. The presence of this suppression effect made it difficult to fully interpret the results. Based on the analyses run, it could be concluded that introjected safety regulation, identified safety regulation, and intrinsic safety motivation share common variance in safety compliance behaviours. The relationship found between identified safety regulation and employee safety compliance behaviour may have been overestimated, while the effect of intrinsic safety motivation on employee safety compliance behaviour may have been underestimated due to this shared variance. Finally, this study also relied solely on the use of cross-sectional data; therefore no conclusions can be made regarding the possible direction of the relationships between the type of employee safety motivation and safety behaviours. This limitation will be addressed by the third study of this.

Study 3

This third and final study continues to build on the results of the previous two studies with two contributions. First, this study aims to confirm the psychometric properties of the SDSM scale achieved in study two. Second, building upon the previous

research, which found significant relationships between specific types of safety motivation and safety behaviours, this study will assess the directionality of these relationships and determine if these relationships are maintained over time. In testing the relationships between different types of safety motivation and safety behaviours over time, it was expected that individuals who are motivated to work safely for autonomous reasons, either through identified safety regulations or intrinsic safety motivation would continue to exhibit positive safety compliance and safety participation behaviours at a subsequent point in time. Furthermore, based on the results from study one and two I anticipated that external safety regulation and introjected safety regulation at time one would not be predictive of employees' safety compliance or safety participation behaviours at subsequent points in time. Finally, employees' safety behaviours at time one were not anticipated to be predictive of any type of safety motivation at time two.

Participants and Procedure

A follow-up survey was sent to all 1089 individuals recruited for study two.[2] Individuals received the follow-up survey appropriately three months after they received the survey for study two in December 2011. A total of 336 individuals completed the survey resulting in an overall response rate of 30.9%. Consistent with study two's procedures, respondents from non-safety critical industries were removed from the dataset. This resulted in the removal of 115 respondents, leaving a total sample of 221

[2] The survey was sent to all 1089 individuals recruited from study two to maximize recruitment of participants for future research projects. A willingness to participate in future research question was asked at the end of the survey.

respondents from safety critical industries.[3] Of the 221 respondents, approximately 68% of them also completed the first survey, resulting in a sample of 151 respondents who have data collected at two points in time.

The mean age of individuals who completed the survey was 45.5 years (SD = 10.3). There were slightly more male than female participants (Male = 112, Female = 92, Unidentified = 17). Respondents worked an average of 42 hours per week (M = 41.8, SD = 13.2) and were employed at their current job an average of 11 years (M = 10.8, SD = 9.0). Respondents were employed in a range of industries, the most common being: Healthcare (29.3%), Construction (11.5%), Food Services/Accommodations (10.1%), Manufacturing (8.7%), and Retail (7.2%).

Measures

Participants completed the same three measures described in study two (i.e., SDSM scale, the safety compliance behaviour scale and the safety participation behaviour scale).

Results

Prior to any analysis, all data was screened for missing data, data entry errors, outliers, linearity, normality, and multicollinearity.

[3] These respondents were removed from the study because the focus of this research was workplace safety, which is not a primary topic of interest outside of safety-critical industries

Psychometric Properties of SDSM Scale

To confirm the psychometric properties of the revised SDSM scale, a confirmatory factor analysis (CFA) modeling the finalized SDSM scale from study two was conducted using the full sample of 221 participants in this study. The same fit statistics from previous studies were used to evaluate the overall fit of the CFA model (i.e., chi-square statistic, CFI, TLI, and RMSEA). In addition, Cronbach's alphas were calculated to determine the reliability of the four SDSM subscales. The four-factor, 14-item SDSM model achieved a similar fit to the data as was achieved in study two ($\chi^2(71) = 141.80$, $p < .001$; CFI = .94; TLI = .92; RMSEA = .07, 90% C.I. = [.05, .09], PCLOSE = .02). Both the absolute fit indices and the incremental indices show descent fit to the data. All four latent factors accounted for a significant amount of variance in each indicator and all parameter estimates were significant (see Table 12).

Given the relatively high covariance between identified safety regulation and intrinsic safety motivation in study two, the covariance between the four latent factors was also examined. The pattern of latent factor covariance was similar to that found in study two, although they were generally not as high. For example, the covariance between identified safety regulation and intrinsic safety motivation in study two was .77, compared to .61 in this study. Finally, the reliability estimates of each subscale were similar to that obtained in study two and ranged from $\alpha = .70$ for external safety regulation to $\alpha = .85$ for identified safety regulation (see Table 13).

Table 12: Study 3 - Standardized Parameter Estimates of the Four-Factor 14-Item SDSM CFA Model

Variables *Why do you put effort into working safely?*	**External**	**Introjected**	**Identified**	**Intrinsic**	***R^2***
Because I risk losing my job if I don't	.61				***.37***
In order to avoid being criticized by others (e.g., supervisor, colleagues, family, clients)	.81				***.65***
In order to get a reward	.50				***.25***
Because other people (e.g., supervisor, colleagues, family, client) pressure me to work safely	.64				***.41***
Because otherwise I will feel guilty		.58			***.33***
Because I feel bad about myself when I don't work safely		.75			***.56***
Because I would be ashamed of myself if I didn't work safely		.69			***.48***
Because I personally value safety			.73		***.54***
Because I value working in a safe environment			.77		***.60***
Because putting effort into working safely is important to me			.84		***.70***
Because I believe it is important to put effort into working safely			.85		***.72***
Because I enjoy working safely				.74	***.55***
Because safety interests me				.77	***.59***
Because I take pleasure in working safely				.88	***.78***

Notes: All estimates significant at p < .001; Listwise N = 195

Table 13: Study 3 - Scale Means, Standard Deviations, Reliabilities, and Correlations

	Mean	SD	1	2	3	4	5	6
1. External Safety Regulation	**2.24**	**.90**	*(.70)*					
2. Introjected Safety Regulation	**3.10**	**1.11**	.41**	*(.72)*				
3. Identified Safety Regulation	**4.61**	**.58**	-.15*	.24**	*(.85)*			
4. Intrinsic Safety Motivation	**3.91**	**.99**	.09	.44**	.55**	*(.83)*		
5. Compliance Behaviour	**4.44**	**.59**	-.00	.27**	.46**	.35**	*(.90)*	
6. Participation Behaviour	**4.15**	**.76**	-.04	.28**	.54**	.41**	.49**	*(.89)*

Note: * $p < .05$; ** $p < 0.01$ (2-tailed).
Scale reliabilities presented along diagonal in parentheses
Listwise N = 180

Safety Motivation and Safety Behaviour Relationship Over Time

Several models using the sample of individuals who completed two waves of surveys (N = 150) were tested to assess whether the four types of safety motivation impact employees' safety behaviours over time. Table 14 provides central tendency measures, inter-correlations, and reliabilities coefficients for this subset of the data. I first tested an autoregressive model in which each variable at time two was regressed on the same variable at time one (e.g., time one intrinsic safety motivation predicting time two intrinsic safety motivation). Next, the cross lagged effects were added to the model. That model was then trimmed of all non-significant paths.

Table 14: Study 3 - Time 1 and Time 2 Scale Means, Standard Deviations, Reliabilities, and Correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. T1 External Safety Regulation	**2.24**	**.96**	*(.76)*											
2. T1 Introjected Safety Regulation	**2.86**	**1.15**	.40**	*(.70)*										
3. T1 Identified Safety Regulation	**4.70**	**.46**	-.05	.21*	*(.75)*									
4. T1 Intrinsic Safety Motivation	**3.93**	**.96**	-.02	.37**	.53**	*(.84)*								
5. T1 Compliance Behaviour	**4.48**	**.60**	-.07	.15	.54**	.41**	*(.89)*							
6. T1 Participation Behaviour	**4.19**	**.67**	.11	.30**	.48**	.40**	.40**	*(.80)*						
7. T2 External Safety Regulation	**2.20**	**.95**	.67**	.37**	-.15	-.04	-.08	.03	*(.74)*					
8. T2 Introjected Safety Regulation	**3.00**	**1.12**	.34**	.68**	.09	.27**	.05	.33**	.45**	*(.74)*				
9. T2 Identified Safety Regulation	**4.64**	**.52**	-.11	.15	.59**	.35**	.40**	.50**	-.13	.15	*(.82)*			
10. T2 Intrinsic Safety Motivation	**3.83**	**.99**	-.07	.29**	.36**	.57**	.40**	.23*	.03	.38**	.50**	(.81)		
11. T2 Compliance Behaviour	**4.45**	**.61**	-.02	.17	.41**	.38**	.70**	.40**	.00	.18	.43**	.29**	(.91)	
12. T2 Participation Behaviour	**4.15**	**.75**	.01	.32**	.44**	.24*	.38**	.61**	-.04	.28**	.61**	.36**	.45**	(.86)

Note: * $p < .05$; ** $p < 0.01$ (2-tailed). Scale reliabilities presented along diagonal in parentheses

The autoregressive model (see Appendix F) provided decent fit to the data ($\chi^2(30) = 67.95$, p = .001; CFI = .94; TLI = .90; RMSEA = .09, 90% C.I. = [.06, .12], PCLOSE = .01), although the RMSEA value was slightly higher than the guidelines suggested by Hu and Bentler (1999). This study did however; use a relatively small sample size (N = 150). Furthermore, the goal of the modeling analyses is to determine the significance of the relationships between safety motivation types and safety behaviours over time; therefore, I proceeded with the evaluation of the path coefficients. As shown in Table 15, all autoregressive relationships with the time one variable predicting the same variable at time two were significant.

Table 15: Study 3 - Autoregressive SEM Results

Path	Standardized Coefficient	p-value
T1 External Safety Regulation → T2 External Safety Regulation	.70	.000
T1 Introjected Safety Regulation → T2 Introjected Safety Regulation	.64	.000
T1 Identified Safety Regulation → T2 Identified Safety Regulation	.62	.000
T1 Intrinsic Safety Motivation → T2 Intrinsic Safety Motivation	.63	.000
T1 Safety Compliance Behaviour → T2 Safety Compliance Behaviour	.67	.000
T1 Safety Participation Behaviour → T2 Safety Participation Behaviour	.53	.000

Next, the cross-lagged effects were added to the model (see Appendix G). The cross lagged model provided a good fit to the data ($\chi^2(14) = 20.96$, p = .06; CFI = .99;

TLI = .95; RMSEA = .07, 90% C.I. = [.00, .11], PCLOSE = .27). Contrary to what I hypothesized, none of the four types of safety motivation measured at time one significantly predicted safety compliance behaviours at time two (external $\beta = .07$, $p = .31$; introjected $\beta = .00$, $p = .96$; identified $\beta = .06$, $p = .46$; intrinsic $\beta = .10$, $p = .18$). However, both introjected ($\beta = .17$, $p < .05$) and identified safety regulation ($\beta = .30$, $p < .001$) at time one did significantly predict employees' safety participation behaviours at time two. Interestingly, this is the first time in this line of research that introjected safety regulation has been significantly associated with either type of safety behaviours.

Perhaps even more interestingly, the reverse relationships were also significant. Specifically, time one safety participation behaviours predicted time two introjected safety regulation ($\beta = .17$, $p < .05$) and identified safety regulation ($\beta = .17$, $p < .01$). These results indicate there may be a reciprocal relationship between introjected and identified forms of safety regulation and engagement in safety participation behaviours. In addition to these reciprocal relationships, time one safety compliance behaviours also significantly predicted time two intrinsic safety motivation ($\beta = .18$, $p < .01$). This relationship does not appear to be reciprocal as the time one intrinsic safety motivation did not significantly predict time two safety compliance behaviours ($\beta = .10$, $p = .18$)

One puzzling result was the path coefficient for the relationship between time one intrinsic safety motivation and time two safety participation behaviours. I hypothesized that this relationship would be positive and statistically significant. Although this relationship was not statistically significant, the direction of the relationship was negative ($\beta = -.16$, $p = .07$). This suggests that as intrinsic safety motivation increases, employees are less likely to engage in safety participation behaviours in the future. This particular

result was comparable to the negative, but non-significant relationship between intrinsic safety motivation and safety compliance behaviours found in study two. Given that the zero order correlation between time one intrinsic safety motivation and time two safety participation behaviour was positive, this relationship was further analyzed to assess the possibility of the presence of a negative suppressor effect in the model results.

First, this negative path was removed from the model to determine if it had any impact on the other remaining relationships modeled. The results remained the same, with one exception. The strength of the path between time one introjected safety regulation and time two safety participation behaviour was slightly reduced and became non-significant ($\beta = .13$, $p = .08$) (see Appendix H). A second follow-up model was run in which the path between time one identified safety regulation and time two safety participation behaviours was removed to determine if the shared covariance between identified safety regulation and intrinsic safety motivation may be causing the negative path coefficient between time one intrinsic safety motivation and time two safety participation behaviours. With the removal of this path, the relationship between time one intrinsic safety motivation and time two safety participation behaviour remained negative and non-significant ($\beta = -.00$, $p = .91$) (see Appendix I). Given that the relationship between time one intrinsic safety motivation and time two safety participation behaviours continued to be negative and non-significant when other paths were removed it was determined that this path coefficient was not a statistical artifact, although the low sample size may be effecting these results (Streiner, 2013). The model was trimmed of all non-significant paths (see figure 6).

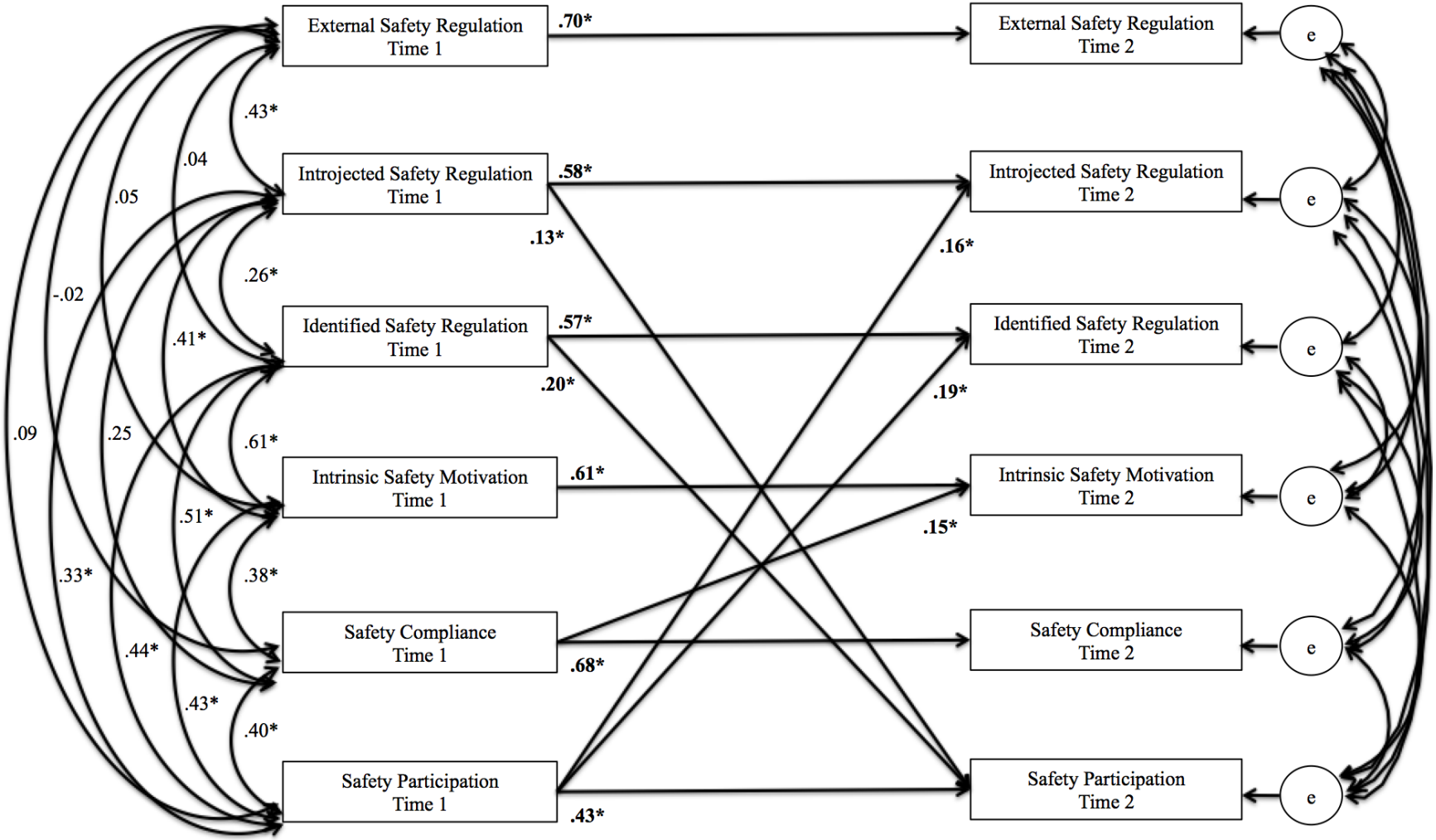


Figure 6: Study 3 final trimmed cross lagged regression model

Discussion

This study examined the relationship between different types of safety motivation and safety behaviours across two time periods, approximately three months apart. It is commonly assumed that the direction of the motivation – behaviour relationship is a linear relationship with increases in safety motivation leading to increases in safety behaviours. To date, there has been very little research testing the actual directionality of this relationship. This study aimed to provide evidence of the directionality of the relationship between different types of safety motivation and safety behaviours. Specifically, given the mounting evidence of the effects of autonomous forms of safety motivation from study one and two from this research program, and from Scott et al. (2014) and Conchie (2013) I hypothesized that identified safety regulation and intrinsic safety motivation would have a lagged effect on both safety compliance and safety participation behaviours, and that controlled forms of safety motivation (i.e., external and introjected safety regulation) would exhibit no lagged effects on either type of safety behaviours.

The results of this study provided partial support to the hypothesis. Identified safety regulation was the only form of autonomous safety motivation that demonstrated a lagged effect on employee safety behaviours. Specifically, identified safety regulation had a lagged effect on safety participation behaviours, but not safety compliance behaviours. Intrinsic safety motivation did not demonstrate a lagged effect on either type of safety behaviours. Unexpectedly, introjected safety regulation at time one also significantly predicted safety participation behaviours three months later. Although

introjected regulation has previously been found to have spurious relationships with other work outcomes (Gagné, et al., 2015), this is the first time introjected safety regulation has been associated with employee safety behaviours. Similar to Gagné, et al. (2015), the positive affect of introjected safety regulation on safety participation behaviours may be due to the shared variance with identified safety regulation and intrinsic safety motivation. In a follow-up analysis to determine if the negative (although non-significant) relationship between intrinsic safety motivation and safety participation behaviours was a manifestation of negative suppression, the relationship between introjected safety regulation and safety participation behaviours was reduced to the point of non-significance.

Another unanticipated observation from this study was the two reciprocal relationships between introjected and identified safety regulations and safety participation behaviours. Specifically, time one introjected and identified safety regulations accounted for a significant amount of variance in time two safety participation behaviours and time one safety participation behaviours also explained a significant amount of variance in time two introjected and identified safety regulations. This bi-directional relationship between introjected and identified safety motivation and safety participation behaviours suggests that carrying out voluntary activities that help to create a safe work environment (e.g., promoting the value of safety, speaking up when you see something unsafe) may influence individuals' motivation to work safely. This finding is similar to the results obtained by Neal and Griffin (2006), who found a reciprocal relationship between general safety motivation and safety participation behaviours. Neal and Griffin suggested that one possible explanation for this relationship may be that individuals receive rewards and

words of encouragement when they engage in safety participation behaviours, which influence employees' motivation. If Neal and Griffin's hypothesized explanation of the reciprocal relationship found in their study were true, one would expect to find safety participation behaviours at time one in this study to predict external safety motivation at time two as the reasons that would have drove motivation (i.e., a reward) is external to the safety participation behaviour itself. The reciprocal relationships found in this study do suggest that if employees do engage in safety participation behaviours, regardless of the initial reason or motive for these behaviours, the act of engaging in these behaviours can help facilitate partial or full internalization of the value or outcome associated with the safety participation behaviours over time.

Also consistent with the findings from Neal and Griffin (2006), this study found no type of safety motivation to be associated with subsequent changes in safety compliance behaviours. However, time one safety compliance behaviours did explain a significant amount of variance in time two intrinsic safety motivation. This finding suggests that the act of complying with safety rules and procedures can have a positive effect on subsequent intrinsic safety motivation. It is also possible that employees who comply with safety policies and procedures gain an increased sense of competence to doing their job. According to self-determination theory, actions and events are most likely to enhance intrinsic motivation when individuals have a perceived level of autonomy in the actions they are performing or when they believe they are competent in performing the action or behaviour (Ryan & Deci, 2002).

Finally, a secondary aim of this study was to confirm the psychometric properties of the SDSM scale from study two. This study found similar fit indices and reliability

estimates to that obtained in study two. The results of the psychometric analysis performed in this study indicate that the scale has good construct validity and internal consistency.

Theoretical and Practical Implications

The findings from this study make several contributions to the occupational safety literature and practice. First, this research is one of only a handful of studies to examine the relationship between employee safety motivation and behaviour over time; thus, providing further insight into the nature and direction of this relationship. This research also provides further evidence of the importance of not only examining the level, but also the type of employee safety motivation. The utility of using self-determination theory, as a framework for understanding the different types of employee safety motivation is further supported by the findings from this study. Self-determination theory has also been found to be a useful framework for postulating about the mechanisms behind the relationships between different types of safety motivation and employees' safety behaviours. The findings from this research help clarify the types of safety motivation most associated with employees' safety behaviours and highlight the significance of encouraging employees to internalize the value and importance of safety.

Limitations

As with all research, there are a number of limitations that should be taken into account when interpreting the findings from this study. First, this study was challenged by a relatively small sample size. One of the main drawbacks of obtaining a small sample size is having enough power to detect significant effects (Maas & Hox, 2005). The

implication of this study limitation is that there may be additional significant relationships between different types of safety motivation and safety behaviours over time there were not detected in this study.

Another limitation of this study was that motivation and behaviour were measured only at two points in time, which were three months apart. Researchers have suggested that a minimum of three measurement periods is needed to model relationships longitudinally over time (Kelloway & Francis, 2012; Ployhart & Vanderberg, 2010). This particular study limitation restricts the inferences that can be made about the direction, and consistency of the relationships between different types of safety motivation and employee safety behaviours longitudinally. However, given that the vast majority of previous research exploring the relationship between safety motivation and safety behaviours has used a cross-sectional design, this study does advance the literature, despite the limited measurement time periods.

General Discussion

Summary of Findings from Studies One, Two, and Three

The findings from this research make several contributions to the field of occupational safety. Specifically, this research program was one of the first to apply self-determination theory to the study of employee safety motivation and demonstrated utility in using this theory to advance our understanding of what motivates employees to work safely. Using self-determination theory, this research program included the development of a scale to measure safety specific self-determined motivation that can be used to assess

different types of employee safety motivation. This research also expanded our knowledge of the relationship between employee safety motivation and safety behaviours by identifying how different types of employee safety motivation relate to safety compliance and participation behaviours. Moreover, this research program was one of the few studies to investigate the relationship between employee safety motivation and safety behaviours over multiple time periods. Finally, the results of this research can be used to inform the development of future workplace safety interventions focused on behavioural change. These contributions were obtained through the course of three research studies.

Study one built upon previous research by Scott et al. (2014) to further develop a multi-dimensional construct and measure of safety motivation based on self-determination theory (i.e., the SDSM scale). The results of study one supported a five-factor model of employee safety motivation. Building upon previous safety motivation research (e.g., Christian et al., 2009), study one also found that employees' safety climate perceptions both directly and indirectly influenced employee safety behaviours through autonomous forms of employee safety motivation only (i.e., identified safety regulation and intrinsic safety motivation). Study two further refined and validated the SDSM scale and provided more evidence of the relationship between autonomous forms of safety motivation (i.e., identified safety regulation and intrinsic safety motivation) and employee safety compliance and participation behaviours across a more diverse group of safety critical industries. Study three found that only one type of autonomous safety motivation (i.e., identified safety regulation) influenced employees' safety behaviours across a three-month time period. This study also found a similar effect for introjected safety regulation. Study three provided evidence that these relationships between

introjected and identified safety regulations and employee safety participation behaviours may be reciprocal as safety participation behaviours also influenced introjected and identified safety regulations across the same three-month time period. The reciprocal nature of the relationship between these two types of safety motivation and employee's safety participation behaviours replicated and expanded the results found in one of the only other research studies examining the safety motivation and behaviour relationship over time (Neal and Griffin, 2006). The results of this research builds upon the results from Neal and Griffin (2006) and further defines exactly what types of safety motivation may be likely to occur from engaging in safety participation behaviours. The results also highlight the utility of a multi-dimensional safety motivation construct and the need to expand the traditional definition of safety motivation to specify the importance of both the quantity and quality of the motivation.

This research built upon Scott et al.'s (2014) initial scale development process by making and testing several enhancements to the SDSM scale. This research demonstrated the utility of using multidimensional measure of employee safety motivation. The SDSM scale achieved similar or slightly better fit indices than multidimensional measures of general work motivation (e.g., Gagné et al., 2010; Gagné et al., 2015) when tested across a range of safety critical industries within Canada. A recently developed Chinese version of the SDSM scale (Jiang & Tetrick, 2016) provides further evidence of the utility of this scale in measuring different types of safety motivation and also provides further evidence not only of the validity and reliability of the scale, but also the generalizability of the SDSM scale. Jiang and Tetrick results support the same five factor model found in study one. Furthermore, Jiang and Tetrick also found autonomous motivation to be positively

related to safety behaviours and transformational leadership, and negatively related to abusive leadership.

There was a mixture of different relationships found between the various types of safety motivation and employee safety behaviours across the three studies. For example, in study one, identified safety regulation and intrinsic safety motivation both positively predicted both types of safety behaviours; however, in study two, only identified safety regulation was significantly predictive of safety compliance behaviours whereas intrinsic safety motivation was only significantly associated with safety participation behaviours. Finally, in study three, which looked at these relationships over a three-month timeframe, identified safety regulation was positively associated with safety participation behaviours, but no significant relationship over time was found between intrinsic safety motivation and either type of safety behaviours.

In the third study, introjected safety regulation predicted future safety participation behaviours. This relationship between introjected safety regulation and safety participation behaviours was not significant in the first two studies. What relationships were found to be statistically significant across the three studies may have been influenced by the amount of shared variance between introjected, identified and intrinsic safety motivation. Given the amount of shared variance between these three types of safety motivation, researchers looking to measure different types of employee safety motivation in the future might consider simplifying the measure to examining the two higher level constructs of controlled and autonomous safety motivation.

Practical and Theoretical Implications

This research program explored the reasons that are most likely to motivate employees to engage in safety behaviours at work. Across all three studies, autonomous forms of safety motivation were the most significantly related to employee's self-reported safety behaviours. This result is consistent with results from the broader work motivation literature, which has found autonomous motivation to be positively related to important work outcomes such as job satisfaction and employee well-being (Gagné et al., 2010). Specifically, the significance of identified safety regulation predicting employee safety performance (i.e., safety compliance and participation behaviours) was a constant finding across all three studies and is consistent to what has been found in the boarder work motivation literature. For example, Gagné et al. (2015) found that identified regulation had the most consistently significant and positive relationship with work performance. A central tenet of self-determination theory is the importance of individuals internalizing the value or outcome associated with a given action (Deci & Ryan, 1985). The consistency in which identified safety regulation was associated with employee safety behaviours across all three studies provides evidence of the importance of internalizing the reasons for engaging in safety behaviours at work as identified safety regulation represents the fullest form of this internalization process.

This finding highlights the importance of safety programs that include elements of personal responsibility for safety and safety ownership (Anonymous, 2005). Based on the results of these three studies, organizations interested in increasing employees' compliance with safety rules and procedures and engagement in supportive workplace safety activities, such as speaking up when they see something unsafe should focus their

efforts on activities that support the development of autonomous forms of safety motivation.

The results of this research challenge the commonly held belief that employee incentive programs are an effective way to motivate employee safety performance (McAfee & Winn, 1989). This type of approach to motivating employee safety behaviours through external rewards and punishments is representative of external safety regulation. Consistent with the results from Scott et al. (2014) and Conchie (2013), the results from all three studies of this current research strongly suggest that there are no statistically significant relationships between external safety regulation and safety compliance or external safety regulation and participation behaviours. Taken together with the results from Conchie (2013) and Scott et al., (2014), this research provides a mounting body of evidence demonstrating the likely ineffectiveness of behavioural change programs focused solely on the promotion of external rewards and punishments (i.e., external safety regulation). The lack of impact of external regulation has also been found in the boarder work context. Specifically, Gagné et al. (2015) concluded that external regulation does not appear to be related to any work outcome that is typically related to more autonomous forms of work motivation.

Previous research has identified a number of organizational factors that are positively associated with safety compliance and participation behaviours including safety climate (Christian et al., 2009; Neal et al., 2000), safety leadership (Christian et al., 2009; Conchie, 2013), and safety management practices (Chen & Chen, 2014; Vinodkumar & Bhasi, 2010). The results of this research may help explain a potential mechanism through which these organizational factors impact employee safety

behaviours. Specifically, the results of this research program suggest that the more employees internalize the reasons for, or the outcomes associated with, performing safety compliance and participation behaviours (i.e., identified safety regulation), the more likely they are to engage in these behaviours at work. Organizational factors such as a positive safety climate, strong safety leadership and safety management practices all demonstrate the importance placed on safety by the organization, which may promote the internalization of the importance of working safely within each employee.

Limitations and Future Research

Limitations of this research program include the use of cross-sectional data in studies one and two. Reliance on cross-sectional data makes it hard to determine the direction of the relationship between different types of safety motivation and safety behaviours. Although, study three did include two data collection periods to allow for some investigation of the directionality of the relationship between safety motivation and employee safety behaviours, it did not include enough data collection periods to be considered a true longitudinal study (Kelloway & Francis, 2012). Therefore, future research should explore these relationships over a longer period of time and use different time intervals and frequency of data collection to fully understand how these relationships behave over time, and how stable the type of safety motivation and safety behaviours are over time.

This research program also relied on self-reported data for both safety motivation and safety behaviours. Although, self-reported data is best for assessing the reasons that motivate individuals to behave safely at work, sole relevance of self-report data does

introduce the possibility for mono-method bias. Future research examining the relationship between different types of safety motivation and employee safety behaviours should consider using an alternative measure of employee safety behaviours, such as peer or supervisor ratings.

Future research should also continue to examine different organizational and individual factors that facilitate autonomous forms of safety motivation. This line of research will help to provide a better understanding of the factors that influence different types of safety motivation employees may have. The leadership style of the employees; supervisors (Conchie, 2013) and the safety climate (Christian et al., 2009) of the workplace are two organizational factors that may be particularly influential on the type of safety motivation employees have. According to self-determination theory, the perceived level of autonomy, competence and relatedness are three individual factors that can influence the type of motivation (Deci & Ryan, 1985; 2000). Specifically, the extent to which employees feel their safety behaviours are a true representation of their own interests and values (i.e., perceived level of autonomy) and how capable employees feel they are to perform the intended safety activities may be important individuals factors for promoting autonomous safety motivation (Gagné & Deci, 2005). In addition to these two individual factors, the extent to which employees feel connected to others and have a sense of belonging and acceptance from those they work with may be especially important for employees to internalize the safety values and actions requested by the organization (Ryan & Deci, 2000).

All three studies used Neal et al.'s (2000) measure of safety behaviours. This scale includes six general items to measure safety compliance and safety participation

behaviours. Although Neal et al's scale has been widely used in the study of employee safety behaviours (Christian et al., 2009), further research examining the relationship between different types of safety motivation and employee safety behaviours would benefit from using alternative safety behaviour scales that include more specific types of safety behaviours, such as safety citizenship behaviours (Hoffman et al., 2003).

The current research highlights the importance autonomous safety motivation has on employee safety behaviours. Future research should also design and test interventions aimed at promoting autonomous forms of safety motivation. These intervention studies can also help answer the question of whether the level and type of employee safety motivation can change over time (e.g., can an employee go from being motivated to work safely by external reasons to being motivated to work safely by identified regulations?).

Concluding Remarks

This research program makes an important contribution to the occupational safety field by validating the importance of considering the type of safety motivation in understanding the relationship between employee safety motivation and safety behaviours. Specifically, this research has contributed to the overall understanding of how different types of safety motivation relate to employee compliance and participation behaviours in safety activities. The findings highlight the importance of autonomous forms of safety motivation in promoting employee safety compliance and participation behaviours. Equally important, the findings also highlight the lack of importance that controlled forms of safety motivation, particularly external safety regulations have in

promotion of safe work behaviours. This is consistent with the main principles outlined in self-determination theory.

References

Andriessen, J. H. T. H. (1978). Safe behaviour and safety motivation. *Journal of Occupational Accidents, 1*, 363-376.

Anonymous. (2005, July). Taking safety personally. *The Safety & Health Practitioner, 23(7),* 72.

Black, A. E., & Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science Education, 84*, 740-756.

Byrne, B. M. (2012). *Structural Equation Modeling with MPlus: Basic Concepts, Applications, and Programming*. New York: Taylor & Francis Group.

Chen, C. F., & Chen, S. C. (2014). Measuring the effects of Safety Management System practices, morality leadership and self-efficacy on pilots' safety behaviors: Safety motivation as a mediator. *Safety science, 62,* 376-385.

Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. (2009). Workplace safety: A meta-analysis of the roles of person and situation factors. *Journal of Applied Psychology, 94,* 1103-1127.

Clarke, S. (2006). The relationship between safety climate and safety performance: A meta-analytic review. *Journal of Occupational Health Psychology, 11(4),* 315-327.

Conchie, S. M. (2013). Transformational leadership, intrinsic motivation, and trust: A moderated-mediated model of workplace safety. *Journal of Occupational Health Psychology, 18,* 198-210.

De Cooman, R., Stynen, D., Van den Broeck, A., Sels, L., & De Witte, H. (2013). How job characteristics relate to need satisfaction and autonomous motivation: Implications for work effort. *Journal of Applied Social Psychology, 43*, 1342-1352.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Deci, E. L., & Ryan, R. M. (2000). The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227-268.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of Self-Determination Research.* Rochester, NY: The University of Rochester Press.

Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology, 49*(1), 14-23.

Fernet, C., Austin, S., & Vallerand, R. J. (2012). The effects of work motivation on employee exhaustion and commitment: An extension of the JD-R model. *Work & Stress*, *26*(3), 213-229.

Gagné, M. & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior, 26*, 331-362.

Gagné, M., et al. (2015) The Multidimensional Work Motivation Scale: Validation evidence in seven languages and nine countries. *European Journal of Work and Organizational Psychology, 24:2*, 178-196.

Gagné, M., Forest, J., Gilbert, M., Aubé, C., Morin, E., & Malorni, A. (2010). The motivation at work safety: Validation evidence in two languages. *Educational and Psychological Measurement, 70*, 628-646.

Gillet, N., Gagné, M., Sauvagère, S., & Fouquereau, E. (2013). The role of supervisor autonomy support, organizational support, and autonomous and controlled motivation in predicting employees' satisfaction and turnover intentions. *European Journal of Work and Organizational Psychology*, *22*(4), 450-460.

Griffin, M. A., & Neal, A. (2000). Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology*, *5*, 347-358.

Güntert, S. T. (2015). The impact of work design, autonomy support, and strategy on employee outcomes: A differentiated perspective on self-determination at work. *Motivation and Emotion*, *39*(1), 74-87.

Heinrich, H. (1931). *Industrial accident prevention: A scientific approach.* 1st Ed. London: McGraw-Hill Publishing Co. Ltd.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: a Multidisciplinary Journal*, *6*(1), 1-55.

IBM Corp. Released 2011. IBM SPSS Statistics for Macintosh, Version 20.0. Armonk, NY: IBM Corp.

Jiang, L. & Tetrick, L. E. (2016). Mapping the nomological network of employee self-determined safety motivation: A preliminary measure in China. *Accident Analysis and Prevention, 94*, 1-7.

Kath, L. M., Magley, V. J., & Marmet, M. (2010). The role of organizational trust in safety climate's influence on organizational outcomes. *Accident Analysis & Prevention, 42*(5), 1488-1497.

Kelloway E. K., & Francis L. (2012). Longitudinal research and data analysis. In Sinclair R. R., Wang M., Tetrick L. E. (Eds.), *Research methods in occupational health psychology: Measurement, design and data analysis.* New York, NY: Routledge.

Kirsch, I. S., Jungeblut, A., Jenkins, L., & Kolstad, A. (2002). *Adult Literacy in America: A first look at the findings of the national adult literacy survey (3rd ed)*. Princeton, NJ: Educational Testing Service.

Kusurkar, R. A., Ten Cate, T. J., Vos, C. M. P., Westers, P., & Croiset, G. (2013). How motivation affects academic performance: a structural equation modelling analysis. *Advances in Health Sciences Education*, *18*(1), 57-69.

Larsson, S., Pousette, A., & Törner, M. (2008). Psychological Climate and Safety in the Construction Industry : Mediated Influence on Safety Behaviour. *Safety Science, 46*, 405−412.

Levesque, C. S., Williams, G. C., Elliot, D., Pickering, M. A., Bodenhamer, B., & Finley, P. J. (2007). Validating the theoretical structure of the Treatment Self-Regulation Questionnaire (TSRQ) across three different health behaviors. *Health Education Research*, *22*(5), 691-702.

MacCallum, R.C., Browne, M.W., and Sugawara, H., M. (1996). Power Analysis and Determination of Sample Size for Covariance Structure Modeling. *Psychological Methods, 1(2),* 130-49.

Maas, C. J., & Hox, J. J. (2005). Sufficient sample size for multilevel modeling.

Methodology, 1(3), 86-92.

McAfee, R. B., & Winn, A. R. (1989). The use of incentives/feedback to enhance workplace safety: A critique of the literature. *Journal of Safety Research, 20,* 7-19.

Mullen, J. (2004). Investigation factors that influence individual safety behavior at work. *Journal of Safety Research, 35,* 275-285.

Muthén, L. K., & Muthén, B. O. (1998-2011). *Mplus user's guide.* Sixth Edition. Los Angeles, CA: Muthén & Muthén.

Neal, A. & Griffin, M. A. (2006). A study of the lagged relationships among safety climate, safety motivation, safety behaviour, and accidents at the individual and group levels. *Journal of Applied Psychology*, *91*, 946-953.

Neal, A., Griffin, M.A., & Hart, P.M. (2000). The impact of organizational climate on Safety climate and individual behaviour. *Safety Science, 34,* 99-109.

Newnam, S., Griffin, M. A., Mason, C. (2008). Safety in work vehicles: A multilevel study linking safety values and individual predictors to work-related driving crashes. *Journal of Applied Psychology, 93,* 632-644.

Ployhart, R. E. & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and analysis of change. *Journal of Management, 36,* 94-120.

Porter, L. W. & Lawler, E. E. (1968). *Managerial Attitudes and Performance*. Homewood, IL: Richard D. Irwin, Inc.

Probst, T. M., & Brubaker, T. L. (2001). The effects of job insecurity on employee safety outcomes: Cross-sectional and longitudinal explorations. *Journal of Occupational Health Psychology, 6,* 139–159.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57*, 749-761.

Ryan, R.M., & Connell, J.P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57*, 749-761.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57*, 749-761.

Ryan, R. M., & Deci, E. L. (2002). An overview of self-determination theory: An organismic-dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of Self-Determination Research* (pp. 3-36). Rochester, NY: The University of Rochester Press.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78.

Satorra, A., & Bentler, P.M. (2010). Ensuring positiveness of the scaled difference chi-square test statistic. *Psychometrika, 75*, 243-248.

Scott, N., Fleming, M., and Kelloway, E.K. (2014). Understanding Why Employees Behave Safely from a Self- Determination Theory Perspective In M. Gagné (Ed.), *The Oxford handbook of work engagement, motivation, and self-determination theory* (pp. 276-294). New York, NY: Oxford University Press.

Sinclair, R. R., Martin, J. E., & Sears, L. E. (2010). Labor unions and safety climate: Perceived union safety values and retail employee safety outcomes. *Accident Analysis & Prevention, 42,* 1477-1487.

Smith, S. (2007). Behavior-based safety: Myth or Magic?. *EHS Today*, Retrieved from http://ehstoday.com/safety/ehs_imp_75429.

Streiner, D. L. (2013). *A guide to the statistically perplexed: Selected readings for clinical researchers*. Toronto: University of Toronto Press.

Tabachnick, B. G., Fidell, L. S., & Osterlind, S. J. (2001). *Using multivariate statistics, 5th ed.* Boston: Pearson.

Tremblay, M. A., Blanchard, C. M., Taylor, S., Pelletier, L. G., & Villeneuve, M. (2009). Work extrinsic and intrinsic motivation scale: Its value for organizational research. *Canadian Journal of Behavioural Science, 41*, 213-226.

Trépanier, S. G., Fernet, C., & Austin, S. (2013). The moderating role of autonomous motivation in the job demands-strain relation: A two sample study. *Motivation and Emotion, 37,* 93-105.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senecal, C., & Valliéres, E. F. (1992). The Academic Motivation Scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational and Psychological Measurement, 52,* 1003-1017.

Van Den Broeck, A., Lens, W., De Witte, Hans, & Van Coillie, H. (2013). Unraveling the importance of the quantity and the quality of workers' motivation for well-being: A person-centered perspective. *Journal of Vocational Behavior, 82,* 69-78.

Vansteenkiste, M., Lens, W., Dewitte, S., De Witte, H, & Deci, E. L. (2004). The "why" and "why not" of job search behavior: Their relation to searching, unemployment experience and well-being. *European Journal of Social Psychology, 34,* 345–363.

Vieira, P. N., Mata, J., Silva, M. N., Coutinho, S. R., Santos, T. C., Minderico, C. S., ... & Teixeira, P. J. (2011). Predictors of psychological well-being during behavioral obesity treatment in women. *Journal of Obesity, 2011,* Article ID 936153, 8 pages, 2011. doi:10.1155/2011/936153

Vinodkumar, M. N., & Bhasi, M. (2010). Safety management practices and safety behaviour: assessing the mediating role of safety knowledge and motivation. *Accident Analysis & Prevention, 42,* 2082-2093.

Williams, G. C., Gagné, M., Mushlin, A. I., & Deci, E. L. (2005). Motivation for behavior change in patients with chest pain. *Health Education, 105,* 304-321.

Williams, G. C., Patrick, H., Niemiec, C. P., Williams, L. K., Divine, G., Lafata, J. E., et al. (2009). Reducing the health risks of diabetes: How self-determination theory may help improve medication adherence and quality of life. *The Diabetes Educator, 35,* 484-492.

Zohar, D. (2002a). Modifying supervisory practices to improve subunit safety: A leadership-based intervention model. *Journal of Applied Psychology, 87,* 156-163.

Zohar, D. (2002b). The effects of leadership dimensions, safety climate, and assigned priorities on minor injuries in work groups. *Journal of Organizational Behaviour, 23(1),* 75-92.

Zohar, D. (2003). The influence of leadership and climate on occupational health and safety. *In: Health and Safety in Organizations, a Multilevel Perspective*.

Hofmann, D.A. & Tetrick, L.E., New York, NY, US: John Wiley & Sons, Inc, 201-230.

Zohar, D. & Luria, G. (2005). A multilevel model of safety climate: Cross-level relationships between organization and group-level climates. *Journal of Applied Psychology*, *4*, 616-628.

Appendix A – Study 1 Survey Items

Group Safety Climate Perceptions (Zohar & Luria, 2005)

Self-Determined Safety Motivation Scale

Why do you put effort into working safely?

Amotivation

I don't, because it doesn't make a difference whether I work safely or not

I don't, because safety is not a priority in my workplace

I don't, because safety is not a priority for me

I don't, because working safely is not worth the effort

External Safety Regulation

Because I risk losing my job if I don't

In order to avoid being criticized by others (e.g., supervisor, colleagues, family, clients…)

In order to get approval from others' (e.g., supervisor, colleagues, family, clients…)

In order to get a reward

In order to avoid injury

Introjected Safety Regulation

Because otherwise I will feel guilty

Because I feel bad about myself when I don't work safely

Because I feel good about myself when I work safely

Because I take pride in working safely

Identified Safety Regulation

Because I personally value safety

Because I value working in a safe environment

Because putting effort into working safely is important to me

Because I believe it is important to put effort into working safely

Because working safely has personal significance to me

Intrinsic Safety Motivation

Because I have fun while working safely

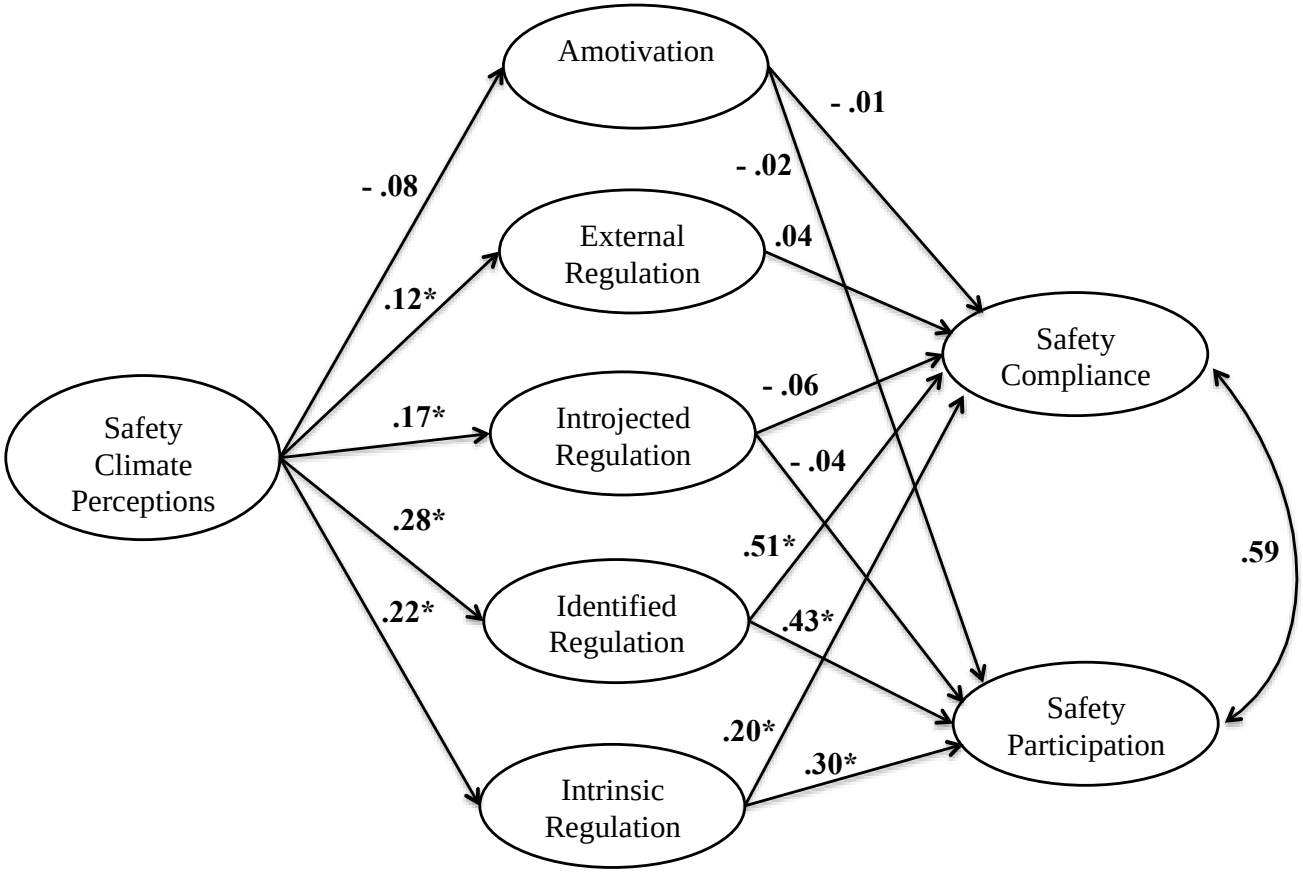
Because I enjoy working safely

Because safety interests me

Because it makes me happy

Safety Behaviours (Neal et al., 2000)

Appendix B – Study 1 Hypothesized SEM Model Results



Appendix C – Study 2 Survey Items

Self-Determined Safety Motivation Scale

Why do you put effort into working safely?

External Safety Regulation

Because I risk losing my job if I don't

In order to avoid being criticized by others (e.g., supervisor, colleagues, family, clients…)

In order to get approval from others' (e.g., supervisor, colleagues, family, clients…)

In order to get a reward

In order to avoid injury

Because people (e.g., supervisors colleagues, family, clients) pressure me to work safely

Because others (e.g., supervisors colleagues, family, clients) will respect me more

Introjected Safety Regulation

Because otherwise I will feel guilty

Because I feel bad about myself when I don't work safely

Because I feel good about myself when I work safely

Because I take pride in working safely

Because I would be ashamed of myself if I didn't work safely

Identified Safety Regulation

Because I personally value safety

Because I value working in a safe environment

Because putting effort into working safely is important to me

Because I believe it is important to put effort into working safely

Because working safely has personal significance to me

Because working safely aligns with my personal values

Intrinsic Safety Motivation

Because I have fun while working safely

Because I enjoy working safely

Because safety interests me

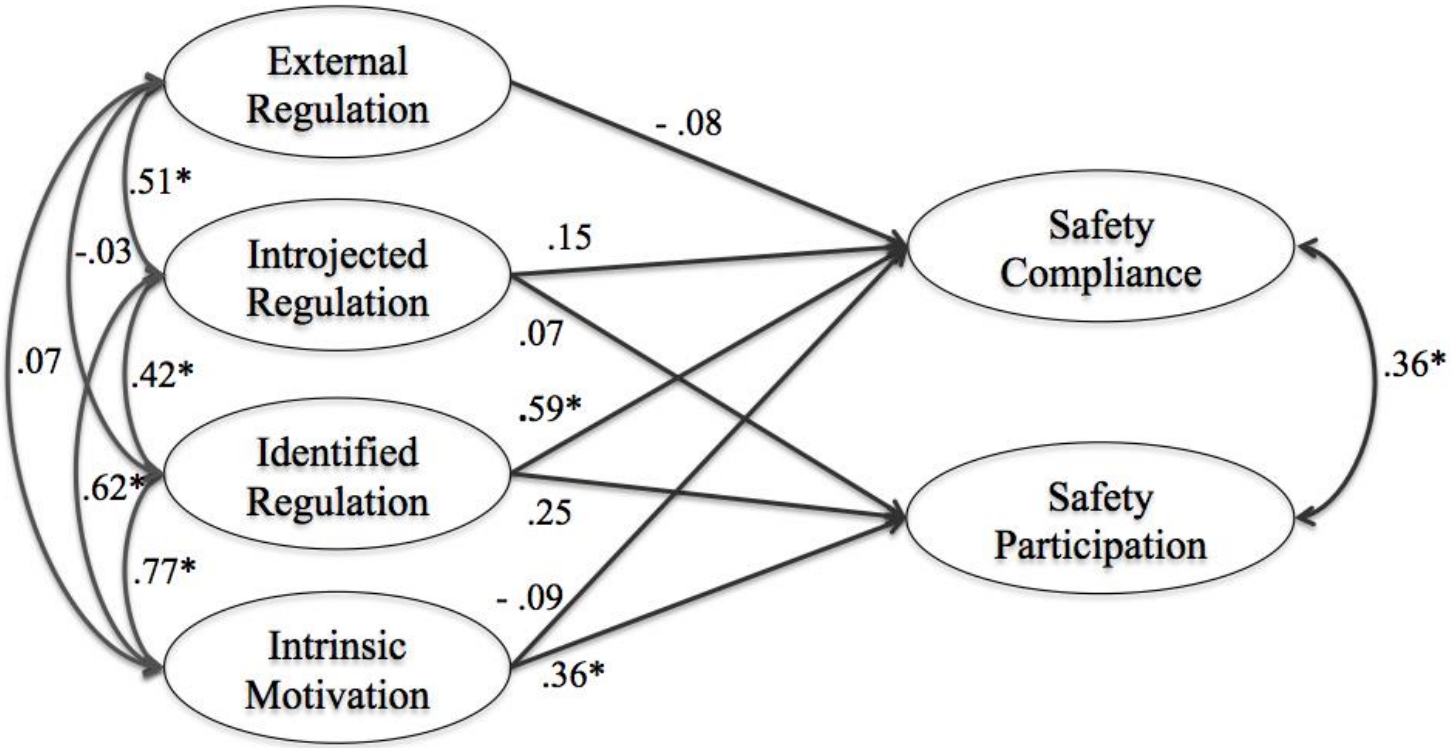
Because it makes me happy

Because I take pleasure in working safely

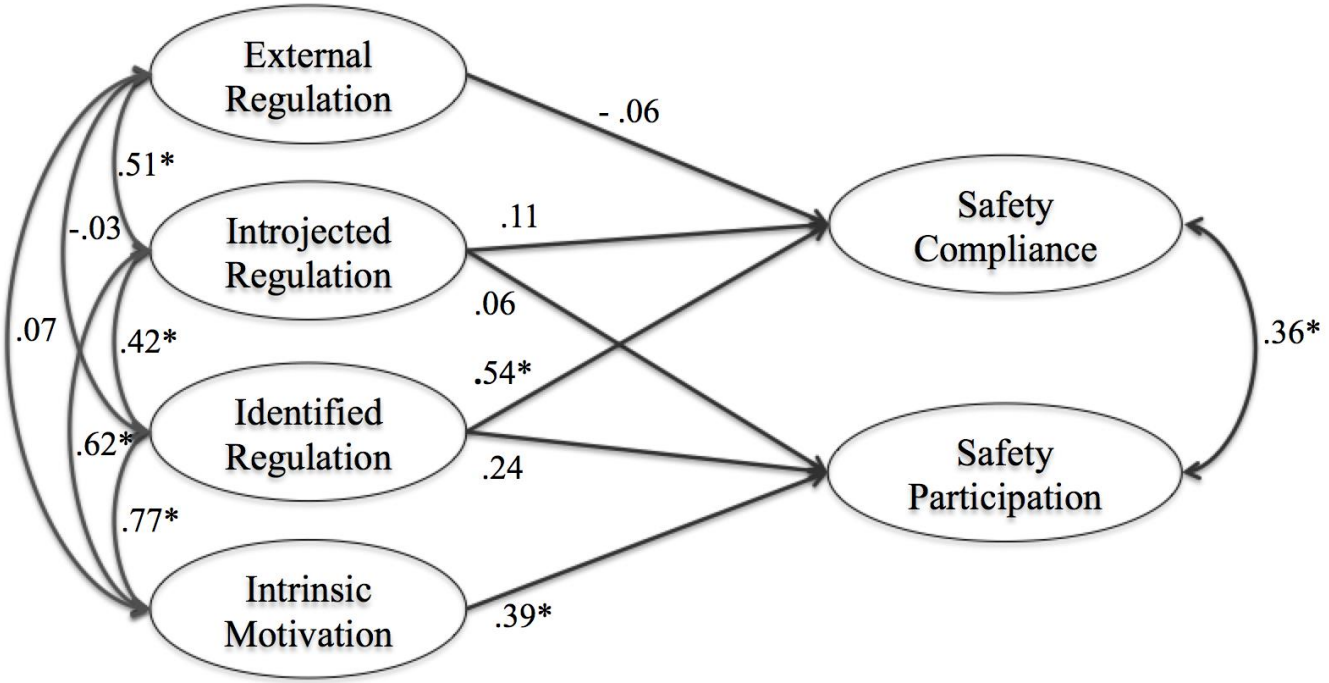
Because I get satisfaction from working safely

Safety Behaviours (Neal et al., 2000)

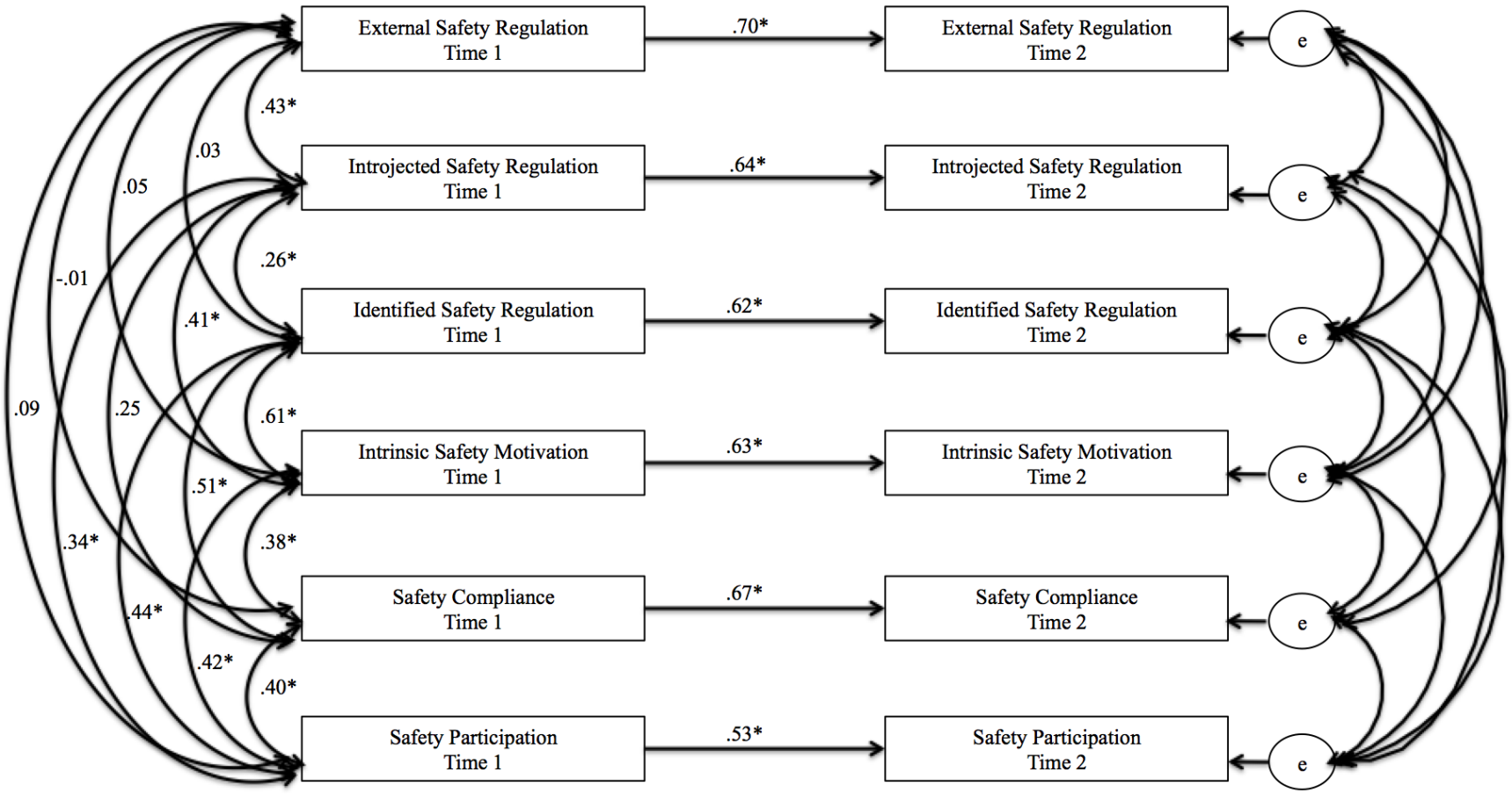
Appendix D – Study 2 Hypothesized SEM Results



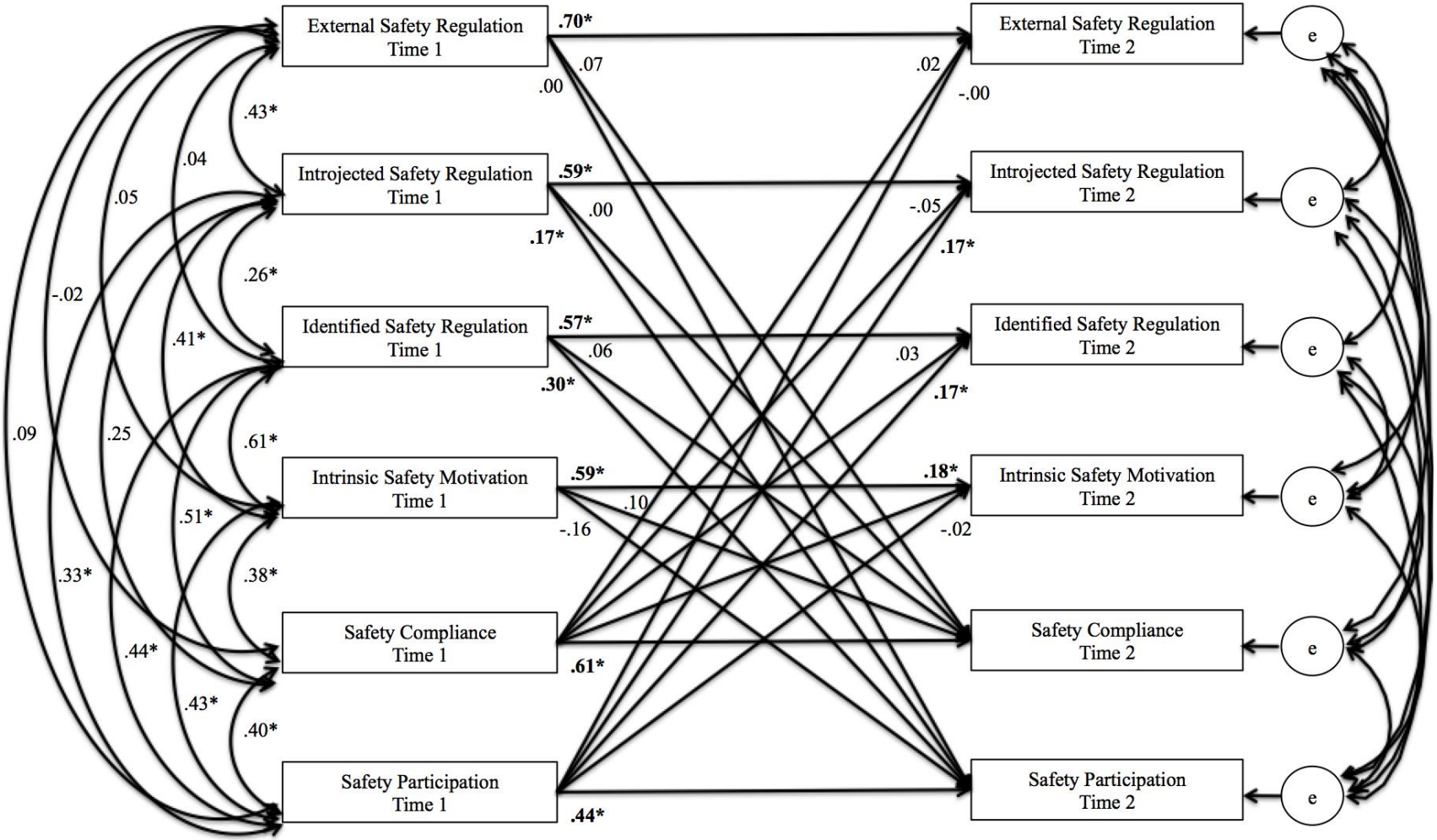
Appendix E – Study 2 Suppression Test SEM Results



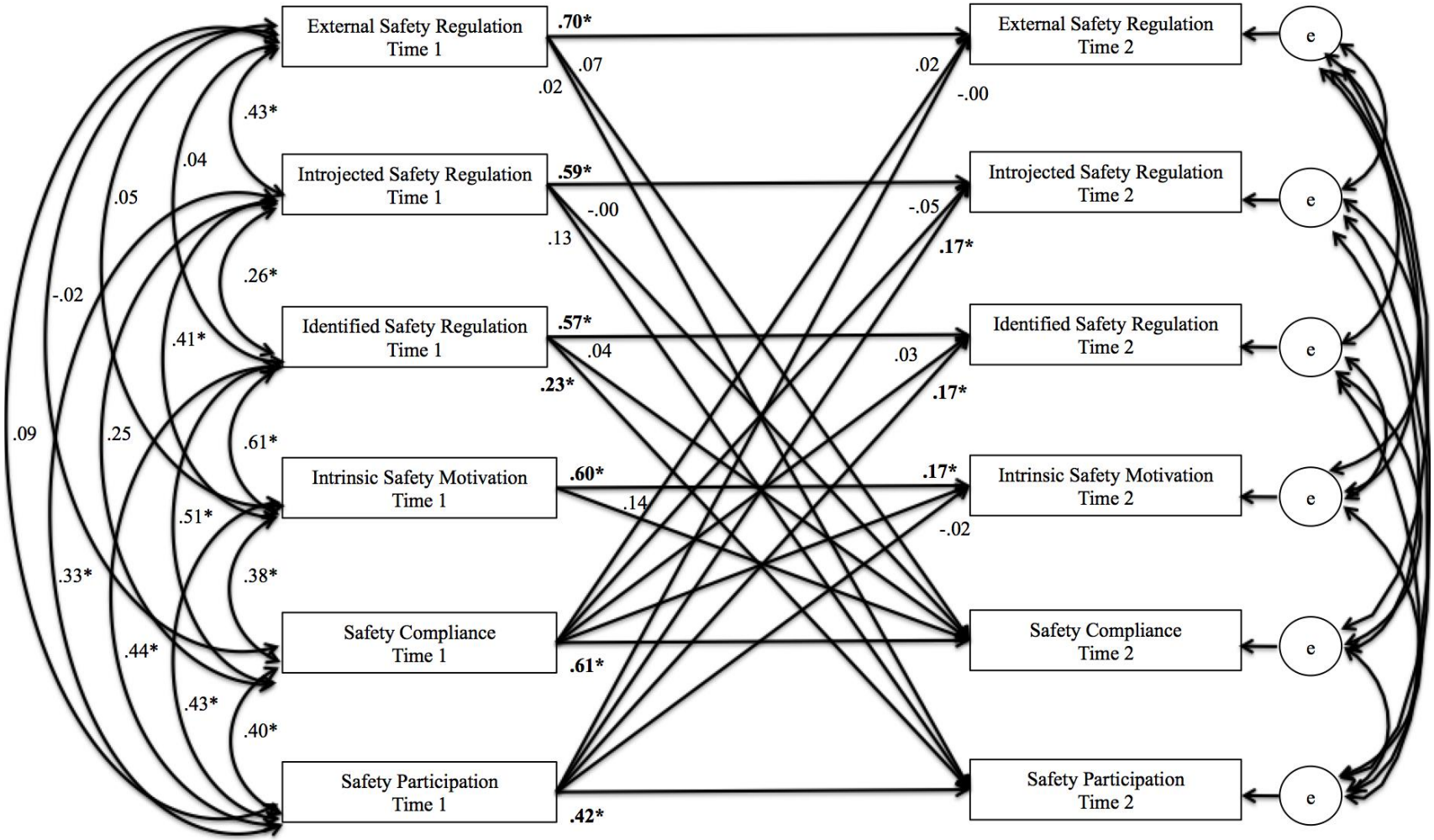
Appendix F – Study 3 Autoregressive Model



Appendix G – Study 3 Cross Lagged Regression Model



Appendix H – Study 3 Cross Lagged Regression Follow-up Model 1



Appendix I – Study 3 Cross Lagged Regression Follow-up Model 2