# The Identification of Individual Differences in Safety Performance:

# Development and Validation of a Safety Values Instrument

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By Dylan P. G. Smibert

In the past century, there has been little to no attention focused on an individual's values towards safety. In this thesis, I have developed and validated a safety values scale with the purpose of investigating the extent to which employees' safety values are related to safety performance. In study 1, nine subject matter experts identified six items that represent the safety values domain. In study 2 ($N$ = 182), the factor structure of the SVS was examined using an exploratory factor analysis (EFA) and was affirmed through a confirmatory factor analysis (CFA) in study 3 ($N$ = 410). The EFA and CFA supported the unidimensional structure of the SVS, $\chi 2$ (9, N = 410) = 20.88, p = .01, CFI = .99, RMSEA = .06 (90% CI = .025, .089), SRMR = .02. The internal consistency of the SVS was $\alpha$ = .85. Results from a hierarchical multiple regression supported that the SVS contributed significant incremental validity over the Big-Five personality traits and safety climate for safety performance and injury metrics. Practically, the SVS has the potential to be utilized in a selection or training context.

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In Canada, workplace accidents and injuries continue to be a serious problem. In 2011, there were 250,000 injuries and 1,000 deaths, which is concerning for employees and employers in the Canadian workforce (approximately 17 million; Statistics Canada, 2011). Specifically, the number of lost-time injuries accepted by the Workers' Compensation Board (WCB) in Canada during 2011 was 249, 511, and over the past 5 years, the number of fatalities has ranged between 919 to1,055 annually (National Work Injuries Statistics Program, 2012). The cost of injuries in the workplace has been estimated to exceed $12 billion annually (Kelloway, Francis, & Montgomery, 2006); however, economic loss aside, the ethical imperative of the 21st century employer is to protect the health and safety of their employees, although this has not always been the case in the past.

The focus of research in safety during the early 20th century has been on the notion of accident proneness, a "personality characteristic," which suggests certain individuals are inherently more likely to be in accidents than others (Greenwood & Woods, 1919; Wong & Hobbs, 1949). This was used as a way to blame the "accident prone" employee and "pass the buck" on employer safety responsibilities. After a century of research, the empirical evidence to support the existence of a stable accident prone personality characteristic is inconclusive (Glendon, Clarke, & McKenna, 2006; Kelloway et al., 2006). One reason may be due to the lack of consensus on the operational definition and how accident proneness is measured (Visser, Pijl, Solk, Neeleman, & Rosmalen, 2007). However, recent meta-analyses and empirical models continue to support the influence of individual differences in safety performance (Christian, Bradley,

Wallace, & Burke, 2009; Clarke & Robertson, 2005; Hogan & Foster, 2013; Visser, et al., 2007).

One area that is often overlooked is the role of values in safety performance. A value is a relatively stable set of beliefs that guides how one ought to behave (Jin & Rounds, 2012; Park & Guay, 2009; Rokeach, 1973; Schwartz, 1992). Values are central within an individual's personality and cognitive system and are therefore determinants of attitudes and behaviour (Rokeach, 1973). In the context of safety performance, holding a value of safety would act as a guiding principle on current and future safe behaviour. Although values are learned through early developmental social interaction and are malleable during childhood and adolescence, a recent meta-analysis (Jin & Rounds, 2012; Park & Guay, 2009) on value stability found that value structures become relatively stable in adulthood around 22 years of age and older. The transcendence and relative stability of values over situation and time for adults provides support for values as a measurable individual difference. By conceptualizing values as a measurable individual difference, there is the potential to further safety research in relation to measurement and the relationship between values and safety performance.

I believe it is important to clarify that the intention of this research is not to support the antiquated "*accident proneness*" concept of the early 20$^{th}$ century, but instead to support a systems approach to safety. Drawing on the systems model of causal factors in occupational injuries (Slappendel, Laird, Kawachi, Marshall & Cryer, 1993), there are three factors that interact to contribute to negative safety outcomes: (1) individual differences, (2) task or job features, and (3) organizational or environmental features. The

influence and interactions of all three of these inextricably connected factors are important in understanding safety incidents. Furthermore, a systems approach suggests that the cause of a safety incident does not rest solely on the shoulders of one factor (i.e., individual differences), contrary to what the *accident-prone* proponents may believe. Further, a systems approach supports that human error exists within all systems and that organizations can improve safety by manipulating the working environment through integrating defenses, safeguards, and barriers (Reason, 2000). Reason's Swiss Cheese Model of Safety (Reason, 1990) identifies four categories of barriers: (1) organizational influences, (2) unsafe supervision, (3) preconditions for unsafe acts, and (4) individual's unsafe acts. This research intends to address the fourth barrier at the individual and employee level of influence. There is a nuanced conceptual difference between identifying individual differences for the purpose of blame (i.e., accident proneness) and for the purposes of improving the safety system.

Influenced by Neal and Griffin's (2004) model of safety behaviour, Christian et al. (2009) conducted a meta-analysis of 477 safety articles and reported a fully mediated model of workplace safety. Distal-organizational (leadership and safety climate) and distal-person (conscientiousness) factors influence the proximal person-related factors (safety motivations and safety knowledge), which influence safety performance (safety compliance and safety participation), which ultimately, influence safety outcomes (accidents and injuries). Building on Christian and colleagues' model, my research expands the distal-person characteristics beyond conscientiousness with safety values.

The conceptualization of a safe employee has expanded beyond just the lack of injuries or accidents experienced in the workplace. Burke, Sarpy, Tesluk, and Smith-Crowe (2002, p. 432) defined safety performance as "actions or behaviours that individuals exhibit in almost all jobs to promote the health and safety of workers, clients, the public, and the environment." There are four factors of safety performance: (1) participating in work practices that reduce risk, (2) openly communicating hazards and incidents, (3) exercising the safety rights and responsibilities of employees, and (4) using protective equipment (Burke et al., 2002). Neil and Griffin (2000) have produced a similar definition, yet identified only two safety performance factors: compliance and participation. *Compliance* behaviours involve following safety rules and regulations, procedures, and use of proper equipment, whereas *participation* behaviours are less directed towards individual safety and focus on a wider organizational context (e.g., volunteering to be a part of a joint-safety committee or voluntarily reporting a near miss to prevent others from experiencing it in the future). By conceptualizing safety performance in the frame of behaviours rather than in low base rate outcome variables (accident and injury rates), researchers can more accurately identify psychological factors associated to safe behaviour (Christian, Bradley, Wallace, & Burke, 2009).

After considering the criteria of safety performance as outlined by Neil and Griffin (2000) and Burke et al. (2002), an individual who excels in safety is defined as someone who abides by safety rules and regulations, participates in safety promotion, and communicates safety issues and concerns. Therefore, the goal of this research was to

develop a safety values instrument to evaluate the relationship between safety values and safety performance.

**Personality and Safety**

Although safety values have not been previously examined in relation to safety performance, personality traits have been a popular topic of interest in predicting safety behaviour. Johns and Saks (2008, p. 41) define personality as "the relatively stable set of psychological characteristics that influence the way an individual interacts with his or her environment and how he or she feels, thinks, and behaves." This definition captures the important aspects of personality traits in that it a) is relatively stable over time, b) influences thoughts and behaviours, and c) suggests environmental factors can play a role.

The "Big-Five" personality traits (Extroversion, Neuroticism, Openness to Experience, Agreeableness and Conscientiousness) have been popularized in the literature and have quickly become the most common and identifiable general dimensions of personality (Barrick & Mount, 1991; Costa, 1996; Costa & McCrea, 1992; Digman, 1990).

There have been many studies that examine the relationship between personality and injury involvement. Whether it is in the realm of vehicle accidents or organizational injuries, there has been a tendency in research to attempt to identify trait-based explanations for safety related incidents. A meta-analysis by Clarke and Robertson (2005) examined the relationship between the Big-Five personality traits and injuries in occupational and non-occupational settings. Both Neuroticism ($\rho$ = .26) and

Conscientiousness ($\rho$ = -.27) were reported as generalizable predictors of accident involvement in both vehicle accidents and organizational injuries. The personality characteristic of extroversion was only a significant predictor in vehicle accidents ($\rho$ =.24) but not organizational injuries. In general, personality traits have a tendency to relate to health and safety behaviours. The next section will examine these relationships further.

**Conscientiousness.** Conscientiousness can be identified by aspects of being dutiful, strong-willed, methodological, and competent (Costa & McCrea, 1992). It has been well established that conscientiousness is one of the best personality trait predictors of performance (Barrick & Mount, 1991). There has been empirical support for relationship between low levels of conscientiousness and injuries (Arthur & Graziona, 1996; Clarke and Robertson, 2005). Individuals with low levels of conscientiousness are often not prepared, not overly dependable or reliable, and are often lackadaisical in their behaviours (Costa & McCrea, 1992). A few explanations for increased injuries among individuals with low levels of conscientiousness include low self-discipline, lack of organization, carelessness, and impulsivity (Costa & McCrea, 1992; Glendon et al., 2006). Glendon and colleagues (2006) suggest that conscientiousness may be a predictor of participation in safety related behaviours. Similarly, Salgado (2002) reports that the best predictor of deviant work behaviour is low conscientiousness.

**Neuroticism.** As defined by Costa and McCrea (1992), Neuroticism consists of sadness, embarrassment, anger, guilt, fearful, and emotional instability. The personality trait of Neuroticism has been shown to have a relationship with organizational injuries in

both organizational settings and vehicle accidents ($\rho$ = .26; Clarke & Robertson, 2005). One explanation for the relationship between increased injury rates and neuroticism is due to the preoccupation with personal anxieties and worries, making them more distracted and more likely to get injured (Hansen, 1989). Negative affectivity (the tendency to experience negative emotions) has also shown a relationship with increased occupational injuries (Iverson & Erwin, 1997).

**Extroversion.** Extroversion is a trait identified by an individual's sociability, optimism, energy, and enjoyment of excitement (Costa & McCrea, 1992). As reported above, people high in extroversion do tend to have an increased level of vehicle accidents ($\rho$ = .24), but there is little evidence of organizational injuries ($\rho$ =-.09; Arthur, Barrett & Alexander, 1991; Arthur & Graziano, 1996; Clarke & Robertson, 2005). One explanation for the increase in extroverts' propensity for injury is that they have lower levels of vigilance; therefore, they will be less engaged by their tasks and more likely to experience an accident (Eysenck, 1962). Sensation seeking, often found concurrent with the extrovert trait, has also been a considered a factor related to increased accident rates (Jonah, 1997). Again, there has been less attention on the organizational injury outcomes; however, Glendon and colleagues (2006) make reference to a dissertation (Lubner, 1992) that found American pilots who were involved in incidents had significantly higher scores in thrill and adventure seeking.

**Agreeableness.** Individuals who are high in agreeableness are often pleasant, cooperative, tolerant, and helpful (Costa & McCrea, 1992). The opposite of high agreeableness (egocentric, cynical, aggressive, dominant, and stubborn) has been shown

to significantly correlate with injury involvement (Cellar, Nelson, Yorke, & Bauer, 2001; Clarke & Robertson, 2005). Hofmann and Stetzer (1996) suggest that group norms for safety related behaviours are important. Those high in agreeableness are more likely to approach team members who are not acting in a safe manner and try to promote and establish team safety norms. When teamwork is required to work safely (e.g., communicating hazards to team members when backing up heavy equipment), an individual high in Agreeableness will support their team producing a safer working environment.

**Openness to Experience.** Openness to Experience is often one of the least studied traits in terms of job performance and has been associated with training proficiency ($\rho$ = .25; Barrick & Mount, 1991; Glendon et al., 2006). Individuals high in Openness have been identified as imaginative, broadminded, curious, and proficient problem solvers (Costa & McCrea, 1992). There is little support of a relationship between Openness to Experience and organizational injuries (Clarke & Robertson, 2005).

Although it can be challenging to separate personality and values in practice, they do theoretically differ in a couple of ways. Values relate to what we ought to do, while personality relates to our common tendencies (Park & Guay, 2009). Personality has been identified as a notable individual difference in predicting safety performance, yet there are other individual differences that have received less attention, namely, the values an individual holds towards safety. The relationship between an individual's values towards safety is worthy of further investigation. This research aims to address this gap in the literature.

## Values and Attitudes

A value is a relatively stable evaluation of an abstract idea or concept (e.g., honesty and safety) in relation to the guiding principles in one's life (Schwartz, 1992; Rokeach 1973). More specifically, "Values (1) are concepts or beliefs, (2) pertain to desirable end states or behaviours, (3) transcend specific situations, (4) guide selection or evaluation of behaviour and events, and (5) are ordered by relative importance" (Schwartz, 1992, p. 4). Values are different from attitudes in terms of their generality (i.e., situation transcendence) and their ranking of importance. Attitudes can be described as a learned evaluative tendency to behave in a consistent manner towards a particular object or situation (Ajzen, 2005). Attitudes consist of three components (Rosenberg & Hovland, 1960): (1) affective (emotions towards the object or situation), (2) cognitive (perceptions or knowledge about object or situation), and (3) behavioural intention (tendency to behave in accordance with affective and cognitive component).

**How are values formed?** Values are developed at a young age through interactions with role models (e.g., parents, teachers, and friends; Parks & Guay, 2009). In most cases, values are learned in isolation (e.g., hard work leads to success), developed in an all-or-none format and are framed in a positive way (Rokeach, 1973). As values accumulate, they are placed into a value structure, whereby values are given priority over others when placed in conflict (Rokeach, 1972). Values and structure become quite stable in adulthood (Jin & Rounds, 2012; Rokeach, 1972), although they are more malleable in childhood and adolescence.

**Models.** Homer and Kahle (1988) found support for their proposed value →

attitude → behaviour hierarchy, which suggests that abstract values lead to attitudes and then to subsequent behaviour. Similarly, Ajzen's (1995; 1991) model of planned behaviour (reasoned action) identifies how intention mediates the relationship between behaviour and the attitude towards a behaviour, subjective norms, and perceived behavioural control. A study by Fogarty and Shaw (2010) tested Azjen's model of planned behaviour in predicting unsafe behaviour (self-reported rule violation). The authors provided evidence of a partially mediated model with workers' attitudes, workplace norms, and perceived control mediating the relationship between managers' attitudes towards safety, violation intention, and rule violation.

**Scales.** Glendon and colleagues (2006) suggested that values toward safety could be measured through the development of a scale that is comprised of workplace safety items. For example, measuring values towards safety participation, compliance, and communication may be useful in predicting occupational safety performance; therefore, there is an opportunity to progress the research domain of safety by developing an instrument that measures an individual's values towards safety.

After conducting an extensive literature search on PsycInfo and Google Scholar, I was unable to locate a published safety value scales; however, I did find several safety attitude scales (e.g., Safety Attitude Questionnaire; Sexton et al., 2006, or Attitude Towards Safety Scale; Cox & Cox, 1991). There are, however, issues with these attitude scales, including that they are developed to be domain specific (e.g., healthcare), and they blur the lines of the constructs by measuring safety climate and working conditions instead of direct safety attitudes. One study (Crowe, 1995) claimed to measure safety

values in relation to unintentional injuries among university undergraduates; however, on closer inspection of the value scale, the items were measuring attitudes: “Seatbelt use is only important for long trips while driving at high speeds on freeways” and “Smoking in bed should be strictly forbidden.”

Although I was unable to locate an instrument that measure safety values in the literature, there are scales that measure values (Rokeach, 1973; Schwartz, 1993). One approach to developing a scale that measures safety values is to mimic the structure of a pre-existing value scale. Schwartz developed and found support for a model of 10 universal values across 40 countries (1992). The values are modeled in a circumplex structure with values of close conceptual proximity correlating higher with one another than conceptually opposing values, which will have a lower or negative correlation with the value. For example, values that are conceptually similar like Achievement and Power are placed proximally next to one another and are positioned opposite from the conceptually dissimilar values of Benevolence and Universalism. The safety values content domain aligned with a broad multi-faceted safety performance criteria identified by Burke et al. (2002) and Neil and Griffin (2000). In line with Schwartz’s human values scale, each value is identified as a single construct. Therefore, the safety values construct will ideally reflect a single-factor structure.

H1: The internal consistency of the Safety Values Scale will reach acceptable levels ($\alpha$ = .70 or greater; Kline 2005) for research purposes.

H2: The Safety Values Scale will have a unidimensional factor structure.

H3: Safety values will be positively correlated to safety performance and negatively correlated to accidents and injuries and will account for unique variance over personality factors and safety climate on safety performance.

**Safety Climate**

It is important to consider safety climate when investigating the relationship between employees, work environments, and safety. Zohar and Luria (2005) identify safety climate as an employee's perception of management's relative priority of safety in the workplace.

There is consistent empirical support for the relationship between safety climate and safety performance (Griffin & Neal 2000; Neal & Griffin 2004; Clarke, 2006; Christian et al., 2009). Clarke (2006) conducted a meta-analysis on safety climate and found a significant relationship between safety climate and safety performance (compliance, $\rho$ = .43 and participation $\rho$ = .50). However, he only found a small non-significant relationship between safety climate and accidents and injuries ($\rho$ = .22) due to the high variability ($SD\rho$ = .18). Even though Clarke's finding was non-significant, other research supports that that safety climate is an important predictor of safety performance (Christian et al., 2009). Including safety climate as a covariate will allow me to assess the incremental variance of safety values in predicting safety performance. Additionally, I expect that the influence of individual differences on safety performance will be the strongest in a poor safety climate because there will be greater opportunity for individual differences to influence safety performance. That is, the variance between safety conscious and not safety conscious employees will be maximized in an environment that

is perceived to have poor management commitment to safety. Conversely, in an environment where management places a high priority on safety, variance in safety performance may be restricted (ceiling effect); therefore, individual differences in safety performance will not be as detectable. Including a measure of safety climate will be important to test this interaction and to control for its influence on safety performance metrics.

> H4: Safety climate will moderate the effect of individual differences on safety performance. That is, individual differences (safety values and personality) will have a stronger relationship to safety performance in a poor safety climate and in contrast, a weaker relationship when safety climate is positive.

**Measuring Safety Performance and Outcomes**

Injury and accident reports are the predominant criterion used in safety research; however, it has been estimated that only one tenth of injuries are officially reported (Kelloway et al., 2006). This underrepresentation attenuates the measurable effect, which may explain the mixed and unstable relationships that have been reported in the literature. In Olsen's (2013) meta-analysis on accident and injury report coding, he noted that there is a lack of standardization in measuring and coding events, which made it impracticable to combine research studies in a meaningful way. Furthermore, accident and injury rates may not reflect safety as accurately as once thought, given the frequency only captures those who have been injured and not those who caused the accident or injury. Identifying

those who are more likely to cause the injury may be of greater interest to researchers than the individuals who were injured.

Examining safety performance from multiple sources will alleviate the limitations of the single-criterion found in accident or injury data. For example, Christian et al. (2009) used a composite measure of safety, which included broad, overall safety-related behaviours as well as specific task (safety compliance) and contextual (safety participation) behaviours. Safety motivation and safety knowledge are also important indicators of potential safety performance. Therefore, my design will incorporate safety performance (compliance and participation), safety knowledge, safety motivation, self-reported safety injuries, events, and a secondary source of safety outcome data from a transportation company.

Scott and Fleming (2014) conducted a preliminary examination of the relationship between safety behaviour tendencies at home and the workplace. From this work, they have developed a scale that measures household safety behaviours, which includes actions such as wearing protective equipment like ear-plugs and safety glasses, using a secure step ladder, or reading instructions on power tools. Given that values have the potential to transcend situation and time, examining the relationship of safety values across multiple environments (work and home) is worth closer examination. Further, the multiple sources of safety information (i.e., safety performance, motivation and knowledge, self-report injuries, safety events, household safety, and objective safety outcome data) will further promote a multiple criterion approach to safety measurement.

Based on an extensive literature review of past predictors of accidents and injuries, and in the context of Burke and colleagues' (2002) and Neal and Griffin's (2000) definition of safety performance, there may be benefit for employees working in safety critical occupations to be high in Conscientiousness, Emotional Stability, Agreeableness, and lower in Extroversion. Furthermore, my thesis will examine if safety values are also significantly related to safety performance.

The goal was to develop a parsimonious, valid, and reliable tool that measures an individual's values towards safety. The value scale was developed and evaluated in line with Hinkin's scale development practices for organizations (1995). Hinkin outlined three steps in scale development: (1) item generation, (2) scale alignment, and (3) scale evaluation.

My thesis consisted of three studies. The first study encompassed the generation and selection of safety value items. The second study examined the factor structure (exploratory factor analysis) and psychometric properties of the SVS. Finally, the third study further explored the factor structure using confirmatory factor analysis and examines the incremental validity of the SVS over personality and safety climate in safety performance metrics.

# Study 1: Item Generation

## Method

### Safety Values Scale (SVS) Development

**Item Generation.** To assess content validity of the scale, a deductive scale development approach was used to write items that capture the domain of safety. In line with the principles for validation and use of personnel selection procedures (SIOP, 2003), items were selected and developed based on their logical, empirical, or theoretical foundation towards safety. After conducting an extensive review of the safety literature, an operational definition of the safety value domain was developed and a list of relevant SVS items was generated. For the purpose of this study, safety was defined as "the pursuit of protection from experiencing or causing injuries, harm, or loss." There were six different iterations of SVS items before the seventh pool of items was selected. There were seven safety value items developed for the sort process: (1) Security (being free from danger or harm), (2) Cautious (taking care to avoid risk or danger), (3) Vigilant (being aware of problems or signs of danger), (4) Protective (preventing others from being harmed or injured), (5) Informative (communicating safety concerns to others), (6) Risky (taking chances that lead to excitement or reward), and (7) Compliant (following rules and procedures).

The value items were designed to mimic the structure of Schwartz's (1992) human values model. In Schwartz's scale, participants rated on a 9-point scale how much each value acts as a guiding principle in their life. Although this approach does not measure values in a ranked or hierarchical order, the summative value score provides a

representation of the importance of the value as a guiding principle in the participant's life. I adopted the structure and scoring of Schwartz's human value scale when I developed and validated the Safety Values Scale (SVS). Schwartz's scale is widely used instrument to measure individual values within and across cultures (1992). This scale was mimicked because the item structure was simple and had short verbal cues with examples to identify each value construct. This was purposefully designed to reduce the influence of cognitive complexity for each item. Furthermore, there were multiple value items clustered into overarching value themes, which provided an opportunity to promote internal consistency of the scale. For example, the value of achievement was comprised of 3 value items: (1) *Ambition* (hardworking, aspiring), (2) *Capability* (competent, effective, efficient), and (3) *Success* (achieving goals). The value scale asked participants to rate the extent to which the value item was a "guiding principle" in the participant's life. The 9-point scale ranged from 1 "*Opposed to my values*" to 9 "*Of Supreme Importance to my values.*" Other anchors included 2 "*Not Important to my values*" and 4 "*Important to my values.*"

**Item Selection.** Nine subject matter experts (SME) enrolled in an Industrial/Organizational Psychology graduate program from a medium-sized Canadian university helped to sort, develop, and rate items for the Safety Values Scale. SMEs have training in advanced scale assessment and psychometrics, personnel and selection, organizational psychology, and occupational health and safety psychology.

The SMEs were asked to sort a list of value items (safety and non-safety related values) into their appropriate domain constructs and indicate their agreement (5-point

scale) as to whether the value represents the domain of safety. Items with greater than 80% sort accuracy (i.e., sorted into appropriate construct of safety) or a mean agreement score above four were retained in the item pool.

## Results

Based on the results from the SMEs, six out of the seven items were retained. The item Risky (taking chances that lead to excitement or reward) did not meet the criteria of inclusion. This item was categorized correctly by only 10% of the SMEs and had a mean score of 2.67 in its relatedness to the safety value construct (see Table 1 for the means of safety value relatedness). This item was categorized into the value theme Stimulation (excitement, novelty, and challenge in life) by 90% of the SMEs; therefore, it was not included in the pool of safety value items. The values that were accurately sorted and rated include: (1) Security (being free from danger or harm), (2) Cautious (taking care to avoid risk or danger), (3) Vigilant (being aware of problems or signs of danger), (4) Protective (preventing others from being harmed or injured), (5) Informative (communicating safety concerns to others), and (6) Compliant (following rules and procedures).

The six safety value items were embedded amongst 12 other values items that represented achievement, stimulation, benevolence, and conformity in an effort to reduce the transparency of the scale's intent.

## Study 2: General Population Sample

The goal of this study was to select items that promote parsimony and adequately represent the safety value construct. A sample of employed North Americans from a cross-section of industries completed the scale to assess the internal consistency, factor structure, and scale validity.

## Method

### Scale Alignment

**Participants.** There were 201 employed participants who fully completed the 45-minute survey. To control for potential speeded and inattentive responding, participants who completed the survey in less than half of the overall average completion time were removed from the analysis. There were 19 participants who were removed from the total sample ($N$ = 201) based on the aforementioned criteria ($N$ =182).

The sample consisted of 182 employed (54% full-time) adults ($M_{age}$= 26.6 $SD$= 9.27) from across North America (79% USA, 19% Canadian). The majority of the sample was female (59%) and Caucasian (83%). Regarding education, 32% held a high school degree, 51% held a university degree or diploma, and 13% held a Master's degree or higher. The participants were employed in a wide range of industries, spanning from food services to engineering and healthcare to petrochemical refining. Participants' positions within these industries ranged from attorney to cashier and senior data analyst to lifeguard (see Table 2 for demographics).

**Design.** Participants were recruited to complete a 45-minute survey through an online research forum on the Reddit website. Reddit is an online public forum that allows members to post and share current events, interesting videos, and academic studies. The users' posts are sorted and organized into "subreddits." One subreddit of particular interest to researchers is called "SampleSize," which consists of 14,875 followers (as of October 31st, 2014) willing to complete academic studies. The study was posted in May 2014, and the study was active for three weeks. Participants were entered into a draw to win $500 in cash prizes, and they received a personalized assessment of their personality in compensation for their time.

**Measures.** Participants were asked to complete the SVS along with several self-report safety scales and a personality inventory. In addition to the SVS, the scales below were included in the survey (see appendix for item wording).

**Safety Motivation Questionnaire (Neal & Griffin, 2006; Neal, Griffin, & Hart, 2000).** Participants rated their safety climate ($\alpha$ = .88), safety motivation ($\alpha$ = .73), safety knowledge ($\alpha$ = .59), safety compliance ($\alpha$ = .83), and safety participation ($\alpha$ = .82) on a 5-point scale. Each scale consisted of 3 items. Safety climate captures the perceptions of a manager's focus on safety, safety compliance reflects an employee's willingness to follow rules and procedures, safety participation captures the participant's engagement to safety programs within the organization, safety motivation captures an employee's motivation and commitment to safety, and safety knowledge refers to the employee's individual knowledge of how to work safely within the work environment (see appendix for items).

**Employee Attitudes to Safety Scale (Cox & Cox, 1991).** In order to test the construct validity of the SVS scale, three factors (10-items) relating to personal attitudes towards safety were included from the Employee Attitudes to Safety scale. This scale had a test-retest reliability of ($r$ = .63) and a low internal consistency ($\alpha = .55$). Sample items included "Safety works until we are busy," "Accidents only happen to other people," and "Safety equipment should always be worn." The items may not fully capture an individual's attitudes and could be measuring other constructs like their perception of safety climate and work environment. However, this is one of the only self-proclaimed safety attitudes scales I could locate after an extensive literature search that is not industry specific (e.g., Safety Attitude Questionnaire; Sexton et al., 2006), and therefore, will be used as a proxy to values in order to evaluate the construct validity of the safety values scale.

**Self-Reported Safety Injury Experience Questionnaire (Barling, Loughlin & Kelloway, 2002)**. Using an adapted version of Barling, Loughlin, and Kelloway's measure of self-reported safety events and injuries (2002), I captured the participants' workplace industry, perception of hazards and dangers in the workplace, self-reported injuries, and safety related events. Within the questionnaire, there are two different self-report sections: (1) one section that measured the absolute frequency of injuries (e.g., "*How many times have you been involved in an incident that resulted in a minor injury in the last six months?*") and (2) another section that measured the general frequency of common injuries and safety events (measured on a 5-point Likert-style scale from "Never" to "Quite Often"). The different measurement sections will be reported distinctly

as self-report frequencies (for the absolute frequencies) and general injury and safety events (for the likert-style reporting.).

**Home Safety Behaviour Scale (Scott & Fleming, 2014)**. This seven-item scale was developed to assess individual tendencies (5-point scale: "Never" to "Very Often") to behave in a safe manner outside of the workplace. For example, participants were asked how often they "wear protective equipment (e.g., proper shoes, ear-plugs, safety glasses) when using powered gardening tools (e.g., lawn mowers)" or how often they "point out potential hazards to family and friends." The internal consistency was adequate ($\alpha$ = .73).

**International Personality Item Pool (IPIP; Goldberg et al, 2006).** The NEO – Personality Inventory factor and facets items were accessed through the IPIP. The IPIP scales are in the public domain and can be accessed for commercial or research purposes. The corrected correlation coefficients between the Big-Five Factors of the IPIP NEO-PI-R and the Original NEO-PI-R range from ($\rho$ = .88 to .92; see appendix for correlation matrix and reliabilities). There were 300 personality items included (all factors and all facets) with factor reliability ranging from ($\alpha$ = .91 - .94). Since the factors and facets of both tests are highly correlated, are equally reliable, and the items read almost identically, the IPIP NEO-PI-R was used instead of the original NEO-PI-R.

**Demographics.** These items captured basic demographic characteristics (e.g., age, gender, ethnicity, education, student status, and hours worked per week).

## Results

### Scale Alignment: Psychometric Properties – General Population Sample

The psychometric properties of the SVS were assessed, through internal consistency, item-total correlations, and factor structure (Exploratory Factor Analysis) of the items. The construct and criterion validity was also examined through Pearson product-moment correlations and multiple regression analysis with other validated safety measures. The results guided the decisions on identifying the best performing items in the context of reliability, factor structure, and domain content representation.

Internal consistency for the SVS was acceptable ($\alpha$ = .77) with inter-item correlations ranging from $r$ = .20 to .60 (Kline, 2005). Although there was no intention of creating subscales within the SVS, the three items that generally represent concern for personal safety (i.e., Security, Cautious and Compliant) correlated with one another ($r$ = .42 - .60). The three items that generally represent concern for the safety of others also correlated the strongest together (i.e., Vigilant, Protective and Informative, $r$ = .51). Further investigation of the factor structure was conducted using an exploratory factor analysis. The item to total correlations ranged from $r$ = .45 (Compliance) to $r$ = .58 (Cautious). See Table 3 for inter-item correlations and item to total correlations of the SVS.

**Exploratory Factor Analysis: Factor Structure**

Exploratory Factor Analysis (EFA) was used to evaluate the factor structure of the SVS scale. Although solutions derived from an EFA have been shown not differ greatly from Principal Component Analysis (PCA) techniques with larger sample sizes and communalities greater than .40 (Field, 2009; Guadagnoli & Velicer, 1988), an EFA was selected over the PCA because it is ideal for initial exploration of data and it supports

generalization beyond the sample to the population of interest (Field, 2009). The Kaiser criterion (Eigenvalue greater than one) and examination of the scree plot were used to determine the number of factors to extract from the solution. After running the initial EFA solution, there was only one factor with an Eigenvalues greater than one. Further, when examining the scree plot, the first factor was well above the point of linearity. Factor 1 accounted for 58% of the total item variance (Eigenvalue = 3.50). Factor loadings were strong and ranged from .63 to .77. The next sequential factor accounted for only .6 Eigenvalues and was below the Kaiser criterion. These findings provide initial support for a one-factor solution of the SVS scale.

**Construct and Criterion Validity**

Pearson's product-moment correlations were used to assess the relationship between the SVS and several other safety related scales (see Table 5 for correlation matrix). The SVS is significantly correlated with Neal and Griffin's Safety Compliance ($r$ = .24, $p$ < .001) Participation ($r$ = .31, $p$ < .001), Motivation ($r$ = .36, $p$ < .001), and Knowledge ($r$ = .18, $p$ = .01) scales. Additionally, the SVS is significantly related to Cox and Cox's Safety Attitude (1991) Individual Responsibility($r$ = .30, $p$ < .001) and Personal Skepticism ($r$ = -.15, $p$ = .04) attitudes. The SVS did not significantly correlate with the Personal Immunity attitude ($r$ = .08, $p$ = .29) or with Neal and Griffin's Safety Climate scale ($r$ = .11, $p$ = .15). Finally, the SVS showed a significant positive relationship to household safety behaviours as measured by Scott and Fleming's (2014) Home Safety Behaviour scale ($r$ = .29, $p$ < .001).

Household safety was analyzed as a safety criterion for the Reddit sample because the context and similarity of safety related behaviours at home is less differential than the wide variety of industry safety context. A hierarchical multiple regression was conducted to further assess the relationship between the SVS and Home Safety Behaviour scale. Although the demographic covariates are not significantly related to the criterion, by controlling for their presence in the regression, I took a more conservative approach to the analysis and reduced potential bias (even if it is non-significant). When controlling for the demographic covariates of age, gender, country, ethnicity, education, and student status in step 1, $R^2 = .05$, $F(6, 131) = 1.25$, $p = .29$, the SVS scale accounted for a significant amount of incremental variance $\Delta R^2 = .06$, in home safety behaviour, $R^2 = .11$, $F(1, 130) = 8.28$, $p = .005$. $\beta = .25$, $t(130) = 2.89$, $p = .005$, $S_{ri}^2 = .06$. Additionally, when the Big-Five personality traits were entered into the model, $R^2 = .12$, $F(5, 175) = 4.75$, $p < .001$, the Safety Values Scale displayed significant incremental prediction $\Delta R^2 = .04$ in household safety behaviour, $R^2 = .16$, $F(1, 174) = 4.75$, $p = .006$, $\beta = .21$, $t(174) = 2.78$, $p = .006$, $S_{ri}^2 = .04$.

Furthermore, when examining the relationship between the SVS and Neal and Griffin's safety performance scales, the SVS in the context of across a wide scope of jobs provided significant incremental validity above personality and safety climate for Safety Participation ($\Delta R^2 = .07$), $R^2 = .28$, $F(1, 127) = 12.83$, $p < .001$ , $\beta = .30$, $t(127) = 3.58$, $p < .001$, $S_{ri}^2 = .07$, and Safety Motivation, ($\Delta R^2 = .08$), $R^2 = .33$, $F(1, 127) = 15.10$, $p < .001$ , $\beta = .31$, $t(127) = 3.89$, $p < .001$, $S_{ri}^2 = .08$. The SVS did not show incremental validity over Safety Knowledge or Safety Compliance in the general population sample.

## Study 3: Transportation Sample

### Method

To further validate the SVS scale and to confirm the factor structure, an additional sample of employees was recruited from a large international transportation organization. Organizational safety performance indicators and objective organizational data served as an additional source of data (not self-reported) and reduced the impact of common method variance.

### Scale Evaluation

An additional sample was acquired to further assess the psychometric properties and validity of the SVS. Objective organizational data served as an additional source of data (not self-reported) and reduced the impact of common method variance. A confirmatory factor analysis (CFA) was conducted along with a concurrent validation of the SVS with current employee organizational data. Hierarchical multiple regression analysis was utilized to evaluate the criterion related validity of the scale.

**Participants.** The sample consisted of 419 employees from an international transportation company based in Canada (80%) and the USA (20%). Again, to control for potential speeded and inattentive responding, participants who completed the survey in less than half of the overall average completion time were removed from the analysis. There were nine participants who were removed from the total sample ($N$ = 419) based on the aforementioned criteria ($N$ = 410). The 410 employees ($M_{age}$= 36.4 $SD$= 9.83) were mostly male (97%), Caucasian (83%), and educated (50% held a high school diploma and 43% held a university certificate or degree.) Ninety-nine percent of the

employees ($N$ = 410) identified that they worked full-time hours ($M_{hours/week}$ = 49.6, $SD$ = 11.6). Regarding service time at the organizations, engineers ($M_{service}$= 10.32 $SD$= 8.85) and conductors ($M_{service}$= 7.07 $SD$= 10.30) had been working at the transportation company longer than conductor trainees ($M_{service}$= .24 $SD$= .20). Based on an a priori power analysis, approximately 335 participants are required to find a small effect ($f^2$ = .05) 80% of the time ($1 - \beta = .80$) using a multiple regression analysis with (at most) 10 predictors. My sample of 410 transportation company employees was above the power requirements to detect a small effect 80% of the time.

**Design.** The transportation employees were recruited through an email invitation sent to their organizational email address. The email was sent to 4,400 employees in July 2014, and the study was active for two weeks. Participants were entered into a draw to win $500 in cash prizes, and they received a personalized assessment of their personality in return for their time. The participants from the international transportation organization were asked to complete the SVS scale, shortened IPIP-NEO Personality Inventory (10-items per factor), and other safety related scales. At the end of the survey, participants were presented an opportunity to consent to matching their responses to past safety, injury, and accident data from the preexisting organizational database. If the participant consented, they were prompted to input their employee identification (ID) number, which helped facilitate the matching process. Participants were reminded that the data would remain confidential, only Saint Mary's Researchers would have access to this data, and individual responses would never be shared with the transportation company. Additionally, the employee ID numbers were stripped from the data after matching the

files, which eliminated any way of tracing their responses to an employee ID in analysis and reporting.

A concurrent validation of the SVS with organizational data and supervisor ratings of safety performance provides further testing of validity. Hierarchical multiple regression analysis and Poisson distribution regression analysis was utilized to evaluate the criterion and construct related validity of the scale.

**Measures.** Similar to the general population sample, participants were asked to complete the SVS ($\alpha$ = .85), Neal and Griffin's Safety Motivation Scale ($\alpha$ = .79), Safety Knowledge ($\alpha$ = .66), Safety Compliance ($\alpha$ = .77), Safety Participation ($\alpha$ = .77), and Safety Climate scale ($\alpha$ = .95). Additionally, the Home Safety Behaviour Scale ($\alpha$ = .79), Self-Reported Safety Injury Experience Questionnaire (Barling, Loughlin & Kelloway, 2002), and demographic questions were included in the survey. A shortened version of the International Personality Item Pool (IPIP; Goldberg et al, 2006) was included to capture the participant's Big-Five personality traits (10-items per Big-Five factor). Internal consistency for the personality factors ranged from ($\alpha$ = .78 to .85).

Additional criterion measures from an internal database of safety and performance indicators were made available for the international transportation organization sample. The indicators included frequency of injuries, accidents, and discipline. Due to the potentially biasing nature of temporal data with cross sectional research, a cutoff of injuries, accidents, and discipline data was restricted to include violations 1-year after the employees' service date. Injuries are captured when an employee files an injury report and accidents are captured when an employee or supervisor completes an accident

investigation report. Injuries capture personal harm, whereas accidents involve material and equipment damage. The two events are not mutually exclusive because there can be an accident with or without personal injury. Similarly, an injury can be experienced without an accident. Discipline events are captured by supervisor reports within a structured demerit system. If a supervisor identifies improper conduct, a rule violation, or unsafe behaviour, the supervisor is responsible for recording the event into the discipline database and allotting the appropriate amount of demerits. For this study, I examined the frequency of recorded rule violations, improper conduct, or unsafe behaviours instead of the demerits associated with the violations.

One limitation of the transportation database is that its utility depends on the number of participants who provide their ID numbers. In total, 155 out of the 410 were matched to their ID number in the transportation database.

## Results

### Confirmatory Factor Analysis: Transportation Sample

To further confirm the factor structure of the SVS, a competing models confirmatory factor analysis was conducted using M-plus 7.1 software. Three models were tested: (1) a one-factor model (all items loading on the latent variable of safety values), (2) an orthogonal two-factor model (safety values items divided into two latent factors of safety for self and safety for others) and (3) an oblique two-factor model (see figure 1). I used several fit indices to assess the quality of fit for the competing models: a chi-square analysis, Comparative Fit Index (CFI), Root Mean Square error (RMSEA), and Standardized Root Mean Squared Residual (SRMR). Hu and Bentler (1999)

recommend that CFI values should be greater than .95, indicating good fit to the data. RMSEA should be near .06, reflecting a close fit, and SRMR values should be close to .08. Acceptable indices on all of the following indicate a good-fit of the data.

The orthogonal two-factor model did not indicate a strong fit to the data, $\chi 2(9, N = 410) = 336.39$, $p < .001$, CFI = .64, RMSEA = .30 (90% CI = .27, .33), SRMR = .29; however, the one-factor model, $\chi 2$ (9, $N$ = 410) = 20.88, p = .01, CFI = .99, RMSEA = .06 (90% CI = .025, .089), SRMR = .02 and the two-factor oblique model, $\chi 2$ (8, $N$ = 410) = 19.50, p = .01, CFI = .99, RMSEA = .06 (90% CI = .026, .093), SRMR = .06, displayed a significantly better fit (see Table 6 for fit indices). A chi-square difference test for nested models indicated a significant model fit improvement for the two-factor oblique $\chi 2(1, N = 410) = 316.89$, $p < .001$ and one-factor models $\chi 2(1, N = 410) = 315.51$, $p < .001$, over the two-factor orthogonal model. However, the two-factor oblique model did not significantly differ from the one-factor model $\chi 2(1, N = 410) = 1.38$, $p > .05$. The fit indices were similar between the two models, yet the one-factor model provided the more parsimonious solution. Therefore, all of the fit indices for the one-factor model indicate good fit (Hu & Bentler, 1999).

**Multiple Regression Analysis: Transportation Sample**

A Pearson's product-moment correlation analysis was conducted to examine the bivariate correlation coefficients of the SVS and all other predictors and criterion (see Table 7 for correlation matrix). Evaluation of assumptions were assessed, and there were no significant concerns of univariate or multivariate outliers, linearity, normality, or homoscedasticity. Upon close inspection of the analysis, there was the potential for the

presence of a suppressor variable amongst the regression coefficients. Suppression occurs when an effect of a variable on a dependent variable (DV) is increased in the presence of another independent variable (IV) (Tabachnick & Fidell, 2013).

One indication of suppression is the reversed direction of the Neuroticism variable (from the bivariate correlation between neuroticism and safety criterion), which is also known as net suppression (Tabachnick & Fidell, 2013). The suppressor variable enhances the effects of other variables in a set of IVs; however, the variables that the suppressor variable has influenced is often difficult to determine. Certainly, Neuroticism is being influenced by the suppressor variable (opposite signs); however, the other personality variables or safety values do not seem to be influenced (based on strength and direction of the bivariate correlations). Interpretation of Neuroticism should be suspended when in a regression equation with the other personality variables. The moderate negative correlation found between Neuroticism and the other Big-Five personality traits ($r$ = -.45 - -.56) is likely leading to the net suppression of the Neuroticism variable. There is no indication to believe the suppressor situation is influencing the other variables in the regression equation.

Hierarchical multiple regression analysis was conducted to assess the incremental validity of the SVS over personality and safety climate in predicting a number of safety criterion variables. For predictor variables that were frequency based (count of injuries, count of accidents), a Poisson multiple regression analysis was utilized to assess the positively skewed frequency distributions with low mean scores (Coxe, West, & Aiken,

2009**)**. The follow section is divided by safety related criterion (See Tables 8, 9, and 10 for hierarchical regression results).

**Safety Motivation**. When controlling for demographic characteristics in step 1 (non-significant) and the Big-Five personality traits in step 2, $R^2$ = .24, $F$(9, 385) = 13.50, $p$ < .001, the SVS scale accounted for a significant amount of incremental variance $\Delta R^2$ = .06 in safety motivation scores, $R^2$ = .30, $F$(1, 384) = 32.67, $p$ < .001, $\beta$ = .27, $t$(384) = 5.72, $p$ < .001, $S_{ri}^2$ = .06. All personality predictors were significant, Agreeableness, $\beta$ = .26, $t$(385) = 4.87, $p$ < .001, $S_{ri}^2$ = .05, Conscientiousness, $\beta$ = .28, $t$(385) = 4.84, $p$ < .001, $S_{ri}^2$ = .05, Extroversion, $\beta$ = .16, $t$(385) = 2.81, $p$ = .01, $S_{ri}^2$ = .02, Neuroticism, $\beta$ = .16, $t$(385) = 2.63, $p$ = .01, $S_{ri}^2$ = .01, and Openness $\beta$ = .13, $t$(385) = 2.78, $p$ = .01, $S_{ri}^2$ =.02, the SVS accounted for 6% of variance in safety motivation, which was the largest amount of variance accounted for out of all the individual predictors. In a separate hierarchical regression analysis, when controlling for demographic characteristics (step 1) and personality traits (step 2), safety climate (step 3) was a significant predictor of safety motivation, $\Delta R^2$ = .01, $R^2$ = .25, $F$(1, 384) = 5.97, $p$ < .001, $\beta$ = .12, $t$(384) = 2.44, $p$ = .02, $S_{ri}^2$ = .01. In addition, safety values (step 4) accounted for a significant amount of incremental variance over safety climate, $\Delta R^2$ = .05, $R^2$ = .30, $F$(1, 383) = 29.01, $p$ < .001, $\beta$ = .26, $t$(383) = 5.39, $p$ < .001, $S_{ri}^2$ = .05.

**Safety Knowledge**. When controlling for demographic characteristics in step 1 (non-significant) and the Big-Five personality traits in step 2, $R^2$ = .26, $F$(9, 385) = 15.15, $p$ < .001, the SVS scale accounted for a significant amount of incremental variance $\Delta R^2$ = .02 in safety knowledge scores, $R^2$ = .28, $F$(1, 384) = 8.51, $p$ < .001, $\beta$ = .14, $t$(384) =

2.92, $p = .004$, $S_{ri}^2 = .02$. Agreeableness, $\beta = .23$, $t(385) = 4.44$, $p < .001$, $S_{ri}^2 = .04$, Conscientiousness, $\beta = .30$, $t(385) = 5.29$, $p < .001$, $S_{ri}^2 = .05$, Extroversion, $\beta = .20$, $t(385) = 3.68$, $p = .001$, $S_{ri}^2 = .03$, and Neuroticism, $\beta = .11$, $t(385) = 2.10$, $p = .04$, $S_{ri}^2 = .01$, were significant personality predictors. The SVS accounted for 2% of unique variance in safety knowledge. In a separate hierarchical regression analysis, when controlling for demographic characteristics and personality traits, safety climate was a significant predictor of safety knowledge, $\Delta R^2 = .02$, $R^2 = .28$, $F(1, 384) = 7.73$, $p < .01$, $\beta = .13$, $t(384) = 2.78$, $p < .001$, $S_{ri}^2 = .01$; however, safety values accounted for a significant amount of incremental variance over safety climate, $\Delta R^2 = .01$, $R^2 = .29$, $F(1, 383) = 6.30$, $p < .01$, $\beta = .12$, $t(383) = 2.51$, $p < .001$, $S_{ri}^2 = .01$.

**Safety Compliance**. When controlling for demographic characteristics in step 1 (non-significant) and the Big-Five personality traits in step 2, $R^2 = .31$, $F(9, 385) = 18.90$, $p < .001$, the SVS scale accounted for a significant amount of incremental variance $\Delta R^2 = .05$ in safety compliance scores, $R^2 = .35$, $F(1, 384) = 28.03$, $p < .001$, $\beta = .24$, $t(384) = 5.29$, $p < .001$, $S_{ri}^2 = .05$. All personality predictors except Openness were significant, Agreeableness, $\beta = .33$, $t(385) = 6.62$, $p < .001$, $S_{ri}^2 = .08$, Conscientiousness, $\beta = .31$, $t(385) = 5.63$, $p < .001$, $S_{ri}^2 = .06$ , Extroversion, $\beta = .20$, $t(385) = 3.70$, $p < .001$, $S_{ri}^2 = .02$, and Neuroticism, $\beta = .18$, $t(385) = 3.13$, $p = .005$, $S_{ri}^2 = .02$. The SVS accounted for 5% of unique variance in safety compliance. In a separate hierarchical regression analysis, when controlling for demographic characteristics and personality traits, safety climate was a significant predictor of safety compliance, $\Delta R^2 = .03$, $R^2 = .34$, $F(1, 384) = 18.13$, $p < .001$, $\beta = .20$, $t(384) = 4.26$, $p < .001$, $S_{ri}^2 = .03$; however, safety values

accounted for a significant amount of incremental variance over safety climate, $\Delta R^2$ = .04, $R^2$ = .37, $F(1, 383) = 22.30$, $p < .001$, $\beta = .22$, $t(383) = 4.72$, $p < .001$, $S_{ri}^2 = .04$.

**Safety Participation**. When controlling for demographic characteristics in step 1 (non-significant) and the Big-Five personality traits in step 2, $R^2 = .23$, $F(9, 385) = 12.47$, $p < .001$, the SVS scale accounted for a significant amount of incremental variance $\Delta R^2$ = .06 in safety participation scores, $R^2 = .29$, $F(1, 384) = 31.91$, $p < .001$, $\beta = .27$, $t(384)$ = 5.65, $p < .001$, $S_{ri}^2 = .06$. All personality predictors except Openness were significant, Agreeableness, $\beta = .26$, $t(385) = 4.86$, $p < .001$, $S_{ri}^2 = .05$, Conscientiousness, $\beta = .28$, $t(385) = 4.78$, $p < .001$, $S_{ri}^2 = .05$ , Extroversion, $\beta = .19$, $t(385) = 3.40$, $p = .001$, $S_{ri}^2$ = .02, and Neuroticism, $\beta = .16$, $t(385) = 2.56$, $p = .011$, $S_{ri}^2 = .01$. The SVS accounted for 6% of unique variance in safety participation, which was the largest amount of variance accounted for out of all the individual predictors. In a separate hierarchical regression analysis, when controlling for demographic characteristics and personality traits, safety climate was a significant predictor of safety participation, $\Delta R^2 = .07$, $R^2 = .29$, $F(1, 384)$ = 36.92, $p < .001$, $\beta = .29$, $t(384) = 6.08$, $p < .001$, $S_{ri}^2 = .07$; however, safety values accounted for a significant amount of incremental variance over safety climate, $\Delta R^2$ = .04, $R^2 = .34$, $F(1, 383) = 23.93$, $p < .001$, $\beta = .23$, $t(383) = 4.89$, $p < .001$, $S_{ri}^2 = .04$.

**Home Safety Behaviours**. When controlling for demographic characteristics in step 1 (non-significant) and the Big-Five personality traits in step 2, $R^2 = .12$, $F(9, 381)$ = 5.75, $p < .001$, the SVS scale accounted for a significant amount of incremental variance $\Delta R^2 = .03$ in household safety scores, $R^2 = .15$, $F(1, 380) = 11.77$, $p = .001$, $\beta = .18$, $t(380) = 3.43$, $p = .001$, $S_{ri}^2 = .03$. All personality predictors except for Extroversion and

Openness were significant predictors, Agreeableness, $\beta = .16$, $t(381) = 2.71$, $p = .007$, $S_{ri}^2 = .02$, Conscientiousness, $\beta = .21$, $t(381) = 3.38$, $p = .001$, $S_{ri}^2 = .03$ , and Neuroticism, $\beta = .15$, $t(381) = 2.34$, $p = .02$, $S_{ri}^2 = .01$. The SVS accounted for 3% of unique variance in home safety behaviour, which was one of the largest amount of variance accounted for out of all the individual predictors. In a separate hierarchical regression analysis, when controlling for demographic characteristics and personality traits, safety climate was a significant but minor predictor of home safety behaviours, $\Delta R^2 = .01$, $R^2 = .13$, $F(1, 379) = 4.77$, $p = .03$, $\beta = .12$, $t(379) = 2.18$, $p < .001$, $S_{ri}^2 = .01$; however, safety values accounted for a significant amount of incremental variance over safety climate, $\Delta R^2 = .02$, $R^2 = .15$, $F(1, 378) = 9.24$, $p = .003$, $\beta = .23$, $t(378) = 3.03$, $p < .001$, $S_{ri}^2 = .02$.

**General Injuries**. This set of questions from the Self-Reported Safety Injury Experience Questionnaire captured an employee's injury frequency for a number of common workplace injuries (strains or sprains, burns, fractures, blisters, etc.). When controlling for demographic characteristics in step 1 and the Big-Five personality traits in step 2, $R^2 = .09$, $F(9, 383) = 3.94$, $p < .001$, the SVS scale did not account for a significant amount of incremental variance $\Delta R^2 = .01$ in general injuries, $R^2 = .09$, $F(1, 382) = 2.00$, $p = .16$. Agreeableness was the only significant personality predictor, $\beta = -.20$, $t(381) = 3.45$, $p = .001$, $S_{ri}^2 = .03$. In a separate hierarchical regression analysis, when controlling for demographic characteristics and personality traits, safety climate was not a significant predictor of general injuries $\beta = -.10$, $t(380) = 1.70$, $p = .09$ $S_{ri}^2 = .01$.

**General Safety Events**. The SVS did not add significant incremental validity to the self-reported frequency of general safety events (e.g., slipped on a slick surface,

received an electric shock, struck by a falling object, etc.) from the Self-Reported Safety Injury Experience Questionnaire. However, Personality accounted for a significant proportion of variance $R^2$ = .08, $F(9, 384) = 3.67$, $p < .001$. Agreeableness, $\beta$ = -.12, $t(383) = 2.01$, $p < .001$, $S_{ri}^2$ = .03, was the only significant personality predictor. In a separate hierarchical regression analysis, when controlling for demographic characteristics and personality traits, safety climate was a significant predictor of general safety events, $\Delta R^2$ = .02, $R^2$ = .10, $F(1, 382) = 6.87$, $p$ = .009, $\beta$ = -.141, $t(382) = 2.62$, $p <$ .001, $S_{ri}^2$ = .02.

**Self Report Frequency Data**. The following section examined the absolute frequency data collected from the Self-Reported Safety Injury Experience Questionnaire (Barling, Loughlin & Kelloway, 2002). Safety frequency data of minor and major safety events occurring within the last six months was analyzed using a Poisson distribution regression analysis. Due to the positively skew and high zero frequency (criterion has a low mean) nature of injury, accidents, and discipline data, a Poisson distribution regression analysis was preferred over an ordinary least squares model (Coxe, West, & Aiken, 2009). Since Poisson distribution models do not use sum of squares (SS) measures, an $R^2$ statistic to assess overall variance accounted for by the predictors was not available. Therefore, I reported the standardized beta weights for the significant predictors (see Table 11).

For the Poisson regression model, all predictors (Big-Five personality and SVS) were entered in one step. For self-reported major injuries (includes injuries that require medical attention and/or time-off), the SVS was the only significant predictor, $\beta$ = -.64,

$t(392) = 2.25$, $p = .025$. However, the SVS did not significantly predict self-reported minor injuries (cuts or bruises that do not require medical attention) or self-report days lost due to injury.

**Transportation Company Database.** When examining the safety metrics from the transportation database via Poisson regression, the SVS was a significant predictor of injuries within the first year of employment, $\beta = -.56$, $t(151) = 2.25$, $p = .03$. Additionally, Agreeableness $\beta = -.66$, $t(151) = 3.23$, $p = .001$ and Conscientiousness $\beta = .88$, $t(151) = 4.01$, $p < .01$ were also significant predictors of injuries. In contrast, the SVS did not significantly predict accidents, or disciplinary action, from the transportation organization database.

When the Poisson regression was re-run with safety climate in the equation, the beta weights of the other variables did not shift drastically. Notably, safety climate had a significant relationship with self-report minor-injuries, $\beta = -.72$, $t(150) = 2.03$, $p = .04$, and self-report major injuries , $\beta = -.72$, $t(150) = 2.10$, $p = .04$. In the presence of safety climate, the SVS remained a significant predictor of major injuries, $\beta = -.48$, $t(392) = 2.12$, $p = .03$; however, the SVS did not remain a significant predictor of minor injuries in the presence of safety climate (see Table 12).

**Safety Climate Moderation Analysis**

To assess the interaction effects of safety climate on the relationship between individual differences and the safety criterion, a bootstrapped moderated regression analysis was conducted using SPSS Process software.

To assess if safety climate moderated the relationship of the SVS and safety criterion, a mean-centered interaction term (safety values x safety climate) was included in the regression equation for each self-report safety criterion (participation, compliance, motivation, knowledge, household behaviours, general injuries, and general safety events). Safety climate moderated the relationship between the SVS and safety knowledge, $\Delta R^2 = .01$, $F(1, 395) = 6.58$, $p = .01$(see Table 13). This suggests that when safety climate was higher, safety values had a stronger influence on safety knowledge (see figure 2). However, safety climate did not significantly moderate the relationship between safety values and participation, compliance, or motivation. The moderation relationship between safety climate and individual differences is complex; therefore, examining the relationship between the remaining personality traits may help clarify the relationship between safety climate and individual differences.

To further analyze the moderating effect of safety climate on the remaining personality factors and safety criteria (participation, compliance, motivation, knowledge, household behaviours, general injuries, and general safety events), bootstrapped moderated regressions were conducted for each of the Big-Five personality factors. Safety climate significantly moderated the relationship between agreeableness and safety motivation, $\Delta R^2 = .03$, $F(1, 395) = 13.55$, $p < .001$, safety knowledge, $\Delta R^2 = .04$, $F(1, 395) = 21.09$, $p < .001$ safety participation, $\Delta R^2 = .03$, $F(1, 395) = 14.88$, $p < .001$, general injuries, $\Delta R^2 = .02$, $F(1, 395) = 10.59$, $p < .001$ and general safety events, $\Delta R^2 = .03$, $F(1, 395) = 11.10$, $p < .001$, (see figures 3 –7). This suggests that when safety climate is higher, agreeableness will have a stronger influence on safety motivation,

knowledge, and participation, injuries and safety events. All main effects were significant ($p < .05$) (see Table 13 for all main effects and interaction effects).

Although safety climate did not consistently display a moderating effect on the remaining the personality predictors, safety climate moderated the relationship between Conscientiousness and Safety Knowledge, $\Delta R^2 = .02$, $F(1, 395) = 10.31$, $p < .001$, and Extroversion and Safety Knowledge, $\Delta R^2 = .01$, $F(1, 395) = 5.51$, $p = .02$ (see figures 7 and 8, respectively). Safety climate also moderated the relationship between Safety Motivation and Neuroticism, $\Delta R^2 = .01$, $F(1, 395) = 5.19$, $p < .02$ (see figure 10). Again, all of the moderation effects are in the direction to suggest that positive safety climate leads to stronger effects of individual differences on safety outcomes.

## Discussion

The goal was to develop and validate a safety value scale that predicts safety performance over and above personality traits and safety climate. Two conclusions can be drawn based on the results from the three studies. First, the psychometric properties of the SVS are consistently acceptable, and second, there is initial support that the SVS scale measures a unique individual difference in the presence of personality and safety climate. The majority of hypotheses were supported with the exception of a few nuances. The discussion will be divided into three parts: (1) scale development, (2) safety climate moderation, and (3) limitations and future direction.

### Scale Development

Following Hinkin's (1995) process to scale development, there was strong support for the validity of the SVS through the item generation process, the scale

alignment process (Pearson correlations, exploratory factor analysis, and confirmatory factor analysis), and the scale evaluation process (Pearson's correlations, Poisson regressions, and hierarchical multiple regression).

**Item generation**. Items were developed based on their logical, empirical, or theoretical foundation towards safety as recommended by the principles for the validation and use of personnel selection procedures (SIOP, 2003). Several iterations of items, formats, and scales were developed before selecting the initial seven value items. The SME's accurate sorting and rating of the items into their appropriate value categories assessed the content validity of the items. SMEs were provided the opportunity to include additional safety items at the end of the exercise, but none of them exercised this option. This may suggest that the SMEs believe that the values presented captured the domain accurately, and that they could not suggest any other values in relation to Safety. The item generation approach along with the SME validation supports the content validity of the scale.

**Psychometric Properties.** In support of Hypothesis 1 (internal consistency will reach acceptable levels of .70 or greater), the SVS items performed in a psychometrically acceptable manner. The internal consistency of the scale ($\alpha$ = .77 study 2; $\alpha$ = .85 study 3) reflects the six facets of the domain of safety values. The increase in internal consistency coefficients (inter-item correlations and item-to-total) between the general population sample and the transportation sample was likely due to the increased homogeneity of responding (i.e., the standard deviations reported for each item were lower in the transportation sample than in the general population sample). The increased

*SD* in the general population sample might have been caused by the number and variety of industries and positions, some of which may have less salient safety considerations than the transportation organization. Logically, the more salient safety hazards are in one's work environment, the more likely they will influence one's values, and might indicate that high safety values could be a consideration.

Although I was unable to locate a previously developed safety value scales to directly assess the convergent validity of the scale, an individual's value towards safety can be inferred through other safety related scales. For example, an attitude is the manifestation of a value (Homer & Kahle, 1988); therefore, there should be a theoretical relationship between the two constructs. The significant positive relationship between Cox and Cox's Safety Attitude Factors of Individual Responsibility and the SVS supports a distal relationship between attitudes and values. The attitude items consist of "Safety equipment should always be worn," "Individuals should encourage colleagues to work safely," and "Individuals share responsibility for safety," which have a value counterpart of Compliant (following rules and procedures), Informative (communicating safety concerns to others) and Protective (preventing others from being harmed or injured), respectively.

Furthermore, the magnitude of the positive relationship between the SVS and other safety scales varied depending on whether the scale measures behaviours or attitudes. Thus, the more distal the relationship from the value, the weaker the correlational relationship should be. For example, Neal and Griffin's Safety Motivation scale, which is a compilation of attitude statements like, "I feel that it is important to

maintain safety at all times" and "I believe it is important to reduce risk…" correlated higher with the value statements of the SVS than the Neal and Griffin's Safety Compliance scale that measures behavioural tendencies such as, "I use all the necessary safety equipment…" Additionally, the non-significant relationship between SVS the demographic control characteristics supports the discriminant validity of the SVS.

In support of Hypothesis 2, (the SVS would have a unidimensional factor structure) a single-factor structure was supported through both the EFA and CFA analysis with acceptable factor loadings and fit indices that support good fit for the single-factor model. Although a two-factor oblique solution had similar fit indices as the one-factor solution, following Occam's razor, the solution that is the most parsimonious was selected.

**Scale Evaluation.** Hypothesis 3 (the SVS would display incremental validity over personality and safety climate on safety performance metrics) was generally supported across all criterion variables. The SVS accounted for significant incremental variance over and above the Big-Five personality traits in all of Neal and Griffin's Safety performance metrics and household safety behaviour. Additionally, the SVS was a significant predictor of self-reported major accidents within the last six months and transportation injuries occurring within the first year of employment. This evidence is promising for the development of the SVS, as it suggests that safety values are a unique individual difference over and above the best individual difference predictors of safety performance. Furthermore, when safety climate (i.e., perceptions of management's commitment to safety) is entered into a step ahead of the SVS, the SVS continues to

account for significant incremental validity in safety performance indicators. This further supports that safety values are unique from personality and safety climate.

Although the SVS did not predict above personality in general safety events, general injuries, self-reported minor injuries, and the transportation data of first year of employment, objective accidents or disciplinary actions and other individual differences (except Agreeableness) were not able to significantly predict these differences either. Further, the expectation that safety values would consistently predict a direct effect of accidents and injuries is slightly unrealistic, given the Neal and Griffin's (2004) model of safety behaviour places four mediators between individual personality characteristics and accident and injury outcomes. Future research could examine the hypothesized relationships defined by Neal and Griffin using path analysis techniques. This type of analysis would provide contextual support for the relationships of the variables and the hypothesized model. This study provided support for the relationship between safety values and the more proximal criterions, such as safety motivation, safety knowledge, and safety performance (compliance and participation).

The significant relationships between the SVS and injuries in the first year of the job (transportation database) and the self-report major injuries, together, support that common method variance may not be a concern with the study. Injuries captured by the transportation's database are more likely to be considered major injuries. Given the distinctive reporting methods, the similar significant negative relationship for the transportation database ($r$ = -.52) and the self-report method ($r$ = -.48) for major injuries are similar. Had common method variance been an influential bias, the relationship

between the SVS and the two criterions would likely be more dissimilar. While the transportation database was a useful secondary source, it would have been preferred to link more than 155 employees to their database results. Additional employee links would have provided additional power to reliably detect an effect in the analysis that relies on low probability occurrences (accidents and injuries).

Moreover, although accident and injury data are often considered an objective secondary source, this database is dependent on individuals reporting into the system. This reflects concerns with accuracy and underreporting of injury and accident data (Olsen, 2013; Kelloway et al., 2006), which will often attenuate the predictor-criterion relationship. Additionally, the injury and accident outcome data were collected prior to the safety value data (first year of employment). One potential concern is that past accidents or injuries could have influenced ratings on the safety values scale. However, given the relative stability of values over time and situation (Jin & Rounds, 2012) the influence of accident or injury frequency is unlikely but not implausible. This influence would need to be examined further through a predictive validation study.

The matter of statistical significance versus practical significance is often considered when a sample size is relatively large. One often looks to effect sizes to further assess the impact or significance of the finding before drawing conclusions. The incremental validity ($\Delta R^2$ or squared-semi-partial correlation) of the SVS can be considered an indicator of effect size for my multiple regression analyses. With incremental validities above personality ranging from 6% for safety motivation and safety participation, 5% for safety compliance, 3% for household safety, and 2% for

safety knowledge, when not in the presence of safety climate and between 5% and 1% above safety climate, an argument can be made for the utility of safety values as a unique predictors. Considering the unique variance accounted for by personality factors range from 1% to 8% with an average of 3%, safety values are well on par with the other individual differences. Furthermore, increasing one's ability to predict safety performance, even slightly, could have a significant impact on the safety of the employee, their coworkers, and the community, especially in high hazard industries. We must ask ourselves if the cost of administering an additional scale outweighs the benefits of improving the safety of our organization and community. I would argue that adding an extra few items to a personality assessment to significantly improve safety performance for safety critical occupations is worth the cost.

**Safety Climate Moderation**

Hypothesis 4 (safety climate will moderate the effect of individual differences on safety performance) was not supported. The direction of the relationship between safety values and safety climate was opposite of what was hypothesized (i.e., higher safety climate would increase the influence of individual differences); however, it is logical to see how individual differences have a stronger relationship to safety performance in a strong safety climate. For example, when safety climate is high, an individual high in agreeableness is more likely to align with the management's emphasis on safety.

The moderation analysis examining the influence of safety climate on the relationship between the SVS and safety criterions suggested that there is no effect of moderation except for with safety knowledge. Safety climate only moderated the effect of

the SVS on safety knowledge, suggesting that when managers are perceived as caring about safety, employees with high safety values are more likely to increase their knowledge of safety processes and procedures. However, this interaction was small and accounted for 1% of the variance. In conclusion, this suggests that the SVS and its relationship to safety outcomes are not strongly influenced by safety climate within an organization. This further supports the nature of the unique individual difference being captured by the SVS. However, Agreeableness was one individual difference that was more influenced by the presence of safety climate than the others. Safety climate displayed significant moderation effects for Agreeableness on five out of the six safety performance and injury criterion variables. This suggests that in environments with strong safety climate (employee perceives that managers are concerned about safety), those high in Agreeableness will improve in safety performance and have fewer injuries and safety events. It is important to highlight the relationship between personality and safety climate because these variables are often measured and reported separately from one another in most studies. The results suggest that personality and safety climate interact together to influence an individuals' safety performance.

**Limitations and Future Directions**

The two samples used in this study were effective in providing a strong starting point for the SVS. The first sample contained a generalized cross-section of employees from many industries and positions (Reddit), and the second sample contained employees from a high-hazard industry where efficiency and safety are both priorities. Additionally, separate samples during the development and assessment process can support external

validity of the scale. Although having two samples to validate a scale is preferred, there are limitations. Both samples utilized a cross-sectional survey methodology, which introduces bias through cohort effects, recall bias, common method variance, and leads to the inability to draw causal conclusions. Common method variance can occur when the same methodology (e.g., scale type or response format) resulting in either inflation or attenuation of the observed relationships (Podsakoff, Mackenzie, & Podsakoff, 2003). One concern comes from the participant providing ratings for both the predictor and criterion variables. Although injury data is fairly objective, there is still the potential for participants to distort their responses to align with their values and attitudes, also known as the consistency motif. One method to control for common method bias is to access predictor and criterion variables from multiple sources. In study 3, I was able to access archival injury data and found a significant relationship between safety values and injuries within the first year of employment. This same relationship was seen in self-reported major injuries, which may suggest common method bias is not as much of a concern. Another approach to reducing common method bias is to create psychological separation by masking the intent of the predictor and criterion variables. The SVS items (predictors) were hidden amongst other value items that were ambiguous to the intent of safety measurement. This alleviated the saliency of the predictors' intention and could have reduced motivation to align their response on the criterion variable. However, given the nature of this kind of data, there are other considerations such as test faking or social desirable responding that may also bias the results.

Another limitation came in the form of a relatively low response rate for both of the study samples. The response rate for the general population sample was 1% via Reddit and was 9% for the transportation database via email. Not all members of the Reddit group are consistently active on the Samplesize forum, which suggests that a portion of the estimated 14,875 members may not have seen the survey link. Further, an individual does not have to be a Samplesize member to complete a survey, which makes the denominator randomly variable and somewhat illogical to report in this context.

Furthermore, the transportation sample received an email to their organizational email address. If participants do not actively use this email than they may not have seen the survey before the deadline. As with any low response rate, it is uncertain if responding is random or if it is due to some unexpected response bias. This potentially limits the ability to extrapolate to the larger population. Assessing the equality in representation between the transportation sample and population would offer insight into whether the sample represents the population. This population demographic data was not available for the transportation population or the Reddit sample. Collecting this population data when available for future research may confirm the representation of the population.

**Test Faking**

One downside of using self-report personality or value measures is that individuals, when in high stakes situations, are more likely to distort their responses in a socially desirable way, which gives them an unfair advantage when it comes to selection (Ellingson, Sacket, & Hough, 1999). Ellingson and colleagues also argue that social

desirability scales (used to identify socially desirable responding) are not effective in restoring the faked scores into valid honest scores. Elingson's study, however, was in a lab setting and asked participants to openly distort their response, which may not be generalizable to a real-world job applicant setting.

Hogan, Barrett and Hogan (2007), examined the effect of social desirability and faking on personality testing in a real world setting. A sample of 5,266 job candidates completed a personality test as part of an initial screening phase, but they were not hired for the job. Six-months later, the job candidates were asked to reapply for the position and were required to complete the personality test again. This provided the applicants with the motivation to try to 'improve' their personality scores. Hogan and colleagues (2007) reported that the majority of applicants (95%) were unable to improve their personality scores and that there was an equal likelihood of scores decreasing as well as improving from the first time to the second time. This provides support that faking on personality measures in real-world selection setting is not a significant problem. To minimize fabrication of responses, one could frame the question as "How do you believe your coworkers' perceive your behaviour?" or by indicating that the questions will be verified in the reference check process (Catano et al., 2012). For an employee at a transportation company, they may not fully trust the anonymity of the survey and may want to portray themselves in a good light in case their data is traced back to them. This may also reduce self-reporting of injuries and safety events. The Reddit sample did not have the same potential consequences of reporting, and therefore, the individuals may be less likely to respond in a socially desirable way. Some researchers suggest that treating

social desirability as a covariate is erroneous (i.e., partition out the variance associated with desirable responding) because this assumes that there is no relationship between social desirability and personality or the SVS and would spuriously attenuate any relationship between the predictor and criterion (Hough & Oswald, 2008).

**Future Directions.** One future area of research is to conduct a predictive validation study with the SVS. This method would help confirm the relationship between the SVS and the safety criterion by adding a temporal aspect to the process by following the same employees over time. Cross-sectional data often leads us to a perspective of the relationships and effects but leaves us wanting a causal understanding. Future analysis could include latent profile analysis or structural equation modeling to further examine the relationship of the safety predictors, mediators, and criterion. Additionally, further examination of the SVS scale in different safety oriented industries could assess the external validity of the SVS tool. One would expect that the relationship between safety values and safety performance should not change drastically depending on the industry, but empirical confirmation of this would be required.

Furthermore, there is a potential to use this results of this research in a selection setting. Using the SVS tool in combination with other personality trait measures that are most predictive to the organization's safety outcome of interest. Organizations must broaden their understanding of safety beyond the frequency of injuries and accidents. Organizations need to broaden their conceptual framework by encompassing compliance, participation, knowledge, and motivation towards safety of the employees working. The more employees who are high in these safety performance metrics, the safer the

organization will be. Unfortunately, many organizations and researchers draw on metrics that are easily accessible (injury, accident, and discipline data), and we allow these metrics to define what safety is. Safety is built from both ground-up and top-down processes, and by selecting safety conscious employees, the ground-up foundation of safety will be set for the top-down process to be most functional. In conclusion, this research developed and validated a safety values scale to reliably measure values towards safety. Furthermore, it provides support for the relationship of safety values with safety performance, which can be a tool used to help guide selection and training decisions in the workplace.

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Table 1
*SME Safety Value Item Selection Means*

| Items in SME Sort | *M* | *SD* |
|---|---|---|
| Vigilant (Aware of problems or signs of danger) | 4.89 | 0.33 |
| Protective (Preventing others from being harmed or injured) | 4.75 | 0.46 |
| Cautious (Care taken to avoid risk or danger) | 4.67 | 0.50 |
| Compliant (Following rules and procedures) | 4.67 | 0.50 |
| Security (Free from danger or harm) | 4.56 | 0.53 |
| Informative (Communicating safety concerns to others) | 4.00 | 1.32 |
| Obedience (dutiful, meeting obligations) | 3.44 | 0.88 |
| Risky (Taking chances that lead to excitement or reward) | 2.67 | 1.87 |
| Ambition (hardworking, aspiring) | 2.00 | 1.12 |
| Honesty (genuine, sincere) | 2.00 | 1.12 |
| An exciting life (stimulating experiences) | 1.56 | 1.01 |

*Note.* A mean score of 4.0 was used as the cutoff for relatedness. Respondents were asked to indicate how much they agreed that the value was related to safety.

Table 2
*Descriptive Statistics*

| | Reddit ($N = 182$) | | | Transportation ($N = 410$) | | |
|---|---|---|---|---|---|---|
| Descriptive Statistic | *M* | *SD* | % | *M* | *SD* | % |
| **Gender** | | | | | | |
| Male | - | - | 40.7 | - | - | 96.6 |
| Female | - | - | 57.7 | - | - | 3.4 |
| **Country** | | | | | | |
| Canada | - | - | 19.2 | - | - | 79.5 |
| United States | - | - | 78.6 | - | - | 20.2 |
| **Ethnicity** | | | | | | |
| Aboriginal | - | - | 0.0 | - | - | 1.7 |
| African-American | - | - | 1.1 | - | - | 2.7 |
| Chinese | - | - | 0.5 | - | - | 0.2 |
| Filipino | - | - | 0.5 | - | - | 0.2 |
| Latin American | - | - | 2.7 | - | - | 1.5 |
| South Asian | - | - | 0.5 | - | - | 3.7 |
| Southeast Asian | - | - | 1.6 | - | - | 1.2 |
| White (Caucasian) | - | - | 87.9 | - | - | 83.7 |
| **Education** | | | | | | |
| Less than high school | - | - | 0.5 | - | - | 1.5 |
| High school | - | - | 31.3 | - | - | 49.5 |
| University certificate | - | - | 4.4 | - | - | 13.9 |
| University degree / Diploma | - | - | 50.5 | - | - | 29.8 |
| Master's Degree | - | - | 10.4 | - | - | 1.0 |
| Doctorate Degree | - | - | 2.2 | - | - | 0.2 |
| Professional Degree | - | - | 0.5 | - | - | 3.9 |
| **Student Status** | | | | | | |
| Yes | - | - | 46.7 | - | - | 0.0 |
| No | - | - | 53.3 | - | - | 100 |
| **Employment Status** | | | | | | |
| Part-Time {hours/week i.e., 15} | - | - | 40.1 | - | - | 1.2 |
| Full-Time {hours/week i.e., 42.5} | - | - | 54.4 | - | - | 98.8 |
| Not Employed - less than 6 months | - | - | 5.5 | - | - | 0.0 |
| **Age** | 26.6 | 9.3 | - | 36.4 | 9.8 | - |
| **Hours Worked per Week** | 31.7 | 12.5 | - | 49.6 | 11.6 | - |

Note. All remaining percentage values are attributed to the "other" category.

Table 3
*SVS Item Level Correlations for Reddit and Transportation Sample*

| | Reddit (Alpha = .77) | | | | | | |
|---|---|---|---|---|---|---|---|
| | *M* (*SD*) | 1 | 2 | 3 | 4 | 5 | 6 |
| 1. Security (free from danger or harm). | 6.09 (1.9) | (0.58) | | | | | |
| 2. Cautious (care taken to avoid risk or danger). | 5.39 (1.8) | 0.60 | (0.58) | | | | |
| 3. Vigilant (aware of problems or signs of danger). | 5.98 (1.9) | 0.42 | 0.43 | (0.52) | | | |
| 4. Protective (preventing others from being harmed or injured). | 6.23 (2.1) | 0.31 | 0.27 | 0.38 | (0.51) | | |
| 5. Informative (communicating safety concerns to others). | 5.95 (2.1) | 0.28 | 0.30 | 0.41 | 0.51 | (0.49) | |
| 6. Compliant (following rules and procedures). | 4.61 (2.0) | 0.42 | 0.42 | 0.20 | 0.33 | 0.22 | (0.45) |

| Table 3 - Cont. | Transportation (Alpha = .85) | | | | | | |
|---|---|---|---|---|---|---|---|
| | *M* (*SD*) | 1 | 2 | 3 | 4 | 5 | 6 |
| 1. Security (free from danger or harm). | 7.28 (1.7) | (.58) | | | | | |
| 2. Cautious (care taken to avoid risk or danger). | 7.39 (1.7) | 0.52 | (.69) | | | | |
| 3. Vigilant (aware of problems or signs of danger). | 7.74 (1.4) | 0.44 | 0.54 | (.66) | | | |
| 4. Protective (preventing others from being harmed or injured). | 8.05 (1.3) | 0.43 | 0.48 | 0.53 | (.62) | | |
| 5. Informative (communicating safety concerns to others). | 7.60 (1.5) | 0.47 | 0.53 | 0.57 | 0.56 | (.70) | |
| 6. Compliant (following rules and procedures). | 7.42 (1.6) | 0.40 | 0.56 | 0.48 | 0.44 | 0.54 | (.62) |

*Note.* All correlations are significant ($p < .01$). Inter-item correlations and item-to-total (correlations) on the diagonal.

Table 4
*SVS Exploratory Factor Analysis*

| | One-Factor |
|---|---|
| Value Items | Safety |
| -Security (free from danger or harm). | **0.63** |
| -Cautious (care taken to avoid risk or danger). | **0.74** |
| -Vigilant (aware of problems or signs of danger). | **0.73** |
| -Protective (preventing others from being harmed or injured). | **0.69** |
| -Informative (communicating safety concerns to others). | **0.77** |
| -Compliant (following rules and procedures). | **0.69** |

*Notes.* Eigenvalue for One-Factor solution is 3.50 accounting for 58.4% of the variance.

Table 5
*Reddit Scale Correlations and Reliabilities*

| | Reddit Sample Scales | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Safety Value Scale (SVS) | 34.1813 | 8.10 | (0.77) | | | | | | | | |
| 2 | Age (years) | 26.56 | 9.27 | 0.08 | (-) | | | | | | | |
| 3 | Gender | - | - | 0.10 | -0.10 | (-) | | | | | | |
| 4 | Student Status | - | - | -0.08 | .45b | -0.07 | (-) | | | | | |
| 5 | Employment | - | - | 0.06 | .26b | -0.12 | .315b | (-) | | | | |
| 6 | Cox & Cox Safety Attitude Personal Scepticism | 2.58 | 0.60 | -.15a | -0.13 | -0.14 | -0.05 | -0.07 | (.57) | | | |
| 7 | Cox & Cox Safety Attitude Individual Responsibility | 4.04 | 0.53 | .30b | 0.01 | 0.12 | 0.09 | 0.08 | -.38b | (.55) | | |
| 8 | Cox & Cox Safety Attitude Personal Immunity | 2.13 | 0.67 | 0.08 | 0.04 | -0.08 | -0.01 | 0.08 | 0.01 | 0.05 | (-) | |
| 9 | Neal & Griffin Safety Climate | 3.58 | 0.95 | 0.11 | -0.08 | 0.12 | -0.05 | 0.14 | -0.13 | .29b | .179a | (.88) |
| 10 | Neal & Griffin Safety Compliance | 3.85 | 0.69 | .24b | -0.11 | 0.14 | -0.04 | 0.03 | -.44b | .54b | 0.07 | .23b |
| 11 | Neal & Griffin Safety Participation | 3.21 | 0.86 | .31b | 0.01 | .179a | 0.04 | -0.01 | -.29b | .53b | .15a | .20b |
| 12 | Neal & Griffin Safety Motivation | 4.09 | 0.58 | .36b | 0.02 | 0.13 | -0.04 | -0.05 | -.45b | .71b | 0.10 | .22b |
| 13 | Neal & Griffin Safety Knowledge | 4.05 | 0.52 | .18a | -0.05 | 0.11 | 0.03 | -0.03 | -.28b | .55b | 0.06 | .24b |
| 14 | Scott & Fleming Home Safety Scale | 3.86 | 0.98 | .29b | -0.03 | .155a | -0.05 | 0.00 | -.24b | .30b | 0.11 | 0.10 |
| 15 | Neuroticism | 2.69 | 0.54 | -0.08 | -0.14 | 0.06 | -0.04 | -.243b | 0.06 | -0.09 | -0.01 | -0.04 |
| 16 | Extroversion | 3.15 | 0.52 | 0.00 | -0.09 | .146a | -.162a | -0.01 | 0.07 | 0.14 | 0.07 | .156a |
| 17 | Openness | 3.84 | 0.43 | 0.04 | 0.03 | .194b | 0.03 | -0.03 | 0.00 | 0.12 | -.212b | -0.06 |
| 18 | Conscientiousness | 3.55 | 0.45 | .33b | 0.00 | .180a | -0.01 | .207b | -.232b | .312b | -0.02 | 0.11 |
| 19 | Agreeableness | 3.56 | 0.39 | .17a | 0.12 | .228b | 0.00 | 0.01 | -0.14 | .220b | -0.10 | 0.10 |

*Note.* Test significance is represented by an 'a' for ($p < .05$) and 'b' for ($p < .01$). Reliability for the scales are on the diagonal in parenthesis.

Table 5 – Cont.
*Reddit Scale Correlations and Reliabilities*

| | Reddit Sample Scales | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | Neal & Griffin Safety Compliance | (.83) | | | | | | | | | |
| 11 | Neal & Griffin Safety Participation | .47b | (.82) | | | | | | | | |
| 12 | Neal & Griffin Safety Motivation | .59b | .57b | (.73) | | | | | | | |
| 13 | Neal & Griffin Safety Knowledge | .51b | .45b | .47b | (0.59) | | | | | | |
| 14 | Scott & Fleming Home Safety Scale | .30b | .27b | .33b | .16a | (.73) | | | | | |
| 15 | Neuroticism | -0.12 | -.209b | -.147a | -0.05 | -0.09 | (.94) | | | | |
| 16 | Extroversion | 0.13 | .242b | .214b | .178a | 0.00 | -.515b | (.94) | | | |
| 17 | Openness | .152a | .187a | .198b | .216b | 0.00 | -.208b | .391b | (.93) | | |
| 18 | Conscientiousness | .387b | .273b | .345b | .188a | .258b | -.476b | .171a | 0.12 | (.94) | |
| 19 | Agreeableness | .214b | 0.10 | .224b | .149a | .262b | -.231b | 0.00 | .329b | .282b | (.91) |

Table 6.

*1-Factor Transportation Sample CFA Fit Indices for SVS model*

| Model Solutions | *χ2* | *df* | *Δχ2* | CFI | TLI | RMSEA (CI 90%) | SRMR |
|---|---|---|---|---|---|---|---|
| Two Factor (Orthogonal) | 336.39 | 9 | | 0.64 | 0.4 | .30 (.27 - .33) | 0.29 |
| Two Factor (Oblique) | 19.5 | 8 | 316.89* | 0.99 | 0.98 | .07 (.026 - .093) | 0.02 |
| One Factor | 20.88 | 9 | -1.38 | 0.99 | 0.98 | .06 (.025 - .089) | 0.02 |

*Note.* * indicates a significant Chi-square difference test ( $p < .001$).

Table 7.

*Transportation Scale Correlations and Reliabilities*

| | Transportation Sample Scales | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Safety Value Scale (SVS) (N = 410) | 45.26 | 7.20 | (0.85) | | | | | | |
| 2 | Age (years)? (N = 407) | 36.35 | 9.83 | 0.01 | (-) | | | | | |
| 3 | Gender (N = 410) | - | - | 0.03 | -0.01 | (-) | | | | |
| 4 | Service (Years) (N = 410) | 4.92 | 8.90 | 0.06 | .584b | 0.01 | (-) | | | |
| 5 | Neal & Griffin Safety Motivation (N = 399) | 4.61 | 0.44 | .411b | 0.02 | 0.10 | 0.02 | (.79) | | |
| 6 | Neal & Griffin Safety Knowledge (N = 399) | 4.36 | 0.47 | .323b | -0.05 | 0.06 | 0.00 | .553b | (.66) | |
| 7 | Neal & Griffin Safety Compliance (N = 399) | 4.42 | 0.52 | .418b | -0.04 | 0.05 | -0.04 | .674b | .608b | (.77) |
| 8 | Neal & Griffin Safety Participation (N = 399) | 3.95 | 0.71 | .418b | 0.04 | 0.07 | 0.04 | .548b | .556b | .544b |
| 9 | Neal & Griffin Safety Climate (N = 399) | 3.54 | 1.17 | .265b | -0.10 | 0.07 | -.212b | .255b | .271b | .360b |
| 10 | Agreeableness (N = 410) | 3.98 | 0.47 | .265b | -0.05 | .117a | -.149b | .355b | .367b | .440b |
| 11 | Conscientiousness (N = 410) | 4.09 | 0.50 | .378b | 0.08 | 0.02 | -0.03 | .377b | .410b | .427b |
| 12 | Extroversion (N = 410) | 3.35 | 0.59 | .197b | -0.08 | -0.02 | -0.03 | .271b | .322b | .299b |
| 13 | Neuroticism (N = 410) | 1.98 | 0.54 | -.150b | 0.06 | 0.04 | .111a | -.192b | -.244b | -.233b |
| 14 | Openness (N = 410) | 3.56 | 0.53 | 0.09 | -.103a | 0.06 | -.142b | .233b | .199b | .181b |
| 15 | Scott & Fleming Home Safety Scale (N = 394) | 3.92 | 0.81 | .267b | -0.03 | 0.09 | -0.09 | .294b | .225b | .265b |
| 16 | General Injuries (N = 397) | 1.49 | 0.39 | -.150b | 0.03 | 0.02 | 0.05 | -.132b | -.176b | -.169b |
| 17 | General Safety Events (N = 397) | 1.52 | 0.41 | -0.07 | -0.02 | 0.01 | 0.05 | -.120a | -.167b | -.196b |
| 18 | Self Report Major injuries (N = 392) | 0.07 | 0.29 | -0.10 | 0.05 | -0.05 | -0.03 | -0.05 | -0.09 | -0.04 |
| 19 | Self Report Minor Injuries (N = 391) | 1.54 | 3.18 | -0.07 | -0.07 | -0.05 | -0.08 | -0.05 | -0.01 | -.109a |
| 20 | Days off due to Physical Injury (N = 392) | 0.86 | 5.57 | -0.02 | 0.05 | -0.03 | 0.04 | 0.03 | -0.02 | 0.03 |
| 21 | Transp. Data @1year_Accidents (N = 155) | 0.19 | 0.44 | 0.08 | 0.12 | 0.02 | 0.09 | -0.04 | 0.02 | 0.00 |
| 22 | Transp. Data @1Year_Discipline (N = 155) | 0.12 | 0.35 | 0.05 | -0.10 | -0.06 | .191a | -0.05 | -0.09 | 0.05 |
| 23 | Transp. Data @1Year_Demerits (N = 155) | 0.34 | 2.12 | 0.00 | -0.07 | -0.03 | .301b | -0.16 | -0.09 | -0.12 |
| 24 | Transp. Data @1year_Injuries (N = 155) | 0.03 | 0.18 | -0.08 | 0.11 | -0.03 | 0.07 | 0.04 | 0.01 | 0.00 |

Table 7. Cont.

| | Transportation Sample Scales | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|
| 7 | Neal & Griffin Safety Compliance (N = 399) | (.77) | | | | | | | |
| 8 | Neal & Griffin Safety Participation (N = 399) | .544b | (.77) | | | | | | |
| 9 | Neal & Griffin Safety Climate (N = 399) | .360b | .387b | (.95) | | | | | |
| 10 | Agreeableness (N = 410) | .440b | .356b | .382b | (.78) | | | | |
| 11 | Conscientiousness (N = 410) | .427b | .382b | .271b | .470b | (.83) | | | |
| 12 | Extroversion (N = 410) | .299b | .280b | .105a | .214b | .370b | (.85) | | |
| 13 | Neuroticism (N = 410) | -.233b | -.203b | -.185b | -.450b | -.557b | -.499b | (.83) | |
| 14 | Openness (N = 410) | .181b | .152b | 0.10 | .179b | .156b | .334b | -.159b | (.78) |
| 15 | Scott & Fleming Home Safety Scale (N = 394) | .265b | .327b | .209b | .218b | .245b | .166b | -.105a | .159b |
| 16 | General Injuries (N = 397) | -.169b | -.183b | -.175b | -.255b | -.175b | -.147b | .198b | -0.06 |
| 17 | General Safety Events (N = 397) | -.196b | -.120a | -.211b | -.214b | -.205b | -.103a | .194b | -.142b |
| 18 | Self Report Major injuries (N = 392) | -0.04 | -.123a | -.107a | -0.02 | -0.04 | 0.07 | -0.04 | 0.02 |
| 19 | Self Report Minor Injuries (N = 391) | -.109a | -0.09 | -.153b | -0.07 | -0.09 | -0.03 | 0.04 | 0.08 |
| 20 | Days off due to Physical Injury (N = 392) | 0.03 | -0.01 | -0.04 | -0.02 | -0.02 | .138b | -0.08 | 0.06 |
| 21 | Transp. Data @1year_Accidents (N = 155) | 0.00 | 0.07 | 0.11 | -0.02 | 0.05 | 0.00 | -0.07 | -.181a |
| 22 | Transp. Data @1Year_Discipline (N = 155) | 0.05 | 0.09 | 0.02 | -0.08 | -0.03 | -0.03 | -0.06 | -.166* |
| 23 | Transp. Data @1Year_Demerits (N = 155) | -0.12 | 0.06 | -0.06 | -0.08 | -0.16 | -0.09 | -0.01 | -.294b |
| 24 | Transp. Data @1year_Injuries (N = 155) | 0.00 | -0.11 | -0.14 | -.222b | -0.02 | -0.12 | .168* | 0.05 |

Table 7. Cont.

| | Transportation Sample Scales | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Scott & Fleming Home Safety Scale (N = 394) | (.79) | | | | | | | | | |
| 16 | General Injuries (N = 397) | -.192b | (-) | | | | | | | | |
| 17 | General Safety Events (N = 397) | -.223b | .688b | (-) | | | | | | | |
| 18 | Self Report Major injuries (N = 392) | -0.04 | 0.09 | .138b | (-) | | | | | | |
| 19 | Self Report Minor Injuries (N = 391) | -.139b | .418b | .423b | 0.03 | (-) | | | | | |
| 20 | Days off due to Physical Injury (N = 392) | -0.04 | .185b | .136b | .383b | .190b | (-) | | | | |
| 21 | Transp. Data @1year_Accidents (N = 155) | 0.13 | -0.08 | 0.01 | 0.03 | -0.08 | 0.01 | (-) | | | |
| 22 | Transp. Data @1Year_Discipline (N = 155) | 0.13 | -0.04 | 0.11 | -0.04 | -0.01 | 0.02 | .266b | (-) | | |
| 23 | Transp. Data @1Year_Demerits (N = 155) | 0.02 | -0.04 | .189a | 0.06 | -0.05 | 0.01 | .171a | .453b | (-) | |
| 24 | Transp. Data @1year_Injuries (N = 155) | -0.09 | .164a | 0.01 | -0.07 | 0.03 | -0.01 | -0.08 | -0.06 | -0.03 | (-) |

Table 8
*Hierarchical Multiple Regression Without Safety Climate - Transportation Sample*

| | Step 1 | Step2 | | Step 3 | | |
|---|---|---|---|---|---|---|
| Safety Criterion | $\Delta R^2$ | $\Delta R^2$ | | $\Delta R^2$ | | Total $R^2$ |
| Neal & Griffin Safety Motivation | 0.002 | 0.24 | a | 0.06 | a | 0.30 |
| Neal & Griffin Safety Knowledge | 0.011 | 0.25 | a | 0.02 | b | 0.28 |
| Neal & Griffin Safety Compliance | 0.008 | 0.30 | a | 0.05 | a | 0.35 |
| Neal & Griffin Safety Participation | 0.004 | 0.22 | a | 0.06 | a | 0.29 |
| Scott & Fleming Home Safety Scale | 0.020 | 0.10 | a | 0.03 | a | 0.15 |
| General Injuries | 0.010 | 0.07 | a | 0.01 | | 0.09 |
| General Safety Events | 0.001 | 0.07 | a | 0.01 | | 0.08 |

*Note.* Step 1 includes demographic covariates, Step 2 includes the Big-Five Personality traits and Step 3 includes the SVS scale. "a" represents significance at $p < .001$ and "b" represents significance at $p < .01$.

Table 9
*Hierarchical Multiple Regression With Safety Climate - Transportation Sample*

| | Step 1 | Step2 | | Step 3 | | Step 4 | | |
|---|---|---|---|---|---|---|---|---|
| Safety Criterion | $\Delta R^2$ | $\Delta R^2$ | | $\Delta R^2$ | | $\Delta R^2$ | | Total $R^2$ |
| Neal & Griffin Safety Motivation | 0.00 | 0.24 | a | 0.01 | b | 0.05 | a | 0.30 |
| Neal & Griffin Safety Knowledge | 0.01 | 0.25 | a | 0.02 | b | 0.01 | b | 0.29 |
| Neal & Griffin Safety Compliance | 0.01 | 0.30 | a | 0.03 | a | 0.04 | a | 0.37 |
| Neal & Griffin Safety Participation | 0.00 | 0.22 | a | 0.07 | a | 0.04 | a | 0.34 |
| Scott & Fleming Home Safety Scale | 0.02 | 0.09 | a | 0.01 | c | 0.02 | a | 0.15 |
| General Injuries | 0.01 | 0.07 | a | 0.01 | | 0.00 | | 0.10 |
| General Safety Events | 0.01 | 0.07 | a | 0.02 | b | 0.00 | | 0.10 |

*Note.* Step 1 includes demographic covariates, Step 2 includes the Big-Five Personality traits, Step 3 includes Safety Climate, and Step 4 includes the Safety Values Scale. "a" represents significance at $p < .001$, "b" represents significance at $p < .01$ and "c" represents significance $p < .05$.

Table 10.
*Hierarchical Multiple Regression Standardized Betas, significance and Squared Semi-Partial Correlations - Transportation*

| | Safety Motivation | | | Safety Knowledge | | | Safety Participation | | | Safety Compliance | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Safety Predictors - no safety climate | $\beta$ | $p$ | $r_{si}$ | $\beta$ | $p$ | $r_{si}$ | $\beta$ | $p$ | $r_{si}$ | $\beta$ | $p$ | $r_{si}$ |
| Agreeableness | **0.26** | a | 0.05 | **0.23** | a | 0.04 | **0.26** | a | 0.05 | **0.33** | a | 0.08 |
| Conscientiousness | **0.28** | a | 0.05 | **0.30** | a | 0.05 | **0.28** | a | 0.05 | **0.31** | a | 0.06 |
| Extroversion | **0.16** | b | 0.02 | **0.20** | a | 0.03 | **0.19** | a | 0.02 | **0.20** | a | 0.02 |
| Neuroticism | **0.16** | b | 0.01 | **0.13** | b | 0.01 | **0.16** | b | 0.01 | **0.18** | a | 0.02 |
| Openness | **0.13** | b | 0.02 | 0.07 | | 0.00 | 0.04 | | 0.00 | 0.04 | | 0.00 |
| Safety Values | **0.27** | a | 0.06 | **0.14** | a | 0.02 | **0.27** | a | 0.06 | **0.24** | a | 0.05 |
| Safety Predictors - with safety climate | | | | | | | | | | | | |
| Safety Climate | **0.12** | b | 0.01 | **0.13** | b | 0.01 | **0.29** | a | 0.07 | **0.20** | a | 0.03 |
| Safety Values | **0.26** | a | 0.05 | **0.12** | b | 0.01 | **0.23** | a | 0.04 | **0.22** | a | 0.04 |

*Note.* Significant ( $p < .05$) beta weights are in bold. "a" ($p < .001$) "b" ($p < .01$) "c" ($p < .05$)

Table 10 – Cont.

*Hierarchical Multiple Regression Standardized Betas, significance and Squared Semi-Partial Correlations - Transportation*

| | Household Safety | | | General Injuries | | | General Safety Events | | |
|---|---|---|---|---|---|---|---|---|---|
| Safety Predictors - no safety climate | $\beta$ | $p$ | $r_{si}$ | $\beta$ | $p$ | $r_{si}$ | $\beta$ | $p$ | $r_{si}$ |
| Agreeableness | **0.16** | b | 0.02 | **-0.20** | a | 0.03 | **-0.12** | c | 0.01 |
| Conscientiousness | **0.21** | a | 0.03 | -0.03 | | 0.00 | -0.09 | | 0.01 |
| Extroversion | **0.11** | c | 0.01 | -0.07 | | 0.00 | 0.03 | | 0.00 |
| Neuroticism | **0.15** | c | 0.01 | 0.06 | | 0.00 | 0.09 | | 0.00 |
| Openness | **0.09** | c | 0.01 | 0.02 | | 0.00 | -0.10 | | 0.01 |
| Safety Values | **0.18** | a | 0.03 | -0.08 | | 0.00 | 0.02 | | 0.00 |
| Safety Predictors - with safety climate | | | | | | | | | |
| Safety Climate | **0.12** | c | 0.01 | **-0.09** | c | 0.01 | **-0.14** | b | 0.02 |
| Safety Values | **0.16** | a | 0.02 | -0.06 | | 0.00 | 0.04 | | 0.00 |

*Note.* Significant ( $p < .05$) beta weights are in bold. “a” ($p < .001$) “b” ($p < .01$) “c” ($p < .05$)

Table 11.

*Poisson Regression Analysis, Standardized Beta Weights and their Significance Value Without Safety Climate*

| | Injuries 1st Year | | Accidents 1st Year | | Discipline 1st Year | | Self-Report Minor Injuries | | Self-Report Major Injuries | |
|---|---|---|---|---|---|---|---|---|---|---|
| Safety Predictor | *β* | *p* | *β* | *p* | *β* | *p* | *β* | *p* | *β* | *p* |
| Agreeableness | **-0.66** | 0.00 | -0.30 | 0.45 | -0.10 | 0.71 | -0.35 | 0.38 | -0.12 | 0.84 |
| Conscientiousness | **0.88** | 0.00 | 0.07 | 0.87 | -0.28 | 0.48 | -0.48 | 0.24 | -0.41 | 0.44 |
| Extroversion | -0.17 | 0.54 | 0.11 | 0.83 | 0.33 | 0.12 | -0.18 | 0.66 | 0.66 | 0.13 |
| Neuroticism | **0.54** | 0.02 | -0.39 | 0.37 | 0.51 | 0.10 | -0.21 | 0.63 | -0.38 | 0.40 |
| Openness | 0.06 | 0.78 | **-0.84** | 0.00 | **-0.79** | 0.00 | **0.74** | 0.01 | -0.01 | 0.98 |
| Safety Values | **-0.56** | 0.03 | 0.45 | 0.24 | 0.22 | 0.27 | -0.30 | 0.37 | **-0.64** | 0.03 |

*Note.* Significant ($p < .05$) beta weights are in **bold**.

Table 12

*Poisson Regression Analysis, Standardized Beta Weights and their Significance Value With Safety Climate*

| | Injuries 1st Year | | Accidents 1st Year | | Discipline 1st Year | | Self-Report Minor Injuries | | Self-Report Major Injuries | |
|---|---|---|---|---|---|---|---|---|---|---|
| Safety Predictor | *β* | *p* | *β* | *p* | *β* | *p* | *β* | *p* | *β* | *p* |
| Agreeableness | **-0.58** | 0.04 | -0.37 | 0.30 | -0.51 | 0.16 | -0.02 | 0.98 | 0.10 | 0.84 |
| Conscientiousness | **0.90** | 0.00 | -0.02 | 0.95 | -0.41 | 0.26 | -0.33 | 0.22 | -0.27 | 0.56 |
| Extroversion | -0.25 | 0.43 | 0.15 | 0.75 | -0.09 | 0.85 | -0.17 | 0.60 | 0.51 | 0.17 |
| Neuroticism | **0.50** | 0.07 | -0.39 | 0.35 | **-0.79** | 0.05 | -0.14 | 0.69 | -0.32 | 0.39 |
| Openness | 0.05 | 0.83 | **-0.74** | 0.00 | **-0.64** | 0.04 | 0.58 | 0.09 | 0.00 | 0.99 |
| Safety Climate | -0.22 | 0.42 | 0.43 | 0.11 | 0.12 | 0.76 | **-0.72** | 0.04 | **-0.60** | 0.04 |
| Safety Values | **-0.52** | 0.02 | 0.37 | 0.29 | 0.55 | 0.11 | -0.10 | 0.73 | **-0.48** | 0.03 |

*Note.* Significant ( $p < .05$) beta weights are in **bold**.

Table 13.
*Moderated Regression Analysis - Unique Main-Effects and Safety Climate Interaction*

| | Safety Motivation | | | | Safety Knowledge | | | |
|---|---|---|---|---|---|---|---|---|
| | *β* | *p* | $R^2$ | $\Delta R^2$ | *β* | *p* | $R^2$ | $\Delta R^2$ |
| Safety Climate | 0.06 | a | | | -0.60 | a | | |
| Agreeableness | 0.30 | a | | | -0.27 | c | | |
| Agreeableness x Safety Climate | **0.13** | a | 0.17 | 0.03 | **0.17** | a | 0.20 | 0.04 |
| Safety Climate | 0.06 | a | | | 0.06 | a | | |
| Conscientiousness | 0.30 | a | | | 0.35 | a | | |
| Conscientiousness x Safety Climate | 0.01 | | 0.16 | 0.00 | **0.11** | a | 0.22 | 0.02 |
| Safety Climate | 0.08 | a | | | 0.09 | a | | |
| Extroversion | 0.19 | a | | | 0.25 | a | | |
| Extroversion x Safety Climate | 0.05 | | 0.13 | 0.01 | **0.08** | b | 0.17 | 0.01 |
| Safety Climate | 0.09 | a | | | 0.09 | a | | |
| Neuroticism | -0.12 | a | | | -0.18 | a | | |
| Neuroticism x Safety Climate | **-.070** | c | 0.10 | 0.01 | -0.05 | | 0.12 | 0.01 |
| Safety Climate | 0.09 | a | | | 0.10 | a | | |
| Openness | 0.17 | a | | | 0.16 | a | | |
| Openness x Safety Climate | -.007 | | 0.11 | 0.00 | 0.05 | | 0.11 | 0.00 |
| Safety Climate | 0.06 | a | | | 0.08 | a | | |
| Safety Values | 0.02 | a | | | 0.02 | a | | |
| Safety Values x Safety Climate | 0.00 | | 0.19 | 0.00 | **0.01** | b | 0.16 | 0.01 |

Note. $R^2$ value reflects the total variance accounted for by the safety climate, individual predictor, and interaction term. The change in $R^2$ reflects the amount of variance accounted for by the interaction term. Significant ($p < .05$) beta weights are in bold. "a" ($p < .001$) "b" ($p < .01$) "c" ($p < .05$).

Table 13 – cont.
*Moderated Regression Analysis - Unique Main-Effects and Safety Climate Interaction*

| | Safety Participation | | | | Safety Compliance | | | |
|---|---|---|---|---|---|---|---|---|
| | *β* | *p* | $R^2$ | $\Delta R^2$ | *β* | *p* | $R^2$ | $\Delta R^2$ |
| Safety Climate | 0.19 | a | | | 0.10 | a | | |
| Agreeableness | 0.39 | a | | | 0.40 | a | | |
| Agreeableness x Safety Climate | **0.21** | a | 0.23 | 0.03 | 0.07 | | 0.24 | 0.01 |
| Safety Climate | 0.18 | a | | | 0.12 | a | | |
| Conscientiousness | 0.43 | a | | | 0.38 | a | | |
| Conscientiousness x Safety Climate | 0.06 | | 0.23 | 0.00 | 0.01 | | 0.25 | 0.00 |
| Safety Climate | 0.22 | a | | | 0.15 | a | | |
| Extroversion | 0.30 | a | | | 0.24 | a | | |
| Extroversion x Safety Climate | 0.05 | | 0.21 | 0.00 | 0.03 | | 0.20 | 0.00 |
| Safety Climate | 0.22 | a | | | 0.15 | a | | |
| Neuroticism | -0.18 | b | | | -0.17 | a | | |
| Neuroticism x Safety Climate | -0.09 | | 0.17 | 0.01 | -0.05 | | 0.16 | 0.00 |
| Safety Climate | 0.23 | a | | | 0.15 | | | |
| Openness | 0.15 | b | | | 0.15 | | | |
| Openness x Safety Climate | -0.02 | | 0.16 | 0.00 | 0.04 | | 0.15 | 0.00 |
| Safety Climate | 0.18 | a | | | 0.12 | a | | |
| Safety Values | 0.03 | a | | | 0.03 | a | | |
| Safety Values x Safety Climate | 0.00 | | 0.26 | 0.00 | 0.00 | | 0.24 | 0.00 |

Table 13. – cont.
*Moderated Regression Analysis - Unique Main-Effects and Safety Climate Interaction*

| | General Injuries | | | | General Safety Events | | | |
|---|---|---|---|---|---|---|---|---|
| | *β* | *p* | $R^2$ | $\Delta R^2$ | *β* | *p* | $R^2$ | $\Delta R^2$ |
| Safety Climate | -0.04 | a | | | -0.06 | a | | |
| Agreeableness | -0.20 | a | | | -0.15 | a | | |
| Agreeableness x Safety Climate | **-0.11** | a | 0.10 | 0.02 | **-0.12** | a | 0.09 | 0.03 |
| Safety Climate | -0.05 | b | | | -0.06 | a | | |
| Conscientiousness | -0.11 | b | | | -0.14 | a | | |
| Conscientiousness x Safety Climate | -0.02 | | 0.05 | 0.00 | -0.04 | | 0.07 | 0.00 |
| Safety Climate | -0.06 | a | | | -0.07 | a | | |
| Extroversion | -0.08 | b | | | -0.06 | | | |
| Extroversion x Safety Climate | 0.03 | | 0.05 | 0.00 | -0.01 | | 0.05 | 0.00 |
| Safety Climate | -0.05 | a | | | -0.06 | a | | |
| Neuroticism | 0.13 | a | | | 0.12 | a | | |
| Neuroticism x Safety Climate | 0.03 | | 0.06 | 0.00 | 0.04 | | 0.07 | 0.00 |
| Safety Climate | -0.06 | a | | | -0.07 | a | | |
| Openness | -0.03 | a | | | -0.09 | b | | |
| Openness x Safety Climate | 0.01 | | 0.03 | 0.00 | 0.01 | | 0.06 | 0.00 |
| Safety Climate | -0.05 | a | | | -0.07 | a | | |
| Safety Values | -0.01 | | | | 0.00 | | | |
| Safety Values x Safety Climate | 0.00 | | 0.05 | 0.01 | 0.00 | | 0.05 | 0.01 |

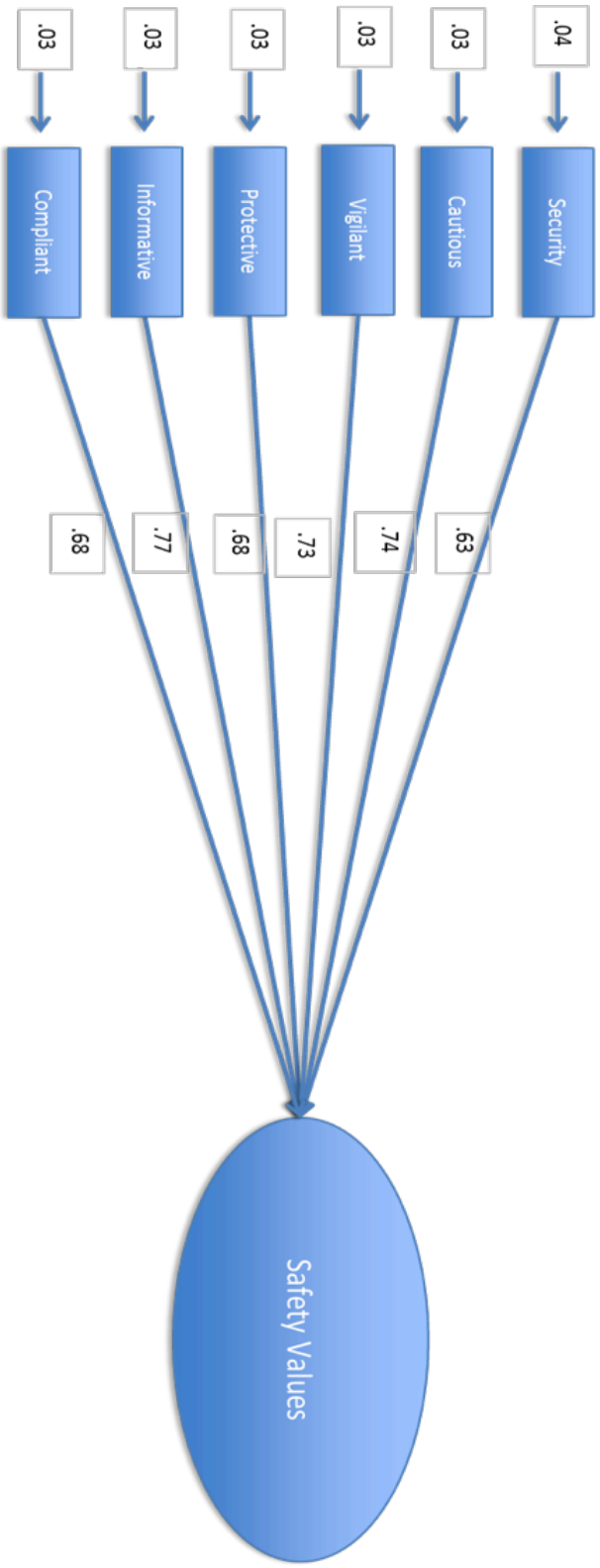


*Figure 1.* CFA for Safety Values with standardized item loadings. All loadings were significant ($p < .05$).

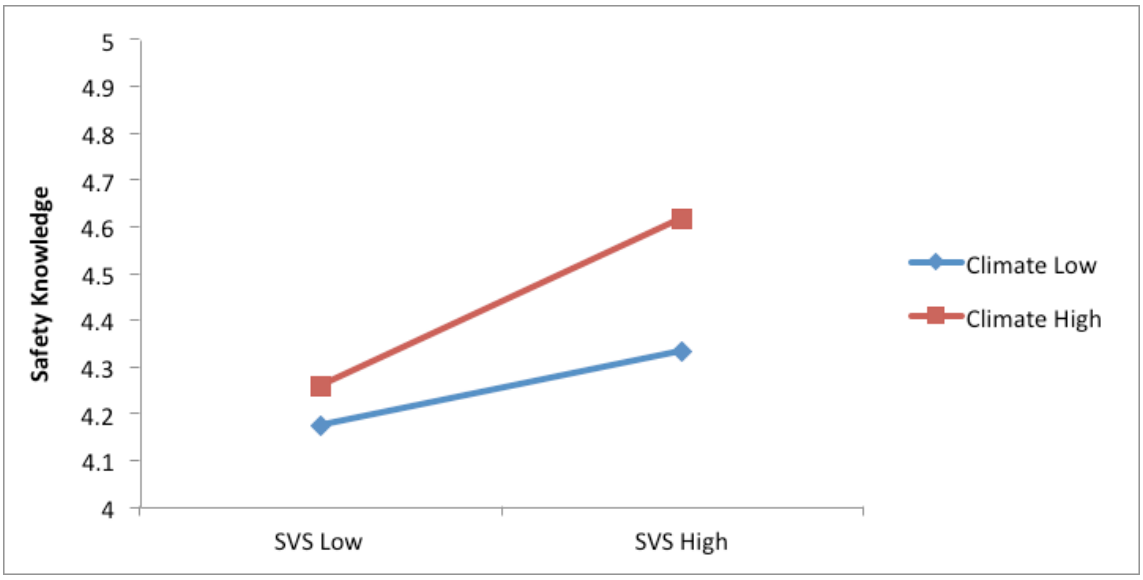


*Figure 2.* Interaction of safety climate on the relationship between Safety Values Scale and Safety Knowledge.

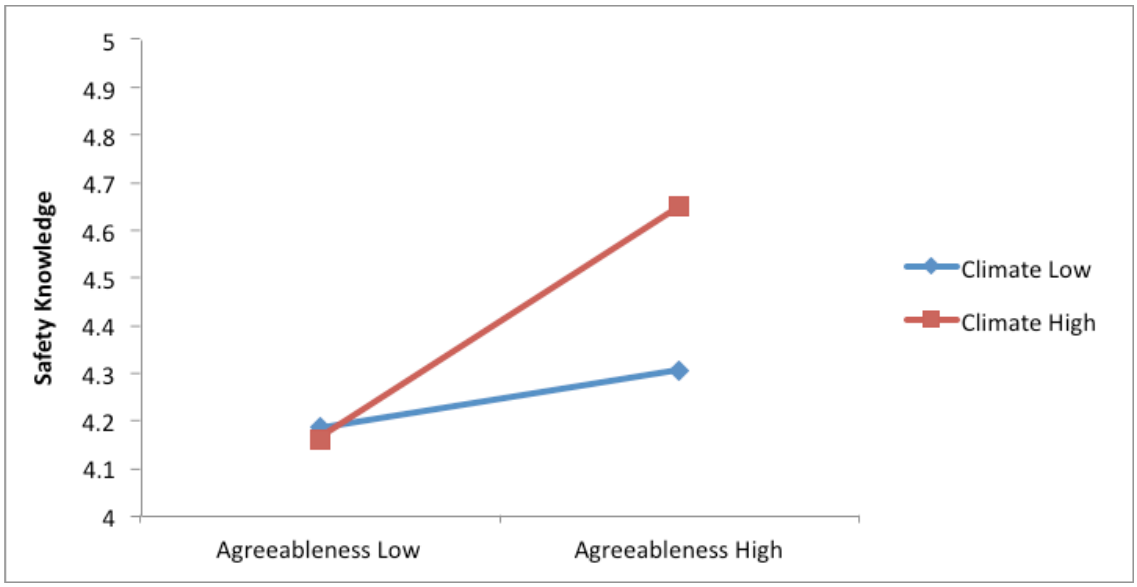


*Figure 3.* Interaction of safety climate on the relationship between Agreeableness and Safety Knowledge.

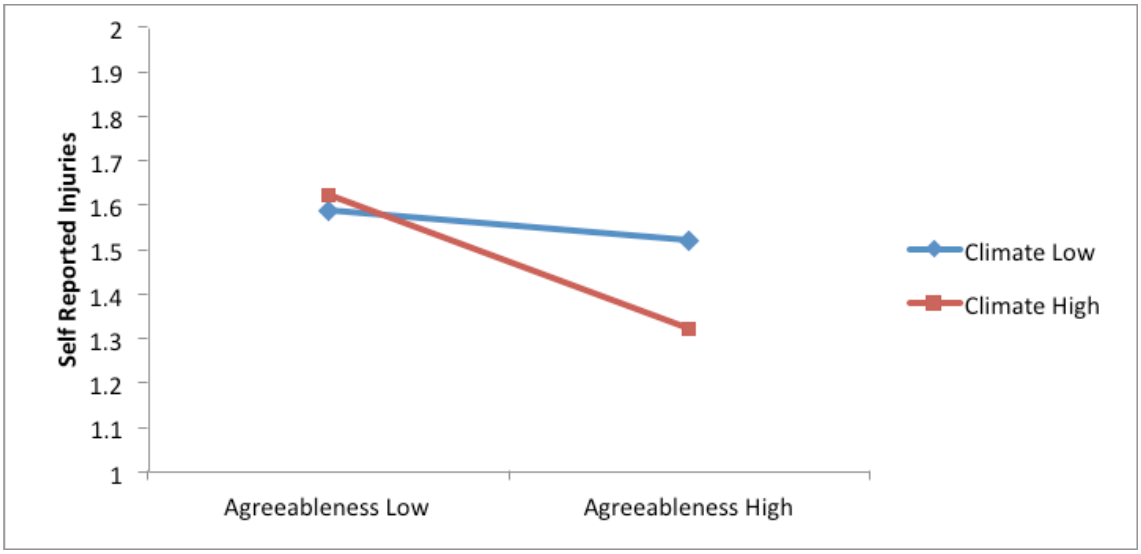


*Figure 4*. Interaction of safety climate on the relationship between Agreeableness and self Reported injuries.

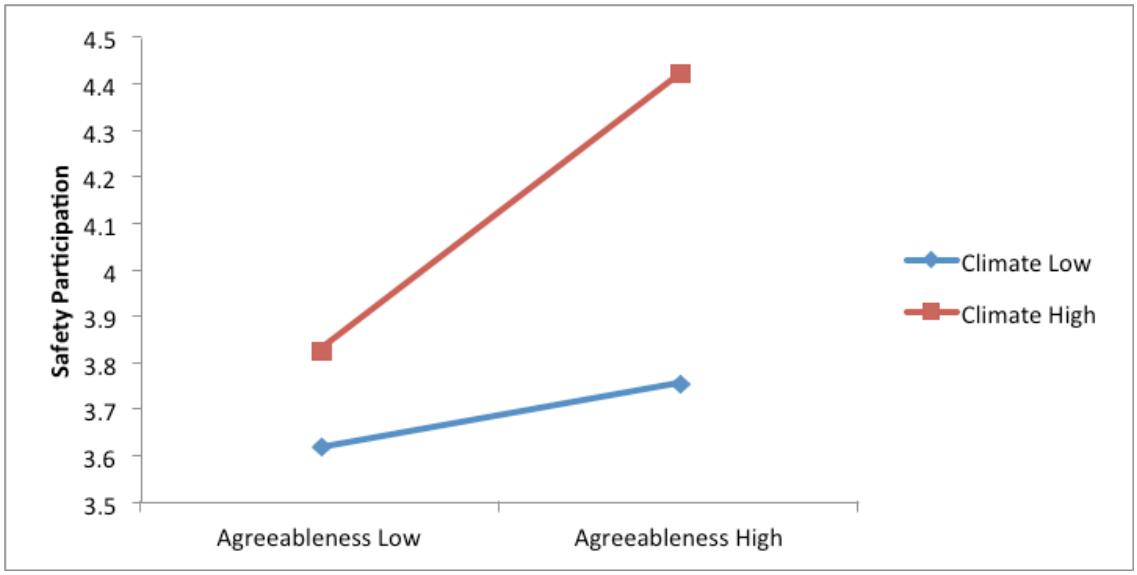


*Figure 5.* Interaction of safety climate on the relationship between Agreeableness and Safety Participation.

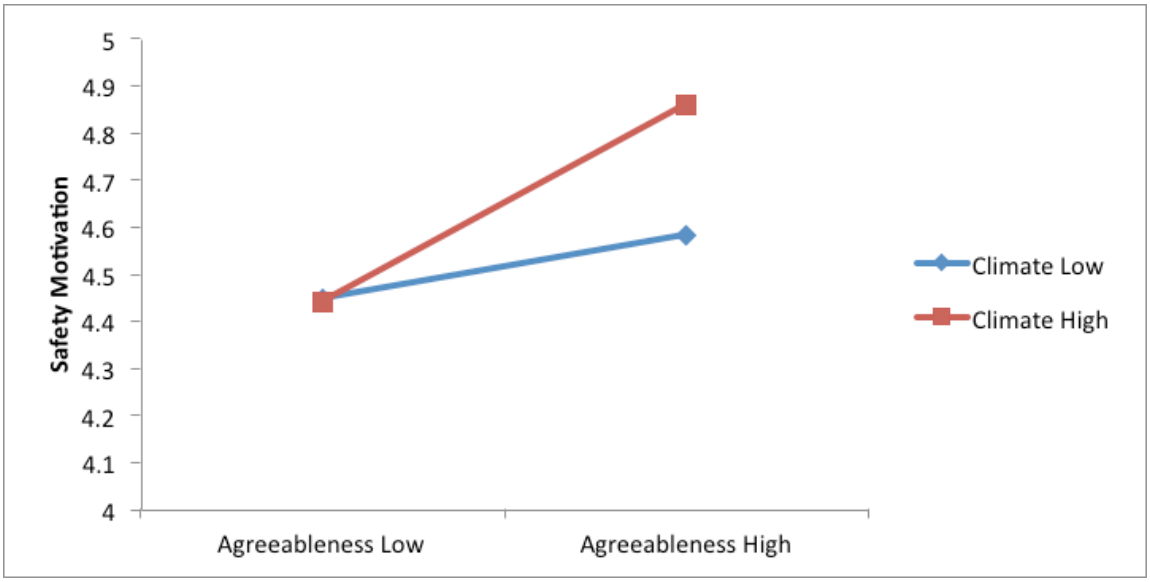


*Figure 6.* Interaction of safety climate on the relationship between Agreeableness and Safety Motivation.

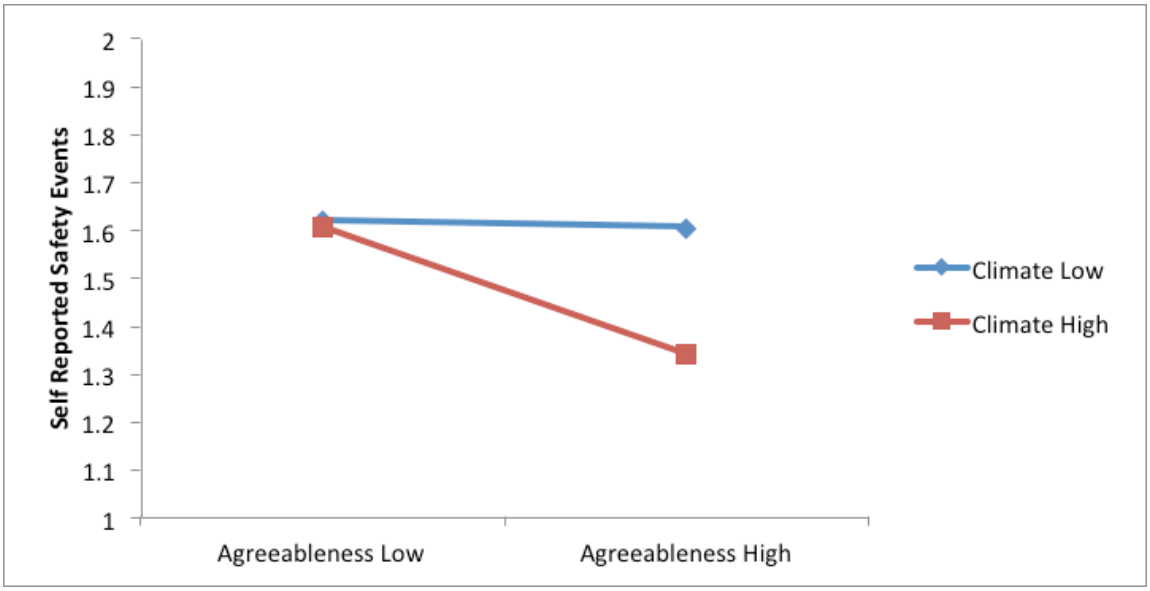


*Figure 7.* Interaction of safety climate on the relationship between Agreeableness and Self reported safety events.

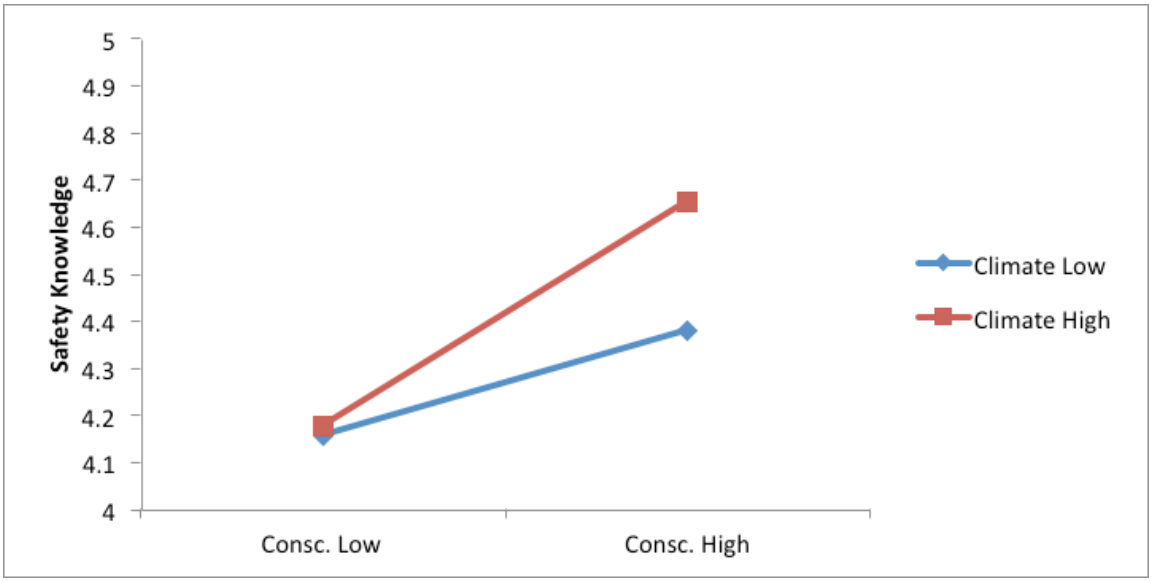


*Figure 8.* Interaction of safety climate on the relationship between Conscientiousness and Safety Knowledge.

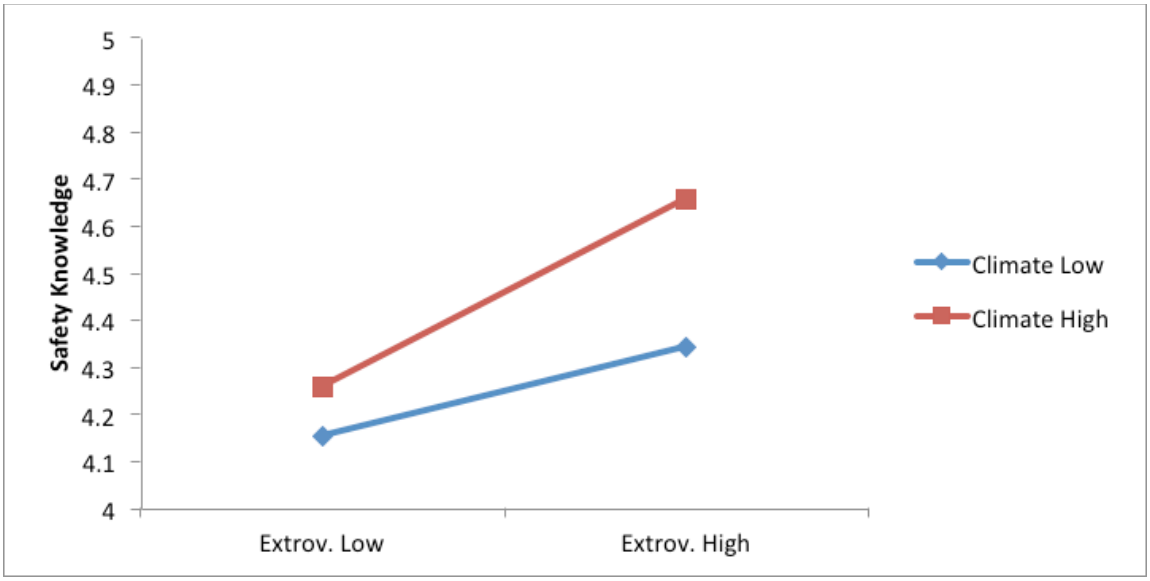


*Figure 9.* Interaction of safety climate on the relationship between Extroversion and Safety Knowledge.

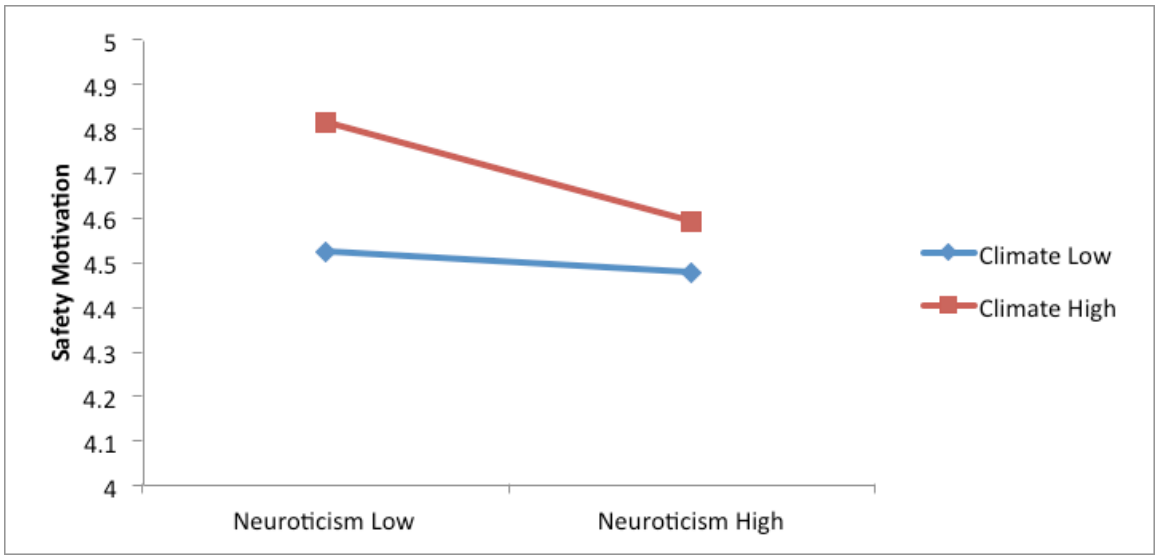


*Figure 10.* Interaction of safety climate on the relationship between Neuroticism and Safety Motivation.

# Appendix

Neal, A., & Griffin, M., A. (2006). A study of lagged relationships among safety climate, safety motivation, safety behaviour, and accidents at the individual and group levels. *Journal of Applied Psychology, 91*(4), 946-953. doi: 10.1037/0021-9010.91.4.946

Items Assessing Safety Climate, Motivation, Knowledge and Behavior

Safety climate
1. Management places a strong emphasis on workplace health and safety
2. Safety is given a high priority by management
3. Management considers safety to be important

Safety compliance
1. I use all the necessary safety equipment to do my job
2. I use the correct safety procedures for carrying out my job
3. I ensure the highest levels of safety when I carry out my job

Safety participation
1. I promote the safety program within the organization
2. I put in extra effort to improve the safety of the workplace
3. I voluntarily carry out tasks or activities that help to improve workplace safety

Safety motivation
1. I feel that it is worthwhile to put in effort to maintain or improve my personal safety
2. I feel that it is important to maintain safety at all times
3. I believe that it is important to reduce the risk of accidents and incidents in the workplace

Safety knowledge (Neal, Griffin, & Hart, 2000; Griffin & Neal, 2000)

1. I know how to perform my job in a safe manner
2. I know how to maintain or improve workplace health and safety
3. I understand the health and safety regulations relating to my work

**Attitudes Towards Safety Scale (Cox and Cox, 1991)**

**Fl Personal skepticism**

Safety works until we are busy.

If I worried about safety I would not get my job done.

There is no point in reporting a near-miss.

Not all accidents are preventable.

Safety equipment requirements are unrealistic.

**F2 Individual responsibility**

Safety equipment should always be worn.

Individual should encourage colleagues to work safely.

Individual shares responsibility for safety.

**F5 Personal Immunity**

People who work to procedures will always be safe.

Accidents only happen to other people.

**Safety Event and Injury Measure Adapted from (Barling, Loughlin & Kelloway, 2002).**

(1 – never, 2 – rarely, 3 - sometimes, 4 - often, 5- rather often)

**Safety Events**

Had something fall on you

Overextended yourself lifting or moving things.

Slipped on a slick surface.

Cut yourself.

Was exposed to chemicals or cleaning solutions without proper ventilation.

Tripped over something on the floor.

Fell off of something (e.g., ladder, shelf, etc.)

Got something in your eyes.

Received an electric shock.

Was burned.

Had clothes caught in something (e.g., a piece of machinery)

Other injuries not mentioned (specify) _____

**Injuries**

Strains or sprains

Cuts or lacerations

Burns

Bruises or contusions

Fractured Bone

Dislocated joint

Serious muscle or back pain

Blisters

Imagining an average shift at your job, please indicate how much you agree with the following statements (1 - strongly disagree to 5- strongly agree)

I am faced with hazards that threaten my personal safety.

My coworkers always follow the safety rules.

I feel safe when I am working by myself.

I feel safe when I am working with my coworkers.

There is a low risk of getting injured.

There is a low risk of being involved in a safety accident.

In the last 6-months, how many incidents resulting in major injuries (that require some form of medical attention and/or time-off) have you been involved in (self-inflicted, or involved in incident where you or others were injured)? _____

In the last 6-months, how many incidents resulting in minor injuries (cuts, bruises, etc. that did not require formal medical attention) have you experienced? ____

How many days have you been off due to physical injury in the last 6 months? ____

**(Scott & Fleming, 2014) Shortened Home Safety Behaviour Scale**
The following statements refer to safety behaviours you may engage in during NON-WORK hours, such as while at home or doing leisure activities. Please rate the extent to which you perform the following behaviours.

Note: Not all of these statements may be applicable to you. In this case, please respond "Not applicable"

**Please choose the appropriate response for each item:**

(Never, rarely, occasionally, often, very often, not applicable.) (1-5)
Use a stable step-stool or ladder to change light bulbs in ceiling/wall fixture

Wear protective equipment (such as proper shoes, ear-plugs, safety glasses) when using powered gardening tools (e.g., lawn mowers)

Wear safety glasses when performing tasks that could lead to eye injuries

Read safety instructions before using a new power tool or electrical appliance

Point out potential hazards to family/friends

Make suggestions to family/friends on how to do an activity in a safer way

Inform someone of your planned route before leaving for an outdoor activity (e.g., running, hiking, etc.)

**What gender do you identify with?**

**Male**
**Female**
**Other:**

**Which ethnic background do you identify with?**

| | |
|---|---|
| **African-American** | **Latin American** |
| **Arab** | **South Asian** |
| **Chinese** | **Southeast Asian** |
| **Filipino** | **West Asian** |
| **Japanese** | **White (Caucasian)** |
| **Korean** | **Other** |

**Please indicate your highest education achieved (please select one):**

**Less than high school**
**High school**
**University certificate**
**University degree / Diploma**
**Master's Degree**
**Doctorate Degree**
**Professional Degree**

**Are you currently a student?**

**Yes**
**No**

**Are you currently employed:**

**Part-Time**
**Full-Time**
**Not Employed**
**Retired**

**What industry do you work in? (Service, restaurant, transportation, construction, etc.) _____**
**What position do you hold? (waiter, cashier, laborer, conductor, etc.) _____**

**How long have you been employed at your current organization? ____ (years/months)**
**How long have you been employed in your current position? ____ (years/months)**
**How many hours (on average) do you work in a week? ____ (Hours)**

**Goldberg, L. R. (1999). A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.),** ***Personality Psychology in Europe*****, Vol. 7 (pp. 7-28). Tilburg, The Netherlands: Tilburg University Press.**

## NEUROTICISM

***10-item scale (Alpha = .86)***

Often feel blue.
Dislike myself.
Am often down in the dumps.
Have frequent mood swings.
Panic easily.

Rarely get irritated.
Seldom feel blue.
Feel comforable with myself.
Am not easily bothered by things.
Am very pleased with myself.

## OPENNESS TO EXPERIENCE

***10-item scale (Alpha = .82)***

Believe in the importance of art.
Have a vivid imagination.
Tend to vote for liberal political candidates.
Carry the conversation to a higher level.
Enjoy hearing new ideas.

Am not interested in abstract ideas.
Do not like art.
Avoid philosophical discussions.
Do not enjoy going to art museums.
Tend to vote for conservative political candidates.

## AGREEABLENESS

***10-item scale (Alpha = .77)***

Have a good word for everyone.
Believe that others have good intentions.
Respect others.
Accept people as they are.
Have a sharp tongue.
Cut others to pieces.

## EXTROVERSION

***10-item scale (Alpha = .86)***

Feel comfortable around people.
Make friends easily.
Am skilled in handling social situations.
Am the life of the party.
Know how to captivate people.

Have little to say.
Keep in the background.
Would describe my experiences as somewhat dull.
Don't like to draw attention to myself.
Don't talk a lot.
Suspect hidden motives in others.
Get back at others.

## CONSCIENTIOUSNESS

***10-item scale (Alpha = .81)***

Am always prepared.
Pay attention to details.
Get chores done right away.
Carry out my plans.
Make plans and stick to them.
Waste my time.
Find it difficult to get down to work.
Do just enough work to get by.
Don't see things through.
Shirk my duties.
Insult people.