DEVELOPMENT AND EVALUATION OF A SAFETY CULTURE SURVEY FOR OCCUPATIONAL SAFETY

by

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(ABSTRACT)

The present study includes the development, large-scale administration to workers at four industrial plants, and evaluation of the Safety Culture Survey (SCS). The SCS consists of three scales: the Actively Caring Scale (ACS), the Safety Perception Scale (SPS), and the Risk Propensity Scale (RPS). The ACS measures person factors related to one's propensity to actively care for the safety of others. Actively caring (AC) refers to employees caring enough about the safety of their coworkers to act on their behalf. In other words, AC refers to continually looking for environmental hazards and unsafe work practices and implementing appropriate corrective actions when unsafe conditions or behaviors are observed. Included in the ACS is the RAC (reported AC) subscale. The RAC focuses on person, behavior, and environment issues. The RAC also categorizes various levels of AC (i.e., whether employees feel they should, are willing to, or often actively care). The SPS measures employees' opinions and attitudes about their current safety climate. The scale addresses a variety of safety perceptions, including management concern for safety, peer support for safety, and personal responsibility for safety. The RPS measures person factors hypothesized to relate to an individual's propensity to engage in risky behaviors which increase the likelihood of a "near miss" or an injury. The RPS also includes the injury index subscale (i.e., reports of work-related injuries and illnesses).

A stepwise multiple regression found the ACS subscales to predict over 50 percent of the variance in RAC scores. Furthermore, the construct validity of the AC model was

supported in a general way. A factor analysis revealed one AC factor and two correlated risk propensity factors. Also, the ACS subscales were more highly correlated with each other than with subscles from the RPS (i.e., variables hypothesized not to predict AC).

There were two interesting interactions found among SCS variables. The interaction between focus of AC (behavior, person, environment) and level of AC (should, willing, often) indicated employees were most willing to AC from a behavior-focus, yet least likely to report they often did AC from a behavior-focus. In addition, employees who perceived an unsupportive safety climate (i.e., those with low SPS scores) and who perceived a high level of risk on the job were less likely to AC compared with employees who perceived an unsupportive safety climate and who perceived a low level of risk on the job. This indicated the importance of efforts to increase the visible support of safety efforts as well as assessing safety perceptions before introducing interventions to increase the salience of work-related hazards.

Furthermore, a stepwise regression to predict injury rate (i.e., injury index scores) with RPS scores was disappointing, predicting only 5.4 percent of variance in injury index scores. However, when injury index scores were divided into high, medium, and low, significant differences were found among RPS subscale scores.

In conclusion, the SCS is presented as a reliable and valid research tool. It can also be used as an applied tool for industry to assess the levels of person factors related to AC behaviors, to assess the perception of management, peer, and personal responsibility for safety efforts, and to help evaluate the effects of interventions designed to bring about a safer workplace.

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Introduction

The Problem Addressed

Approximately two million workers are critically injured at work each year, and over 10,000 workers are killed. Every year, work-related accidents cost employers billions of dollars, and in 1990, approximately 35 million productive work days were lost due to injuries on the job (National Safety Council, 1991).

Many of the injuries occurring in industry are preventable or reducible by decreasing unsafe behaviors and increasing safe behaviors. However, safety equipment is often uncomfortable to use, and safe operating procedures are often inconvenient and time consuming to follow. Furthermore, management often gives mixed signals (sometimes unintentionally, sometimes not) to employees concerning safety issues. On the one hand, employees are told not to work unsafely, however, they are often rewarded for producing more, faster, or better, which often entails risky behavior.

Therefore, many safety systems in organizations are similar to the examples given by Kerr (1975) in his classic article, *"On the Folly of Rewarding A While Hoping for B"*. In this article, Kerr gave examples from medicine, education, business organizations, and society in general where systems which were explicitly designed to motivate beneficial behaviors actually rewarded the opposite or incompatible behaviors.

Furthermore, the chances of an employee being involved in an accident is relatively low. On average, only approximately four employees in 100 are involved in lost work time accidents per year (National Safety Council, 1991). Therefore, most of the times a worker fails to use safety equipment or follow safety procedures that employee is rewarded by increased comfort, convenience, and speed of work without experiencing any aversive consequence.

Approaches to Reduce Occupational Accidents

According to the Geller et al. (1990) "safety triad" three general factors require attention for maximum injury reduction: 1) ongoing behaviors 2) the work environment (e.g., equipment, tools, machines, housekeeping, hazards, and engineering), and 3) the person (e.g., knowledge, skills, abilities, intelligence, motives, and personality). Most approaches to occupational safety focus on one or more of these factors.

Environment-focused approaches. Some injuries are preventable through manipulations of the work environment. Environment-focused safety programs include the design or redesign of the work environment (e.g., tools, equipment, physical surroundings) in order to shield or remove employees from harm or to prevent employees from performing unsafe acts. However, many work situations only obtain limited benefits from manipulating the physical work environment. Some environments are innately hazardous (e.g. underground coal mining), constantly changing, or difficult to predict, making it unlikely or impossible to protect fully employees through environmental manipulations (Peters, 1991).

Workers are usually much more willing to admit the impact of external (i.e., environmental) causes of injury than to admit the role of person or behavior factors (Geller, 1994). Specifying the environment as the cause for an incident removes the blame from the individual. This might be one reason the typical response to a "near miss" or injury is an environmental manipulation or equipment redesign (Geller, Lehman, & Kalsher, 1989). Along these lines, Geller and Roberts (1993) implemented a safety program throughout a large manufacturing plant where workers were given the opportunity to audit the environment for safety hazards, as well as to audit the safe and unsafe behaviors of their coworkers. The workers quickly began conducting environmental audits, pointing out design and housekeeping deficiencies. However,

many workers objected to conducting behavioral audits, resulting in the suspension of this program component.

Behavior-focused approaches. Behavior-focused approaches to occupational safety focus on systematically studying the effects of various interventions on target behaviors by first defining the target behavior in a directly observable and recordable way. The behavior is then observed and recorded, preferably unobtrusively and in its natural setting. When a stable baseline measure of the frequency, duration, or rate of behavior is obtained, an intervention designed to change the behavior in beneficial directions is administered. This intervention typically involves modifying or changing the salience of the antecedents and/or consequences of target behavior(s). The frequency, duration, or rate of behavior during and/or after the intervention is recorded and compared to the baseline measures of behavior to determine intervention effectiveness (e.g., Daniels, 1989; Geller et al., 1989).

Although the behavioral approach focuses on observable behavior, when persons behave in certain ways internal states or attitudes can be affected. For example, according to dissonance theory, if a person chooses to behave publicly in a way inconsistent with his or her true attitude, dissonance is aroused (Cooper & Fazio, 1989; Festinger & Carlsmith, 1959). This dissonance is often reduced by a subsequent attitude change to match the behavior. However, dissonance is not required for behaviors to change attitudes. For example, someone could emit a safety behavior (e.g., safety belt use) not because of a positive attitude towards safety belts, but because of a chance at receiving a safety reward. After buckling-up, the person could feel safer and begin to buckle-up even after no rewards are offered in order to continue to feel safe. After continued occurrences of buckling-up and feeling safe, the person could develop a positive attitude toward safety belts. The spiraling of behavior feeding attitude, feeding behaviors, feeding attitudes and so on can lead to large changes in behaviors and

attitudes resulting from a relatively small initial change in behavior (Geller, Roberts, & Gilmore, 1993).

Behavior-focused approaches to safety are also important even when environment-focused safety precautions have been taken. In order to take advantage of environmental manipulations or engineering solutions to safety, employees must often take the initiative by performing certain safety-related behaviors. For example, most industries provide safety glasses to their employees and retrofit dangerous machinery with guards; but safety devices can be ignored and guards can be circumvented. Therefore, interventions targeting safe and unsafe behaviors are often necessary for optimal safety performance.

One of the most commonly used and cost effective behavior-based interventions is feedback. Numerous researchers have reported significant improvement in individual and group work performance following a behavior-based feedback process (e.g., Geller, Eason, Phillips, & Pierson, 1980; Komaki, Heinzmann, & Lawson, 1980; Sulzer-Azaroff & de Santamaria, 1980). This approach to organizational behavior management, whereby workers receive specific feedback from systematic observation and recording of designated target behaviors, has been applied frequently and successfully to reduce work injuries (e.g., Alavosius & Sulzer-Azaroff, 1986; Sulzer-Azaroff, Loafman, & Merante, 1990). However, the research demonstrating the beneficial impact of behavior observation and feedback on occupational safety has usually been short-term and small-scale, requiring outside agents (i.e., consultants) to help implement the process. Large-scale and long-term applications of behavior-change techniques require the employees themselves to apply the interventions (e.g., systematic behavioral observation and feedback) throughout the workplace. Therefore, the more individuals who participate in a safety observation and feedback program, the more likely the intervention will bring

about desired behavior change, eventually leading to reduced injury rates (Geller et al., 1990).

Person-focused factors. A basic premise of person-based approaches to behavior and attitude change is that focusing only on observable behavior does not completely account for a person's actions. People are much more than their behaviors. People's intention, intrinsic motivation, subjective interpretation, and personality are essential to understanding and appreciating humanity. Thus, a person-based approach applies surveys, personal interviews, and other self-report measures to find out how individuals feel about certain situations, conditions, behaviors, or personal interactions.

The person factors that contribute to an injury or "near miss" are often more difficult than environment or behavior factors to specify, because most person factors are difficult or impossible to observe objectively (e.g., self-esteem, intelligence, intrinsic motivation). Most of the work regarding the person factors related to occupational safety has focused on either the accident prone personality (e.g., Hansen, 1989; Jones & Wuebker, 1988; Wellman, Kelly, & Trapasso, 1988) or personality factors (e.g., optimism) which lead to self-protective behaviors (e.g., Peters, 1991).

When attempting to control injury from the person perspective, a worker's attitudes, knowledge, or personality is usually assessed. An intervention is then implemented to improve these person characteristics or the "deficient" individuals would be reassigned, terminated or simply not selected for a job (e.g., Jones & Wuebker, 1988).

When people change their attitudes, values, or thinking strategies, certain behaviors can change as a result. For example, Ajzen and Fishbein (1977) claimed intentions as a result of careful thought and consideration of consequences can lead to action. Thus, just as targeting behaviors can influence attitudes, targeting attitudes can also influence behaviors.

Cost-Effectiveness

Both attitudes and behaviors should be targeted for injury reduction; because attitude change can lead to behavior change, and vice versa. However, when the objective is to decrease a particular unsafe behavior or to increase a certain safe behavior, it is often most cost-effective to target behaviors directly through behavior management interventions (e.g., behavioral prompts, feedback, and rewards).

In order to apply most person-based approaches optimally to behavior and attitude change clinical psychologists receive specialized training for many years. Such training is often necessary because tapping into an individual's perceptions, attitudes, and thinking styles is a demanding and complex process. Consequently, some person-based behavior change processes can be very time consuming, involving numerous one-on-one sessions between professional and client.

In contrast, a behavior-based approach to behavior and attitude change can be administrated by individuals with minimal professional training. Behavior-based approaches began with an attempt to reach people in the settings where their problems occur (e.g., the home, school, rehabilitation institute, workplace) and teach the managers or leaders in these settings the behavior-change techniques most likely to work under the circumstances (e.g., Baer, Wolf, & Risley, 1968; Daniels, 1977). Research has shown that this on-site approach is cost effective, primarily because behavior-change techniques are straightforward and relatively easy to administer. Furthermore, behavior-based intervention progress can be readily monitored by indigenous personnel observing target behaviors (e.g., Daniels, 1989; Geller et al., 1993; Sulzer-Azaroff & de Santamaria, 1980).

Integration of Behavior and Person Approaches

A common perspective is that behavior-based and person-based approaches to behavior change represent opposite poles of an intervention continuum. Behavior-based

interventions are often considered cold, objective, and mechanistic, operating with minimal concern for people's feelings; whereas person-based interventions are often thought of as warm, subjective, and caring, with limited concern for directly changing others' behaviors.

Given the conceptual foundations of behavior-based and person-based intervention techniques, it is easy to build barriers between these two perspectives and assume that one must follow either one or the other approach when designing a behavior change process. However, an integration of these approaches might not only be possible but necessary to develop an optimal safety intervention. For example, Geller et al. (1990) specified all factors contributing to the safety of an organizational culture can be classified as environmental, behavioral, or personal. Aspects of both behavior-based and person-based psychology are relevant for addressing the two human dimensions of this "safety triad".

The purpose of the present study includes the development and evaluation of a survey to measure person factors related to involvement in behavior-based safety efforts. Thus, this study includes an attempt to integrate further the person and behavior-based approaches to occupational safety.

The Actively Caring Model

Presumably, some employees work safely because of mandates (or policy directives) from management, but other individuals require more intrusive interventions to motivate their compliance with safety rules. After some individuals achieve the desired behaviors, it would be useful to enlist them as intervention agents to increase the safe behavior of others (Geller, 1992; Geller et al., 1990). In other words, instead of "preaching to the choir," the choir should be sent out to enroll converts. In fact, Roberts and Geller (1994) recently found a direct relationship between the number of

intervention agents and the impact of intervention programs designed to increase the use of vehicle safety belts.

From a brainstorming session with safety leaders of an Exxon Chemical Company, Geller (1991) coined the term "actively caring" (AC) to refer to an ultimate goal in occupational safety, namely that employees care enough about the safety of their coworkers to act on their behalf. In other words, employees AC for safety would continually look for environmental hazards and unsafe work practices, and implement appropriate corrective actions when unsafe conditions or behaviors are observed.

The most recent conceptualization of AC (Geller et al., 1993) defined three basic types of AC, depending upon the target of the intervention - - environment, person, or behavior. Intervening to reorganize or redistribute resources in an attempt to benefit others (e.g., cleaning another's work area, picking up litter, recycling, conducting an environmental safety audit) is AC from an environment focus. Person focused AC is behaving in an attempt to make another person feel better (e.g., intervening in a crisis situation, sending a get-well card). Finally, behavior-focused AC is attempting to influence another individual's behavior in desired directions (e.g., giving rewarding or correcting feedback, demonstrating or teaching desirable behavior). It is noteworthy that these three categories of AC represent the factors in the Geller et al. (1990) safety triad (e.g., basic dimensions needing attention in a comprehensive occupational safety process).

Furthermore, it is suggested that people will feel they should, feel they are willing, and actually actively care to varying degrees. It is hypothesized that people will not actually actively care as much as they feel they should or are willing. Therefore, assessing differences between whether a person feels he or she should actively care, is willing to actively care, or often does actively care could be used as a diagnostic for potential for improvement. For example, when employees feel they should actively care

and are willing to actively care more than they do actively care, there is potential for relatively quick improvements in safety following appropriate training or communication that such AC behaviors are supported in comparison to employees who do not feel they should, are not willing, and do not actively care. The current study will measure these various levels of AC.

Furthermore, six individual difference factors are hypothesized in the current study to increase the propensity for an employee to actively care for the safety or health of a coworker. Individuals presumed most likely to actively care are those high in self-esteem (i.e., "I feel valuable"), group belongingness or cohesiveness (e.g., "I belong to my work group"), optimism (i.e., "I expect the best"), self-efficacy (i.e., "I can do it"), and personal control (i.e., "I am in control"). As conceptualized recently by Geller et al. (1993), empowerment (i.e., "I can make a difference") is a combination of optimism, self-efficacy, and personal control. Individuals high in extraversion are also hypothesized to interact more with others in an AC manner.

Research Support for the Actively Caring Model

Self-esteem. Coopersmith (1967) defined self-esteem as the evaluation an individual makes and usually maintains about oneself. This self evaluation process indicates the extent to which the individual feels capable, significant, successful, and worthy. Rushton (1980) suggested a positive relationship between self-esteem and altruistic behavior. Rushton stated people with a positive sense of well being, high self-esteem, or positive mood may be less preoccupied with themselves than individuals with low self-esteem or more negative moods. Consequently, those with a positive sense of well being might be more likely to help others.

Michelini, Wilson, and Messe (1975) and Wilson (1976) measured subjects' self-esteem with a sentence completion test and then measured whether subjects helped another individual in a bystander intervention situation. High self-esteem subjects were

significantly more likely than low self-esteem subjects to help another person pick up dropped books (Michelini et al., 1975) and to leave an experimental room to assist a person in another room who screamed he had broken his foot following a mock "explosion" (Wilson, 1976). Similarly, subjects with higher self-esteem scores were more likely to help a stranger (i.e., a confederate) by taking his place in an experiment where they would presumably receive electric shocks (Batson, Bolen, Cross, & Newinger-Benefiel, 1986).

Maqsud and Rouhani (1990) classified Botswana adolescents as having high or low self-concept according to the Bhatanger Self-Concept Scale. Subjects with high self-concepts scored significantly higher on Kohlberg-type moral dilemmas (e.g., to make choices to benefit others or society rather than only ones self) than subjects with low self-concepts. However, there was only a slight correlation between moral reasoning and self concept (r=.21).

Group belonging/cohesion. The social psychological construct most analogous to the AC concept of belongingness is group cohesion- - the sum of positive and negative forces attracting group members to each other (Wheeless, Wheeless, & Dickson-Markman, 1982). Staub (1978) reviewed studies which showed that people were more likely to help victims who belonged to their group, with "group" determined by race, nationality, or an arbitrary distinction such as preference for an artist's paintings. Similarly, Batson et al. (1986) found subjects more likely to help a confederate if they rated her as similar to them.

Furthermore, Driver (1987) hypothesized that self-evaluations would predict altruism to a greater extent for friends than for strangers or antagonists. He found college students scores on an altruism scale to be positively related to self-evaluations only when the reference person was a friend, not when the reference person was a stranger or antagonist.

In a bystander intervention study (Latane & Nida, 1981), pairs of friends intervened faster to help a female experimenter who had fallen from a chair than did pairs of strangers. Thus, with friends as subjects, the bystander intervention effect may not occur because group cohesiveness (or belongingness) counteracts the diffusion of responsibility that presumably accounts for the bystander intervention effect. In a similar vein, Rutkowski, Gruder, and Romer (1983) manipulated group cohesion and found the most AC behavior among subjects in the high-cohesion conditions.

In a retrospective study, Blake (1978) studied real-world relationships between group cohesion and the ultimate in AC behavior- - altruistic suicide. His data was gathered from official records of Medal of Honor awards given during World War II and Vietnam. The independent variable was the cohesiveness of combat units (estimated by group training and size) and the dependent variable was percentage of "grenade acts"- - voluntarily using one's body to shield others from exploding devices. Results revealed that the smaller, more elite, specially trained combat units (e.g., the Marine Corps, and Army airborne units) accounted for a substantially larger percentage of "grenade acts" than larger, less specialized units (e.g., Army non-airborne units), thus supporting the hypothesis that group cohesion increases AC behavior.

Optimism. Optimism is the expectation that life events, including personal actions, will turn out well (Scheier & Carver, 1985; Seligman, 1991). Sharrock, Day, Qazi, and Brewin (1990) found that when residential staff at a mental hospital attributed their patient's problems to unstable and uncontrollable factors, they were optimistic about patient recovery. This optimism, measured by a variation of the Garety and Morris (1984) optimism scale, was positively related to the staff's helping behavior, as measured by reports of spending extra effort helping patients.

Furthermore, researchers have manipulated optimistic states (or moods) among individuals by giving them unexpected rewards or positive feedback and then observing

the occurrence vs. nonoccurrence of AC related behaviors. Isen and Levin (1972), for example, showed that individuals finding a dime in the coin return slot of a public phone (placed there by researchers) were more likely to help a confederate who dropped a folder of papers than were individuals who did not find a dime. Similarly, students given a cookie while studying at the university library were more likely than those not given a cookie to agree to help another student by participating in a psychology experiment.

Isen, Clark, and Schwartz (1976) delivered free samples of stationary to homes and then called residents later to request an AC behavior. Specifically, the caller said he had dialed a wrong number but since he had used his last dime, he needed the subject to call a garage to tow his car. Subjects who had received the gifts of stationery were more likely to make the AC phone call than were subjects who had received no gift.

Carlson, Charlin, and Miller (1988) reviewed these and other studies that showed direct relationships between mood (or optimism) and AC behavior. They reported the following pleasant experiences to increase AC (i.e., helping) behavior, purportedly by inducing a positive mood (or optimistic outlook): finding a dime, receiving a packet of stationery, listening to soothing music, being on a winning football team, imagining a vacation in Hawaii, and being labeled a charitable person.

Although it is reasonable to expect that having a positive experience could lead, at least temporarily, to an optimistic outlook (i.e., that things are going to go your way), optimism has traditionally been discussed as a relatively stable belief that life events will be positive (Scheier & Carver, 1985, 1993). Most of the examples given relating optimism to helping behavior came from the manipulation of mood states, which could be labeled temporary optimism. However, how long this temporary optimism lasts and under what circumstances this length will vary is not clear. For example, in the Isen et al. (1976) study, the beneficial effects of giving out free stationary began to decrease

after six minutes and the increased likelihood of helping completely disappeared after 20 minutes. However, it is not known what factors could increase or decrease the duration of the improved mood.

Although subjects high in optimism are expected to be more likely to exhibit helping behavior, too much optimism has actually been shown to be counterproductive, at least for self-helping behaviors. Burger and Burns (1988) found that women with higher degrees of "unrealistic optimism" were less likely to use effective contraception to avoid an unwanted pregnancy. Therefore, unrealistic optimism may be related to an illusion of invulnerability, where no need is felt to protect oneself from certain dangers. However, this unrealistic optimism is usually associated with oneself, as opposed to others whose risks are often seen as inflated (Weinstein, 1982). Therefore, an overly optimistic person may actually be more likely to intervene on behalf of a coworker because of the belief that others are more vulnerable in relation to themselves and more likely to receive an unintentional injury.

Self-efficacy. Self-efficacy theory proposes that behavior change operates through changing an individual's expectations of personal mastery and success (Bandura, 1977). Those high in self-efficacy may be more likely to attempt new behaviors, and therefore, be more responsive to interventions designed to increase AC. According to self-efficacy theory, expectations of self-efficacy are key to behavior change because they determine the initial decision to perform a behavior, the effort to expend, and the persistence to perform in the face of adversity (Bandura, 1977).

Shotland and Heinhold (1985) proposed skills training would reduce the bystander intervention effect (i.e., an inverse relationship between group size and victim-helping behavior). Trained individuals were said to be more confident in their abilities (e.g., higher in self-efficacy), therefore, less likely to share responsibility with others or use reactions of others to interpret events. However, they still found a bystander

intervention effect for subjects who had received extensive red cross training. On the other hand, Cramer, McMaster, Bartell, and Dragna (1988) found no bystander intervention effect with registered nurses. It was hypothesized the combination of training and experience led to the elimination of the bystander intervention effect.

Furthermore, Sherer et al. (1982) found measures of self-efficacy to be related to locus of control, and concluded internal locus of control alone was not enough to predict an individual's belief in the ability to control the successes of outcomes in a given area. The individual must also have some success experiences from which to base the belief in a positive outcome.

Personal control. The personal control factor of AC is one of the most extensively researched individual difference variables, and refers to a general expectancy regarding the location of forces controlling a person's life - internal or external. Those with an internal locus of control believe they usually have direct personal control over significant life events as a result of their knowledge, skills, and abilities. In contrast, persons with an external locus of control believe factors like chance, luck or fate play important roles in their lives (Rotter, 1966; Rushton, 1980). In other words, internals generally expect to have more personal control over the positive and negative reinforcers in their lives than do externals.

In a recent field study, Bierhoff, Klein, and Kramp (1991) had ambulance drivers obtain the name and address of those present at vehicle crash scenes who had administered first aid in order to send them a questionnaire. They found those who helped the crash victims had more of an internal locus of control than did a matched control group of bystanders who had witnessed an accident, but not helped. In addition, Midlarsky (1971) found more internals than externals willing to help a confederate perform a motor coordination task that presumably involved the reception of electric shocks.

Sherrod and Downs (1974) manipulated subjects' perception of personal control by asking subjects to perform a task in the presence of loud, distracting noise, telling half the subjects they could terminate the noise if necessary. The subjects with the perceived personal control to terminate the noise (but did not) were significantly more likely to comply with a later request by a confederate to help solve math problems that required time and resulted in no extrinsic rewards.

Oliner and Oliner (1988) measured the personal control of 406 people who helped rescue Jewish refugees in Nazi-occupied Europe. They found the rescuers to have a more internal locus of control than people who did not rescue Jews when they had an opportunity.

Extraversion. Extraversion measures one's general approach (or style) when responding to others. Extraverts are typically characterized as outgoing, impulsive, uninhibited, and sociable; whereas introverts tend to be quiet, retiring, and introspective (Eysenck & Eysenck, 1985). Actively caring (as the term is currently operationalized) often requires a person to interact with other people on behalf of their behaviors or an environmental risk, and thus it's possible more outgoing individuals (e.g., extraverted) will score higher on measures of AC than individuals less sociable and more reserved (e.g., introverted). Therefore, a direct relationship is hypothesized between extraversion (e.g., Eysenck & Eysenck, 1985) and propensity to actively care for occupational safety.

Rushton, Faulkner, Neale, Nias, and David (1989) found significant positive correlations (r=.21) between self-report measures of altruism and extraversion among sets of twins. Likewise, Johnson, Danko, Darvill, and Bochner (1989) found significant positive correlations between self-report measures of altruism and extraversion among university students in Australia, Egypt, China, Hawaii, and Missouri (r=.44, .19, .36, .38, .31 respectively).

Distinctions Between AC, Helping Behaviors, and Altruism

The helping behaviors previously discussed are somewhat different than AC described by Geller (1991) and studied in the present research. The previously discussed helping behaviors usually occurred as a reaction to an accident or event which has already happened (e.g., falling off a ladder, dropping books, explosion). The AC behaviors most relevant to occupational safety, and proposed by Geller (1991), help people avoid an accident that is only possible, even unlikely in any given situation.

There is also a major difference between AC and the traditional view of altruism. Altruism is generally seen as acting to benefit another through some kind of self-sacrifice, without the hope of reciprocation or benefit to the self (Liebert & Spiegler, 1982). On the other hand, the end result of AC behaviors would be a safer workplace for everyone. Furthermore, it is assumed that going beyond the self to also help others is a sign of a healthy personality. For example, Maslow (1971) revised his original needs hierarchy to include self-transcendency (i.e., going beyond the self for others) as the highest form of self-actualization.

Another difference between the AC model and past research regarding person variables related to occupational safety is the focus on predicting those who will look out and intervene for the health and safety of others. Most research has focused only on those who will be involved in an accident themselves (i.e., accident prone people, those who are likely to exhibit self protective behaviors).

Risk Propensity

Although the long debated notion of a single and stable personality trait of accident proneness has generally been discounted (e.g., Hansen, 1988, McKenna, 1983), the finding that a minority of employees are often the victims of the majority of occupational injuries is still prevalent (e.g., Wellman et al., 1988). Among safety professionals this phenomenon is referred to as the "80/20 rule", indicating 80% or more

of workplace injuries are caused by 20% or fewer employees. Furthermore, although sparse, there have been studies finding a number of personality characteristics related to increased probability of personal injury.

Extraversion. Fine (1963) and Craske (1968) found drivers high in extraversion more likely to have been involved in a vehicle crash. More recently Smith and Kirkham (1981) found extraversion among British drivers to be significantly correlated with vehicle crashes (r=.18) and driving violations (r=.21). On the other hand, Pestonjee and Singh (1980) found Indian bus drivers in a no accident group more extraverted than a multiple accident group.

However, as discussed earlier there is also reason to believe extraverts are more willing to actively care, as defined by giving feedback to others regarding their safe or unsafe behavior. Therefore, extraversion is hypothesized to predict risk propensity as well as AC.

Cognitive failures. Cognitive failures measures the degree and frequency a person experiences mental lapses or distractions conducive to experiencing a "near miss" or injury (Broadbent, Cooper, Fitzgerald, Parker, 1982). Both catastrophic (resulting in injury or death) and insignificant mental errors can be seen as reflecting similar breakdowns in our cognitive processing (Reason, 1988). Larson and Merritt (1991) found that two separate groups of young men with more cognitive failures had caused more self-reported auto accidents than those with less cognitive failures.

Psychological reactance. Individuals are predisposed in varying degrees to preserve their personal freedom or react aggressively to a perceived threat to personal freedom (Brehm, 1966). When one's perceived freedom is lost or threatened (e.g., by an external controlling agent), one will experience an unpleasant state (termed reactance) resulting in a desire to recover the lost or threatened freedom. Safety regulations often use very directive language (e.g., you are required to use hearing protection, you must use

steel toed shoes). Individuals high in psychological reactance may actually act in ways counter to top-down safety mandates in an attempt to assert their personal freedom.

Geller, Casali, and Johnson (1980) investigated the relationship between the intrusiveness of safety belt inducement devices (i.e., light, buzzer, and/or ignition interlock) and safety belt use, and found that as inducements were more intrusive (e.g., buzzers instead of lights) the higher the probability the system had been defeated by either locking the belt behind the front-seat occupant or disconnecting the system. Also, Bensley and Wu (1991) reported high-threat alcohol prevention messages resulted in male heavy drinkers consuming more beer in a taste test than subjects who received low threat messages.

Furthermore, Hansen (1989) found distractibility (r=.30) and general social maladjustment (r=.28) significantly correlated with injury involvement from a sample of 362 chemical workers. Distractibility and general social maladjustment were measures constructed by the author. Distractibility refers to task attention deficits and could be seen as conceptually similar to cognitive failures (e.g., Broadbent, et al., 1982). General social maladjustment includes questions regarding issues such as law breaking, disregard for others, impulsivity, and authority problems and could be seen as conceptually similar to psychological reactance (e.g., Brehm, 1966).

Risky lifestyle. Because it is reasonable to expect a significant predictor of future injury is risky behavior (e.g., assuming risky behaviors lead to injury), an original scale was developed to predict risk propensity based on one's reported involvement in risky activities (risky lifestyle). An assumption of this scale is that the risk level a person accepts in a given situation (e.g., while driving) will generalize to other situations.

Therefore, it is hypothesized in the current study that four individual difference measures will relate positively to involvement in work related injury: extraversion, cognitive failures, psychological reactance, and risky lifestyle.

Safety Perceptions

Although the emphasis of the current study is on the AC person factors (e.g., self-esteem, personal control, belonging, etc.) and their relationship to AC, the perceived support for safety efforts is also an important aspect of a safety culture. The current study will explore the relationship between perceived support for safety efforts and the perceived level of on-the-job risk as it relates to propensity to actively care.

One of the methods proposed to increase AC behaviors is to attempt to make the current safety hazards more salient. However, increasing the perception of risk might not lead to increased involvement in safety efforts in all situations. For example, Goldberg, Dar-El, and Rubin (1991) suggested if the perception of risk is increased (e.g., the certainty of someone being injured on the job) in an organizational culture perceived as unsupportive of safety efforts, the increased salience of the dangerous work environment could lead to a fatalistic outlook or learned helplessness. On the other hand, if hazards are made more salient in a culture seen as supportive of safety efforts, involvement in safety efforts should be more likely. Therefore, it is not only important to find and measure person factors which influence whether individuals will look beyond their own response-consequence contingencies to support safety efforts, but also to measure the perceptions of support for safety.

Applications of the Actively Caring Model

Actively caring thank you cards (Pilot Study 1). At a large Virginia chemical manufacturing plant (2000 employees), Roberts and Geller (1995) administered the first draft of the Safety Culture Survey (SCS) to 31 subjects in one work area. The survey included measures of self-esteem, belonging, and optimism embedded within a number of questions addressing a variety of safety issues, including personal risk perception, safety training, management concern for safety, personal work styles, and peer support for safety. The survey also included a 3-item RAC (reported AC) subscale. These three

questions only measured behavior-focused AC (e.g., I am willing to praise other employees for working safely). Each question was formatted to a five-point Likert scale from totally disagree to totally agree. After taking the SCS, each participant (n=31) was given five Actively Caring Thank You Cards. Workers were told to give the cards to their coworkers whenever they saw an example of an AC behavior, and if they ran out of cards, they could obtain more from their supervisors. The bottom of the cards could be torn off and redeemed (by the recipient of the card) for a drink or ice cream in the company cafeteria (worth 55¢).

Insert Figure 1 about here

The hypothesis that workers who gave or received AC thank you cards will score higher on the self-esteem, group cohesion, and optimism scales was partially supported. One-tailed independent t-tests indicated the self-esteem scores for the four workers who either gave or received thank you cards (M=34.75, SD=3.77) was significantly higher than the self-esteem scores of those who did not give or receive thank you cards (M=30.85, SD=4.25), $t(23)=1.71$, $p=.05$; and the group cohesiveness scores for those workers who either gave or received thank you cards (M=70.25, SD=8.45) were significantly higher than those workers who did not give or receive thank you cards (M=54.19, SD=15.54), $t(23)=1.99$, $p=.029$. However, no significant difference in optimism scores was found between the participants (M=21.25, SD=1.26) and nonparticipants (M=20.71, SD=1.55), $t(23)=.65$, $p=.262$, but the difference was in the predicted direction.

Texas Olefins Plant (Pilot Study 2). The original SCS was modified to include two additional RAC subscale questions and a scale to measure personal control (Nowicki & Duke, 1974; Strickland, 1989). Scales measuring sensation seeking

(Zuckerman,1979), cognitive failures (Broadbent et al., 1982), and risky lifestyle were also added to provide divergent validity data and to assess risk propensity. This modified scale was given to 466 workers of a Texas Olefins Plant (TOP). Complete surveys were obtained from 125 workers. A multiple stepwise regression procedure was performed using the AC person factors as the independent variables and the RAC subscale as the dependent variable. Personal control (r=.42), belonging (r=.32), and self-esteem (r=.35) were included in the terminal model. Unexpectedly, sensation seeking (r=.24) was also included in the terminal model (R^2=.29, p<.05).

Texas Plastics Plant (Pilot Study 3). The TOP SCS was modified to exclude sensation seeking and include extraversion (Eysenck & Eysenck, 1985) and psychological reactance (Merz, 1983; Tucker & Byers, 1987) and administered to 226 employees at a Texas Plastics Plant (TPP). The TOP RAC subscale was increased to include a total of 9 questions for TPP. Five RAC subscale questions were behavior-focused and four RAC questions were environment-focused. Multiple stepwise regression procedures were performed using the AC person factors as the independent variables and the MBPP RAC subscale (i.e., environment focused and person focused) as the dependent variables. Personal control (r=.39), reactance (r=-.35), self-esteem (r=.35), and belonging (r=.27) were included in the terminal model for behavior-focused RAC (R^2=.26, p<.05). Whereas, personal control (r=.35), belonging (r=.34), and reactance (r=-.27) were included in the terminal model for environment-focused RAC (R^2=.21, p<.05).

North Carolina Knit Products (Pilot Study 4). The same SCS given at TPP was also administered to 230 employees at a North Carolina Knit Products Plant (NCKP). Multiple stepwise regression procedures were performed using the AC person factors as the independent variables and the NCKP RAC subscale scores as the dependent variables. Extraversion (r=.42), reactance (r=-.39), belonging, (r=.40), risky lifestyle (r=-

.15), and personal control (r=.36) were included in the terminal model for behavior-focused AC (R^2=.40, p<.05). Reactance (r=-.50), extraversion (r=.36), personal control (r=.43), and optimism (r=.42) were included in the terminal model for environment-focused RAC (R^2=.44, p<.05).

Personal control and belonging explained significant, independent variance in all TOP, TPP, and NCKP RAC subscale scores. Furthermore, psychological reactance explained significant, independent variance in the RAC subscale scores for each plant in which it was administered (i.e., TPP & NCKP).

The Current Study

The current study included the large-scale administration of the Safety Culture Survey (SCS) to workers at four industrial plants. A major objective of the current study is to reduce the number of SCS items to facilitate administration of the survey to industrial worker populations. The reliability and validity of the revised scale was also assessed, which included assessing the scale's utility at predicting reports of propensity to actively care as well as to be involved in an injury. The relationships among various subscales and between subscales and criterion measures were hypothesized as follows:

Summary of Hypotheses

H1: Subscales from the ACS will be more highly correlated with reported AC (RAC) than correlations between the Risk Propensity Scale (RPS) subscales (i.e., risky lifestyles, cognitive failures, reactance) and RAC.

H2: Subscales from the ACS will show high correlations with each other and low correlations with the RPS subscales.

H3: The Actively Caring Scale (ACS) subscales (i.e., self-esteem, self-efficacy, optimism, personal control, group belongingness, and extraversion) will show significant positive correlations with reported AC (RAC).

H4: A factor analysis including the ACS subscales, RPS subscales, RAC, and injury index will reveal at least two factors. One factor will include the ACS subscales and the RAC, the other will include the RPS subscales and the injury index.

H5: Individuals with higher RPS scores will report being involved in more injuries (i.e., higher injury index scores)

H6: Sites with higher ACS scores will have lower reports of injury.

H7: Individuals will state they are more likely to actively care from a person focus and environment focus than from a behavior focus.

H8: Individuals will be more likely to state they should actively care than they are willing to actively care and they will report they are willing to actively care more than they actually actively care.

H9: There will be an interaction between the perception of support for safety efforts (i.e., the SPS) and level of perceived risk effecting RAC. Specifically, those who have a high perception of support for safety and perceive a high risk environment will have high RAC. Those who have a low perception of support for safety and who perceive a high risk environment will have low RAC. Those with high versus low perceptions of support for safety will not differ when risk is perceived as low.

In addition to the specific hypotheses to be tested, some exploratory analyses will be done. A factor analysis will be performed on the items from the safety perception scale (SPS) to determine the factors which make up this scale. It is predicted that at least two factors will emerge, a management support for safety factor and a peer support for safety factor.

Method

Subjects

Employees at four industrial plants were administered the revised Safety Culture Survey (SCS). The majority of the employees administered the survey were either

maintenance or operations workers, although other organizational personnel, including managers and supervisors, also took the SCS.

Washington Nuclear Facility (WA). WA (n=15,000) is a large nuclear materials maintenance site in Washington State managed for the Department of Energy. The survey was administered by the author to 245 employees from one department within the site. The average age of the workers at the WA site is 40 years, 90.5 percent are white, and 67.5 percent are male. The average education level of the hourly workers is a high school diploma plus two years college or trade school. The return rate of the surveys administered at the WA site was 64 percent.

Texas Polyethylene Plant (TX). The TX site (n=315) is a polyethylene manufacturing plant located in Texas. The survey was administered by an associate of the author to all 315 employees at the site. The average age of the workers at the TX site is 38 years, 90 percent are white, and 81 percent are male. The average education level of the hourly workers is a high school diploma plus two years college or trade school. The return rate for surveys administered at the TX site was 41.6 percent.

Tennessee and Georgia Knit Products Plants (TN) & (GA). Two knit products plants of the same company, one in Tennessee (TN) and the other in Georgia (GA) were administered the survey. Both plants manufacture textiles, and the employees at both sites were administered the survey by the area supervisors from each respective site. The average age of the workers at the TN (n=215) site is 43 years, 95 percent are white, and 61 percent are male. The average education level of the hourly workers is a high school diploma. The return rate of the surveys administered at the TN site was 93.5 percent. The average age of the workers at the GA (n=281) site is 40 years, 96 percent are white, and 68 percent are male. Ninety-five percent of the GA workers have high school diplomas. The return rate of the surveys administered at the GA site was 78.3 percent.

The Safety Culture Survey (SCS)

The SCS used at NCKP (i.e., Pilot study 4) was revised slightly, eliminating some redundant questions and adding questions measuring self-efficacy (e.g., Sherer, et al., 1982) and additional RAC questions. Therefore, the SCS used in the present research is a battery of three separate scales, each presumably measuring different, although related components of employee health and safety. The SCS includes a Safety Perception Scale (SPS), an Actively Caring Scale (ACS), and a Risk Propensity Scale (RPS). These scales include separate subscales. Some of the subscales are original, whereas others were adapted from established personality measures. In addition, five questions were added to assess employee injury and "near miss" history (injury index). The entire SCS is presented in Appendices A and B.

Actively caring scale (ACS). The ACS measures person factors related to one's propensity to actively care for the safety of others. The ACS includes six subscales: self-esteem adapted from Rosenberg's (1965) Self-Esteem Scale (9 questions), self-efficacy based on the Sherer et al. (1982) Self-Efficacy Scale (22 questions), learned optimism based on Scheier and Carver's (1985) Life Orientations Scale (7 questions), personal control (18 questions) based on the Nowicki-Strickland I-E scale (Nowicki & Duke, 1974; Strickland, 1989), group belongingness based on the Wheeless et al. (1982) Group Cohesion Measure (13 questions), and extraversion (9 questions) based on the E/I scale of the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1985).

Included in the ACS is the RAC subscale, measuring employee reported AC. The RAC consists of 12 base questions. The 12 base questions focus on three different ways to actively care (i.e., for the person, behavior or environment). Four base questions are person-focused (RACp), four base questions are environment-focused (RACe), and four base questions are behavior-focused (RACb). Each of

these base questions is also asked in three different ways (i.e., employees should; I am willing; I often). Therefore, the RAC consists of 36 total questions. See Appendix B for a list of these base questions.

Risk propensity scale (RPS). The RPS measures person factors hypothesized to relate to an individual's propensity to engage in risky behaviors which increase the likelihood of a "near miss" or an injury. The RPS includes five sub-scales: risky lifestyles (12 questions) (Geller et al., 1993), cognitive failures (13 questions) based on the cognitive failures scale developed by Broadbent et al. (1982), psychological reactance (11 questions) based on the Merz Psychological Reactance Scale (Merz, 1983; Tucker & Byers, 1987), and Extraversion (9 questions) based on the E/I scale of the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1985). In addition to the personality and attitude measures, the revised SCS includes five questions regarding employee's accident and "near miss" history. These questions (i.e., the injury index) were used as a criterion measure for the RPS.

Safety perception scale (SPS). The SPS was developed by Roberts and Geller (in press). It measures employees' opinions and attitudes about their current safety climate. The scale (33 questions) addresses a variety of safety issues, including personal risk perception, safety training, management concern for safety, personal work styles, and peer support for safety.

Procedure

The circumstances under which the surveys were administered were slightly different for each organization. Employees at WA were given the survey in two large groups before a safety training session. Employees at both knit products sites (GA & TN) were given the survey in small groups during safety meetings by area supervisors. Employees at TX were told by their area supervisors the survey was available to take, and that management was interested in their comments and

perceptions regarding plant safety. However, no specific block of time was set aside to complete the survey. All employees were told their answers would be completely anonymous, although codes were used to categorize the surveys according to department or work group. The survey took approximately one hour to complete.

Collection, Entry, and Acceptability of Survey Data

The surveys were printed on opscan forms. After the surveys were completed, the forms were sent to the University of South Florida Testing and Evaluation Center and optically scanned. The unanalyzed data were then sent to the author, along with the opscan sheets. The accuracy of the opscan data entry procedure was checked by matching 10 randomly selected responses from the opscan sheets to the data file sent to the author for five percent of the surveys obtained from each site. No errors were found.

The survey data were then cleaned of omission errors. The data from any individual who omitted 10 or more questions were eliminated. All other omitted questions were replaced with the average response for that question.

Results

Reliability Analysis

An internal consistency analysis was used to estimate the reliability of each SCS subscale (Murphy & Davidshofer, 1988). Table 1 contains each scale, the number of original (i.e., full) scale items, Cronbach's alpha for the combined site full scale, the number of items deleted (based on eliminating those items which resulted in an increased alpha), and Cronbach's alpha for the combined site reduced scale. Most scales only showed a small increase in alpha after items were reduced. However, risky lifestyle increased by a large amount after items with low inter-item correlations were removed from the scale (full alpha =.55, reduced alpha = .78). Furthermore, two scales

(optimism and cognitive failures) contained no items which resulted in a higher alpha after removal. Therefore, no items were removed from these scales. Overall, 32 items were removed from the SCS, increasing the mean scale alpha from .75 to .79.

Insert Table 1 about here

Table 2 lists the full and reduced alpha for each SCS scale for each company. All reduced scale alpha values were higher for each company except personal control (full alpha =.76, reduced alpha = .70) and self-efficacy (full alpha =.89, reduced alpha = .85) for TX, and personal control (full alpha =.79, reduced alpha = .78) for TN.

Insert Table 2 about here

Correlations Among Variables

Table 3 presents the intercorrelations among the combined site ACS variables (i.e., belonging, personal control, self-efficacy, self-esteem, optimism, extraversion), RPS variables (i.e., risky lifestyle, reactance, cognitive failures), and criterion variables (i.e., injury index, and RAC).

Insert Table 3 About Here

Predicting Who Will Actively Care

A series of stepwise multiple regressions were performed with the RAC as dependent variable and the ACS subscales (i.e., self-esteem, self-efficacy, optimism, personal control, group belongingness, extraversion) and RPS subscales (i.e., risky lifestyles, cognitive failures, psychological reactance) as the independent variables.

Separate regressions were performed for the combined site data as well as for the individual site data. Regressions were also performed with the separate RAC categories (i.e., RACp, RACe, and RACb) as the dependent variables. These regressions were all performed for both the full and reduced survey.

Combined site RAC regression. Tables 4 and 5 display the independent variables for each step, the partial r, model R, R^2, and F values for the full and reduced combined site RAC regression. The full final model R was significantly different than zero after eight steps $F(8, 700) = 114.12$, $p < .001$. The eight variables included in the regression equation were belonging, personal control, extraversion, self-efficacy, risky lifestyle, cognitive failures, reactance, and optimism. The reduced final model R was significantly different than zero after seven steps $F(7, 701) = 127.94$, $p < .001$. The seven variables included in the regression equation were the same as those for the full scale with the exception of optimism (i.e., belonging, personal control, extraversion, risky lifestyle, self-efficacy, cognitive failures, and reactance).

Insert Tables 4 and 5 about here

WA RAC regression. Tables 6 and 7 display the independent variables for each step, the partial r, model R, R^2, and F values for the WA RAC regression. The full final model R was significantly different than zero after six steps $F(6, 150) = 145.48$, $p < .001$. The six variables included in the regression equation were belonging, extraversion, personal control, risky lifestyle, cognitive failures, and self-efficacy. The reduced final model R was also significantly different than zero after six steps $F(6, 150) = 43.27$, $p < .001$. The six variables were the same as those for the full scale except self-efficacy was excluded and optimism was included.

Insert Tables 6 and 7 about here

TX RAC regression. Tables 8 and 9 display the independent variables for each step, the partial r, model R, R^2, and F values for the TX RAC regression. The full final model R was significantly different than zero after five steps $F(5, 125) = 21.82$, $p < .001$. The five variables included in the regression equation were belonging, reactance, personal control, self-efficacy, and optimism. The reduced final model R was significantly different than zero after three steps $F(3, 127) = 33.92$, $p < .001$. The three variables included in the regression equation were belonging, reactance, and personal control.

Insert Tables 8 and 9 about here

TN RAC regression. Tables 10 and 11 display the independent variables for each step, the partial r, model R, R^2, and F values for the TN RAC regression. The full final model R was significantly different than zero after eight steps $F(8, 192) = 34.15$, $p < .001$. The eight variables included in the regression equation were personal control, belonging, reactance, self-efficacy, cognitive failures, optimism, risky lifestyle, and extraversion. The reduced final model R was significantly different than zero after seven steps $F(7, 193) = 35.40$, $p < .001$. The seven variables included in the regression equation were the same as those for the full scale with the exception of reactance.

Insert Tables 10 and 11 about here

GA RAC regression. Tables 12 and 13 display the independent variables for each step, the partial r, model R, R^2, and F values for the GA RAC regression. The full

final model R was significantly different than zero after four steps $F(4, 215) = 76.73$, $p < .001$. The four variables included in the regression equation were self-efficacy, belonging, extraversion, and personal control. The reduced final model R was significantly different than zero after four steps $F(4, 215) = 95.37$, $p < .001$. The four variables included in the regression equation were the same as those for the full scale.

Insert Tables 12 and 13 about here

Combined site RACp regression. Tables 14 and 15 display the independent variables for each step, the partial r, model R, R^2, and t values for the full and reduced combined site RACp regression. The full final model R was significantly different than zero after seven steps $F(7, 701) = 78.20$, $p <.001$. The seven variables included in the regression equation were belonging, extraversion, personal control, risky lifestyle, self-efficacy, cognitive failures, and optimism. The reduced final model R was significantly different than zero after seven steps $F(7, 701) = 76.97$, $p < .001$. The seven variables included in the regression equation were the same as those for the full scale.

Insert Tables 14 and 15 about here

Combined site RACe regression. Tables 16 and 17 display the independent variables for each step, the partial r, model R, R^2, and t values for the full and reduced combined site RACe regression. The full final model R was significantly different than zero after five steps $F(5, 703) = 83.97$, $p <.001$. The five variables included in the regression equation were belonging, personal control, extraversion, reactance, and risky lifestyle. The reduced final model R was significantly different than zero after five steps

$F(5, 703) = 115.85$, $p < .001$. The five variables included in the regression equation were the same as those for the full scale.

Insert Tables 16 and 17 about here

Combined site RACb regression. Tables 18 and 19 display the independent variables for each step, the partial r, model R, R^2, and t values for the full and reduced combined site RACb regression. The full final model R was significantly different than zero after seven steps $F(7, 701) = 83.60$, $p < .001$. The seven variables included in the regression equation were personal control, belonging, self-efficacy, extraversion, risky lifestyle, cognitive failures, and reactance. The reduced final model R was significantly different than zero after five steps $F(5, 703) = 110.58$, $p < .001$. The five variables included in the regression equation were the same as those for the full scale with the exception of cognitive failures and reactance.

Insert Tables 18 and 19 about here

Effect of Reducing the Combined Site Survey on RAC

The extent to which the reduced combined site survey predicted RAC differently than the full combined site survey was tested using Steiger's (1980) z test for the difference between r_{ya} and r_{yb}. There was no significant difference between the reduced survey (R=.749) and the full survey (R=.752) for predicting RAC, z =.205, p>.05.

Cross Validation

Because there were a relatively large number of predictor variables (i.e., 9) used to predict RAC, the potential for capitalizing on chance could lead to an inflated R. Therefore, the site showing the best reduced RAC regression coefficient (i.e., WA) was

cross validated (e.g., Stevens, 1992) using the reduced RAC regression data from the remaining three sites (i.e., TX, TN, GA). As can be seen from Table 20, the R^2 from the cross validation of the WA regression with TX, GA, and TN were .25, .47, and .41 respectively, with an average R^2 of .38.

Although the WA data showed the highest R^2 (i.e., .63) when predicting RAC, it included predictors not hypothesized to predict RAC (i.e., risky lifestyle and cognitive failures). The GA data showed an R^2 (i.e., .60) nearly as high as WA but with no predictors not hypothesized to predict RAC. Therefore, the GA regression equation was cross validated using the reduced regression data from the remaining three sites (i.e., TX, WA, and TN). As can be seen from Table 21, the R^2 from the cross validation of the GA regression with TX, WA, and TN were .30, .55, and .52 respectively, with an average R^2 of .46. Therefore the regression model more closely related to the AC theory resulted in the highest cross validations.

Insert Tables 20 and 21 about here

Determining SCS Factors

A common (i.e., Maximum-Likelihood) factor analysis was performed through SPSS (Norusis, 1990) on 8 combined site reduced scales (i.e., belonging, personal control, self-efficacy, self-esteem, optimism, reactance, extraversion, and cognitive failure). Risky lifestyle was not included in this analysis because it had a very low communality (i.e., .02), indicating the factors explained almost none of the variance in risky lifestyle scores.

Bartlett's test of sphericity (1797.99, $p>.01$) indicated the correlation matrix was an identity matrix. Therefore, the data sample was from a normal multivariate

population. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was quite high (.85).

As seen in Table 22, two factors were extracted based on the SPSS default (i.e., eigenvalues greater than 1). Inspection of the scree plot also indicated the presence of two factors. The combination of both factors accounted for 59 percent of the total variance in subscale scores.

After oblique (i.e., oblimin) rotation and using a factor loading cutoff of .30, Factor 1 was uniquely defined by belonging, extraversion, and personal control. Optimism also loaded positively on Factor 1. Factor 2 was uniquely defined by cognitive failures and reactance. Self-esteem and optimism loaded negatively on Factor 2. There was a moderately high correlation between Factors 1 and 2 (r= -.34).

Factor scores were created using the SPSS default (i.e., Regression Method). Factor scores for both factors were entered into a simple regression to predict RAC. As can be seen from Table 23, Factor 1 was more predictive of RAC (R^2=.46) than was Factor 2 (R^2=.10), z = 6.7, p<.01.

Insert Table 22 and 23 about here

Predicting Injury Index

A stepwise multiple regression was performed with the combined site injury index score as the dependent variable and the ACS subscales (i.e., self-esteem, self-efficacy, optimism, personal control, group belongingness, and extraversion) and RPS subscales (i.e., risky lifestyles, cognitive failures, and psychological reactance) as the independent variables. Table 24 displays the independent variables for each step, the partial r, model R, R^2, and t value for the reduced combined site injury index regression. The final model R was significantly different than zero after two steps $F(2, 706) = 19.66$,

$p < .001$. The two variables included in the regression equation were risky lifestyle and self-esteem.

Insert Table 24

Injury Index MANOVA.

Because the results of the regression to predict the injury index was disappointing, another approach to determining individual difference variables relevant to injury was used. A multivariate analysis of variance (MANOVA) was performed on eleven dependent variables: belonging, personal control, self-efficacy, reactance, self-esteem, extraversion, risky lifestyle, cognitive failures, optimism, RAC, and safety perceptions. Independent variables were injury index (low, medium, and high) and site (GA, TN, TX, and WA).

Table 25 presents the summary results of the MANOVA. With the use of Wilks' criterion, the combined dependent variables were significantly affected by both injury index, $F(22, 1374) = 2.16$, $p < .001$, and site, $F(33, 2024) = 1.50$, $p < .033$, but not by their interaction, $F(55, 3183) = 1.32$, $p > .05$.

Insert Table 25 About Here

To investigate the impact of the independent variables on the individual dependent variables, univariate analysis of variances were performed. As can be seen in Table 26, nine variables--personal control, self-efficacy, reactance, self-esteem, risky lifestyle, cognitive failures, optimism, and safety perceptions showed significant differences across injury index scores.

Insert Table 26 About Here

Post hoc tests were performed to determine the significant differences occurring between injury index scores for each dependent variable. Table 27 lists each dependent variable, the mean differences between high, medium, and low injury index scores, and the Student's t statistic. Individuals with higher reported injury index scores had lower personal control, self-efficacy, optimism, and self-esteem scores and reported higher reactance, cognitive failures, and risky lifestyle scores. There were no differences in belonging or extraversion scores between those with high medium or low injury index scores.

Insert Table 27 About Here

As can be seen in Table 28, univariate analysis of variances indicated 10 variables (personal control, optimism, self-esteem, belonging, cognitive failures, extraversion, risky lifestyle, safety perceptions, actively caring, and injury index) showed significant differences across sites.

Insert Table 28 About Here

Post hoc tests were performed to determine the significant differences occurring between sites for each dependent variable. Table 29 lists each dependent variable, the mean differences between the WA, TN, GA, and EX site scores, and the Student's t statistic. There was no clear trend regarding the dependent variables and site.

Insert Table 29 About Here

Focus and Type of AC for Each Site

The focus (i.e., person, behavior, or environment) and level (i.e., should, willing, or often) of AC for each site (i.e., WA, TX, TN, and GA) was assessed using a three-way ANOVA. Table 30 contains the means for each condition. As can be seen in Table 31 there were significant main effects for site, $F(3, 6368) = 23.53$, $p < .001$, focus, $F(2, 6369) = 8.47$, $p < .001$, and level, $F(2, 6369) = 76.86$, $p < .001$. There were also significant two-way interactions between site and focus, $F(6, 6365) = 9.52$, $p < .001$ and between focus and level, $F(4, 6367) = 41.59$, $p < .001$. There was no three-way interaction.

The focus, level, and site main effect and interaction effect graphs are depicted in Figure 2. Environment and person-focused AC were higher than behavior-focused AC. Furthermore, workers felt they should actively care more than they were willing to actively care, and they were willing to actively care more than they actually did (i.e., often) actively care.

The focus by level interaction graph indicates employees were most willing to actively care from a behavior-focus, yet least likely to report they actually did (often) actively care from a behavior-focus.

Insert Table 30-31 and Figure 2 About Here

Post hoc tests were performed to determine the significance of differences between the AC focuses and AC Levels. Tables 32 lists the mean differences and Student's t for each AC focus and level.

Insert Table 32 About Here

Planned multiple comparisons were then performed to determine the significance of differences between the behavior/willing and the person/willing AC, the behavior/willing and environment/willing AC, and the behavior/often and environment/often AC. As seen in Table 33, these comparisons showed the subjects reported the most willingness to actively care from a behavior-focus yet were least likely to report they often actively care from a behavior-focus.

Insert Table 33 About Here

The Safety Perception Scale Factors

A common (i.e., Maximum-Likelihood) factor analysis with oblique (i.e., oblimin) rotation was performed through SPSS on the individual questions from the combined site SPS. Five factors were extracted based on eigenvalues greater than 1 as well as inspection of the scree plot. However, only the first three factors formed interpretable categories. Factor 1 included Questions 4, 5, 7, 12, 13, 17, 25, 30, 32, 35, and 36, and can be interpreted as "management support for safety". Factor 2 included Questions 1, 2, 6, 10, 22, and 34 and can be interpreted as "peer support for safety". Factor 3 included Questions 9, 19, 27, 38, and 41 and can be interpreted as "personal responsibility for safety". Questions making up each factor are listed in Table 34

A common factor analysis with oblimin rotation was performed again, including only those items from the first three factors (i.e., management support for safety, peer support for safety, and personal responsibility for safety). Both the scree plot and eigenvalues greater than 1 indicated the presence of three factors. The combination of all

three factors accounted for 44.6 percent of the total variance in question scores. Bartlett's test of sphericity (4262.80, p>.01) indicated the correlation matrix was an identity matrix. Therefore, the data sample was from a normal multivariate population. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was high (.91).

As seen in Table 35, using a factor loading cutoff of .40, Factor 1 was uniquely defined by Questions 4, 5, 7, 12, 13, 17, 25, 30, 32, 35, and 36. Factor 2 was uniquely defined by Questions 1, 2, 6, 10, 22, and 34. Factor 3 was uniquely defined by Questions 9, 19, 27, and 38 . There was a moderately high correlation between Factors 1 and 3 (r= .36). There were lower correlations between Factors 1 and 2 (r= .21) and between Factors 2 and 3 (r= .18). The items included in the three factors of this analysis matched those extracted from the first three factors of the original five-factor analysis, with the exception that Question 41 failed to load on Factor 3.

Insert Tables 34-35 About Here

Perceptions of Risk and Safety Perception Interaction

A two-way analysis of variance was performed to test the interaction between the perception of risk (high, medium, and low) and the safety perceptions (high medium and low) on RAC. Perception of risk was operationalized by the average response to questions 3--*The risk level of my job concerns me quite a bit* and 23--*Compared to other plants, I think mine is rather risky*. Safety perceptions were operationalized by the SPS. Furthermore, the SPS can be broken down into three major factors; management support for safety, peer support for safety, and personal responsibility for safety. Therefore, three additional two-way ANOVAs were performed; one for each SPS factor.

As can be seen in Tables 36-37 and Figure 3, a two-way interaction was found between perception of risk and SPS for RAC, $F(2, 705) = 4.33$, $p < .01$. In other words,

when overall safety perceptions were high or medium there were no significant differences between RAC scores across high, medium, and low perceptions of risk. However, when overall safety perceptions were low, those who perceived risk as medium had significantly lower RAC scores than those who perceived risk as low, and those who perceived risk as high had significantly lower RAC scores than those who perceived risk as medium.

Insert Tables 36-37 and Figure 3 About Here

As can be seen in Tables 38-41, of the three SPS factors, an interaction was found only between management support for safety and perception of risk, $F(2, 705) = 9.09$, $p < .01$. Similar to the overall SPS interaction, when management support for safety was perceived as high or medium there were no significant differences between RAC scores across high, medium, and low perceptions of risk. However, when management support for safety was low, those who perceived risk as high had significantly lower RAC scores than those who perceived risk as low or medium.

Insert Tables 38-41 and Figure 3 About Here

Discussion

Reduction of SCS Items

Although most of the subscales of the SCS were adapted from established psychological measures, the scales were revised to better fit an industrial worker population. Furthermore, one of the practical concerns (e.g., disadvantages) of the full survey is that it was quite long, especially for an industrial worker population. During testing there were complaints from both managers and hourly workers about the length

of time needed to complete the survey (approximately 1 hour). One of the most frequent complaints was that many industrial workers (e.g., especially maintenance and operations personnel) are "doers" not "readers," and to ask them to sit for an hour to read and complete a written survey is aversive. Therefore, one of the goals of this research was to reduce the length of the full survey.

Interitem correlations were performed on each full subscale of the SCS as a reliability (i.e., internal consistency) measure. Cronbach's alpha was acceptable for each full scale ($\alpha > .70$) except for risky lifestyle ($\alpha = .55$). Risky lifestyle is an original scale co-developed by the author. To reduce the length of the survey, items with low interitem correlations were removed from each subscale. A total of 32 items were eliminated from the SCS, which increased the internal consistency of the SCS subscales. Therefore, all reduced scales had acceptable Cronbach's alphas, including risky lifestyle ($\alpha = .78$).

Although the reduced SCS had a higher internal consistency than the full SCS, this was no guarantee the reduced survey would predict AC to the same extent as the full survey. Therefore, separate stepwise multiple regressions were performed using both the full and reduced SCS subscales as predictors of RAC. The full scale combined site stepwise multiple regression was slightly higher when predicting RAC using eight predictors than the reduced scale regression which included seven predictors.

Because the regression coefficient, when predicting RAC, was slightly less for the reduced survey than for the full survey, the two final regression coefficients were compared. Steiger's (1980) z test for the difference between r_{ya} and r_{yb} showed the difference was not significant when predicting RAC between the reduced (R=.749) and full (R=.752) surveys. Therefore, because the reduced survey showed a higher internal consistency and predicted RAC just as well as the full SCS with fewer questions, the remainder of analyses discussed in this paper used the reduced SCS.

Support for the AC Model

The Geller et al. (1990) multiple intervention level (MIL) hierarchy is a system for categorizing behavior change techniques into multiple levels or tiers, each level defined by its intrusiveness and cost-effectiveness. At the top of the MIL hierarchy (i.e., Level 1), the interventions are least intrusive and target the maximum number of persons for the least cost per person. At this level, intervention techniques (e.g., attempts to activate behaviors through signs, billboards, and public service announcements) are designed to have maximum large-scale appeal with minimal personal contact between target individuals and intervention agents. Geller et al. hypothesized that those individuals uninfluenced by initial exposure to these types of interventions (i.e., Level 1) will be uninfluenced by repeated exposures to interventions at the same level. These individuals require a more intrusive and costly (i.e., higher level) intervention.

Higher level (and more influential) intervention processes require increased costs in terms of materials and personnel (i.e., intervention agents). Compared to signs, lectures, and policy statements, for example, an observation and feedback process changes the behavior of more individuals; but such programs are much more costly to implement with regard to personnel, materials, and effort. When it is important to develop and implement higher-order (i.e., more intrusive and costly) intervention processes (e.g., when employees are not influenced in positive directions by lower level interventions), these higher-level intervention processes require the active assistance of many employees. The actively caring (AC) model was designed as a heuristic to identify person variables related to becoming an intervention agent for organizational behavior change and to develop intervention strategies for increasing the probability that employees will become intervention agents.

All six of the variables (which were all intercorrelated) hypothesized to influence AC correlated significantly with RAC. Therefore, the AC person factors predicted

overlapping variance in propensity to actively care with personal control and belonging having the most predictability. As shown by the combined site stepwise regression, five of the seven variables hypothesized to influence RAC (i.e., belonging, personal control, extraversion, self-efficacy, and optimism) predicted independent and significant variance in employees' reported willingness to actively care (i.e., they were included in the combined site stepwise regression). Two of these variables (belonging and personal control) were included in the regression of all four individual industrial sites.

Although most of the SCS scales were intercorrelated, the average correlation among the SCS scales hypothesized to predict RAC ($r=.45$) was higher than the average correlation between the RAC subscales and the scales hypothesized not to predict AC ($r=.29$), $t(23) = 2.95$, $p<.01$. These correlation patterns can be used as evidence for convergent (e.g. high correlations among variables hypothesized to predict AC) and divergent (e.g., low correlations between variables hypothesized to predict AC and variables not hypothesized to predict AC validity. Furthermore, the average correlation between the variables hypothesized to predict AC with RAC ($r=.45$) was higher than the average correlation between variables not hypothesized to predict AC with RAC ($r=.27$), $t(6) = 2.7$, $p<.05$. Therefore, moderate support for construct validity was shown for propensity to actively care.

Because there were a relatively large number of predictor variables (i.e., 9) used to predict AC, the potential for capitalizing on chance could lead to an inflated R. Therefore, the site showing the best reduced total regression equation (i.e., WA) was cross validated (e.g., Stevens, 1992) using the reduced regression data from the remaining three sites (i.e., TX, TN, GA). Although the average R^2 (.38) was acceptable when using the regression equation from WA for the cross validation, it included variables not hypothesized to predict AC (i.e., risky lifestyle, and cognitive failures). When using the regression equation from TN, which showed an R^2 nearly as high as WA

but with no predictors not hypothesized to predict RAC, the average $\underline{R}^2$ was .46 for the cross validations. Therefore the regression model more closely related to the AC model resulted in the best cross validation.

Further support for the AC model came from the factor analysis. Factor 1 was uniquely defined by only subscales hypothesized to predict AC (i.e., belonging, extraversion, and personal control). Factor 2 was uniquely defined only by subscales hypothesized to predict the injury index (i.e., cognitive failures and reactance). Furthermore, the factor scores were entered into a simple regression to predict RAC for both Factor 1 and Factor 2. Factor 1 was more predictive of RAC (R^2=.46) than was Factor 2 (R^2=.10), $\underline{z} = 6.7$, $\underline{p}<.01$.

The current study demonstrated there is a great deal of overlap between the separate ACS subscales, at least the way currently operationalized. Future studies with alternative operationalizations of the AC person factors might reveal less or different intercorrelations. For example, when employees were asked to operationalize the ACS person factors by listing procedures and situations that increase and decrease these states, substantial overlap between lists have been found (Geller, 1991). When employees were asked to suggest action strategies for increasing self-esteem, optimism, and personal control, the same basic strategies were suggested for each concept (e.g., increase positive recognition programs, listen actively with empathy, set realistic and trackable goals, treat others with respect, consider safety as achievement rather than loss-control, hold people accountable for processes to reduce injuries rather than the company's injury rate, and celebrate "small win" accomplishments of safety achievement goals). However, when asked to derive operational definitions and action strategies for self-efficacy and belonging, employees have made several suggestions unrelated to the lists developed for the other AC factors. The need to give employees sufficient training, resources, and time to complete their assignments, for example, was prompted by the

self-efficacy construct. Group activities, group goals, and group feedback were listed as methods to increase belonging. Thus, discussions with employees regarding ways to increase AC behaviors have resulted in operational definitions that suggest intercorrelations different from those found in the current study. Therefore, research is needed to define the AC factors in various ways, manipulate the factors for individuals and groups, and assess the effects of the various manipulations on AC behaviors.

The Effects of Site on ACS and RPS Subscales

Although the univariate analysis of variances indicated significant differences across sites for the various ACS and RPS subscales, there were no clear patterns. In other words, the site with the highest RAC score (i.e., TN) did not show the highest personal control, self-efficacy, optimism, self-esteem, and belonging scores and the site with the highest injury index (e.g., WA) did not have the highest reactance, cognitive failures, and risky lifestyle scores. Therefore, at this point within site or within individual comparisons of the ACS and RPS scores seem to be more meaningful than between site comparisons.

Focus and Level of AC for Each Site

Overall, employees reported more environment and person-focused AC than behavior-focused AC. Furthermore, workers felt they should actively care more than they were willing to actively care, and they were willing to actively care more than they often did actively care.

The focus (i.e., person, environment, or behavior) by level (i.e., should, willing, or often) interaction indicated employees were most willing to actively care from a behavior-focus, yet least likely to report they often did actively care from a behavior-focus. In other words when AC from an environment or person-focus, employees actually did (i.e., often) actively care as much as they reported being willing to actively care. However with behavior-focused AC, employees were most willing to actively care

but reported doing so least often. Therefore, there seems to be something different about behavior-focused AC compared to person and environment-focused AC. Based on being most willing to actively care from a behavior-focus, it can be inferred that employees either feel it is most important or easiest to do. However, since employees reported doing behavior-focused AC least often, it is probably not seen as the easiest to do. Therefore, given that behavior-focused AC is most important to employees, yet done least often, it has the most potential for being increased. This is a promising finding because, as mentioned earlier, behavior-focused AC is seen as most important for reducing workplace injuries. However, to bring out the potential improvements in industrial safety, training is probably needed to give employees information on what types of behaviors to look for, how to observe properly the behaviors, and communication and assertiveness skills for giving safety related feedback.

Safety Perception by Risk Perception Interaction

When training AC related concepts and behaviors in organizations it is important to take a systems approach. For example, as mentioned previously, one goal of increased AC is to increase the salience of dangers and hazards in the work environment. If this is done in an organizational culture perceived as unsupportive of safety efforts, the increased salience of the dangerous work environment could lead to a fatalistic outlook or learned helplessness. On the other hand, if hazards are made more salient in a culture seen as supportive of safety efforts, increased participation in safety efforts (i.e., RAC) could be more likely (Goldberg et al., 1991).

Overall, those who perceived low risk (as defined by averaging the two questions from the SCS which referred to perceptions of risk in the workplace --*The risk level of my job concerns me quite a bit* and *Compared to other plants, I think mine is rather risky)* had higher RAC scores than those who perceived high risk. Furthermore, those with high safety perceptions (i.e., high SPS scores) had higher RAC scores than those with low

safety perceptions. However, for employees with low safety perceptions, those with high perceptions of risk had lower RAC scores than those with low perceptions of risk. When safety perceptions were perceived as medium or high, the level of risk had no effect. The interaction of risk perception with safety perception was explored further by looking at the three different SPS factors of management support for safety, peer support for safety, and personal responsibility for safety. Of the three SPS factors, the SPS by risk level interaction seemed to be due mostly from the management support for safety factor. This is because an interaction similar to that of the SPS by risk perception was also found with the SPS factor of management support for safety. In other words, when management support was perceived as low, those with higher perceptions of risk had lower RAC scores. When management support was medium or high, risk level had no effect on RAC. There was no peer support by risk level interaction and no meaningful personal responsibility by risk perception interaction.

The safety perception by risk perception interactions seem to indicate that when the support for safety efforts are low, especially from management, attempts to increase the perception of on-the-job risk could be harmful. However, even though no benefits regarding RAC were obtained by increased perception of risk, and increased risk only seemed to decrease the level of AC, caution should be used if considering efforts to make the workplace seem safer than it really is. It should be restated that AC refers primarily to looking out for others, not for one's self. This study did not consider the effects of risk perception on self-protecting behaviors or attitudes. Therefore, although attempts to decrease the perception of risk might lead to increased AC, it might also make workers less cautious and pay less attention to hazards concerning themselves. Therefore, in addition to increasing the AC person factors, AC could be increased through increasing the perception of support for safety efforts, especially management support.

Incorporating the AC Person Factors into a Behavioral Framework

Consistent with attempting to integrate behavior-based and person-based psychology, it is important to determine how increasing the AC person factors leading to increased AC fits into a behavioral framework. One possible explanation of how the AC person factors function is to consider them as establishing operations (i.e., setting events). A setting event is an environmental event, operation, or stimulus condition that affects an organism by altering (a) the reinforcing effectiveness of other events and (b) the frequency of occurrence of that part of the organism's repertoire relevant to those events as consequences (Michael, 1993). In other words, setting events are conditions which make rewards more or less reinforcing. For example, if a person has not eaten in a few hours, this is a setting event which increases the reinforcement value of food. Along these lines, having a high sense of belonging could set the stage for other-directed behavior or make helping someone more reinforcing. Furthermore, if you like certain people (e.g., members of your in-group), helping these individuals is likely to be more reinforcing than if you do not like them or have neutral feelings towards them.

Likewise, feelings of self-efficacy ("I can do it"), personal control ("I'm in control"), and optimism ("I expect the best") could make job enrichment (i.e., expanded duties and the offer of new challenges) more reinforcing. If someone with low self-efficacy, personal control, and optimism is given new challenges, the person will probably feel a low probability of receiving a rewarding consequence (intrinsic or extrinsic) for completing the task. In most organizations, looking out for your coworkers by observing and giving feedback on behaviors can be seen as a new challenge or added responsibility. Furthermore, common complaints regarding the implementation of an AC process are that workers feel they do not know another's job enough to give specific feedback, or that they are not effective communicators. Therefore, for individuals low in self-efficacy, personal control, and optimism, the response cost for AC would be higher

(e.g., the effort greater in relation to the probability of receiving a reward), therefore, less likely to occur than for individuals high in these AC person factors.

Therefore, on a regular short term basis (e.g., daily, weekly) it is suggested the best way to control or motivate safe behaviors is to focus (i.e., target and measure) behaviors directly. As mentioned before, if this is done in a way which considers relevant person factors (e.g., personal control, self esteem, belonging, etc.) subsequent attitude change is likely, which will in turn lead to a maintenance or increase in desired behavior. However, consistent with the safety triad (Geller et al., 1990), when attempting to change behavior in a way which also promotes relevant person factors, these person factors should also be measured. However, it is not practical to measure person factors systematically on a regular short term basis. Therefore, it is suggested that relevant person factors be measured on a regular long term basis (e.g., semi-annually, annually) or after significant behavior-change efforts to determine whether the behavior-based interventions are being implemented in a way which support relevant person factors.

Assessing Risk Propensity

A secondary goal of the current research was to assess the validity of the risk propensity scale (RPS). However, the regression analysis predicted less than seven percent of the variance in injury index scores. One reason for the lack of criterion-related validity could have been restriction of range. Most of the injury index scores were low and medium, with very few high scores. Therefore, the injury index scores were divided into high, medium and low. A MANOVA was then performed on eleven dependent variables: belonging, personal control, self-efficacy, self-esteem, optimism, extraversion, reactance, cognitive failures, risky lifestyle, RAC, and safety perceptions. Independent variables were injury index (low, medium, and high) and site (GA, TN, TX,

and WA). Bartlett's test of sphericity indicated the correlation matrix was an identity matrix, meaning the data sample was from a normal multivariate population.

With the use of Wilks' criterion, the combined dependent variables were significantly affected by both injury index and site but not by their interaction. As hypothesized, individuals with higher reported injury/accident rates had significantly higher reactance, cognitive failures, and risky lifestyle scores. Furthermore, individuals with higher reported injury/accident rates had significantly lower personal control, self-efficacy, optimism, and self-esteem scores. However, there were no significant differences in belonging or extraversion scores between those with high medium or low injury index scores. One explanation for no differences across RPS scores for belonging and extraversion is the possibility of an interaction between these factors and injury. For example, it is reasonable that a person involved in a higher than average number of injuries or illnesses would feel a decreased sense of self-efficacy (e.g., the person has shown he or she cannot "do it", at least safely), a decreased sense of personal control (e.g., an injury is an example of lost control), and a decreased sense of self-worth or self esteem (e.g., especially if the person cannot work and must survive through some type of public assistance).

However, an interaction could explain the lack of a main effect of injury on belonging and extraversion. For example, individuals who have been injured might bond together through common experiences and seek the company of others for strength and social support. On the other hand, individuals who have a higher than average injury rate might feel embarrassed and be less likely to want to interact with others. Therefore, individuals who score high versus low on extraversion and belonging measures might be expected to react differently to having a high rate of injury. For example, those high in belonging and extraversion might seek the social support of others, whereas those low in extraversion and belonging might tend to decrease their contact with others after injuries.

Future research could be conducted in this area by tracking the ACS measures as well as the injury index scores over time, and assessing how individuals whose injury index scores change over time change on the ACS measures. It could be hypothesized that individuals high in belonging and extraversion during early measures who subsequently show increased injury index scores would show even higher levels of extraversion and belonging, whereas individuals initially low in belonging and extraversion would show lower belonging and extraversion scores after increased injury.

Practical Applications of the SCS

In addition to serving as a research tool, the SCS could be of practical use to industry. It could be used as a measure to check the current level of relevant person factors shown to be related to AC behaviors, as well as to gauge the perceived level of support for safety efforts from management and employees. Furthermore, if individuals indicate their work group on the SCS (e.g., maintenance, operations, support staff, foreman, manager), then groups with low SCS scores could be targeted for intervention. Follow-up surveys could then be used to assess the effectiveness of interventions targeted at these individual work groups as well as entire companies.

One reason it is important to measure factors other than injury rate when assessing industrial safety efforts is that injuries occur so infrequently that there is often too little variability in injury rates to see meaningful changes, especially in the short term. Therefore, only using outcome measures of safety (e.g., the number of injuries) to gauge the success of safety programs is not optimal. In addition to the monitoring of on-the-job behaviors, if the SCS was given on a continuous basis (e.g., annually or before and after the implementation of new safety programs) it could be an important part of the upstream evaluation process to reduce workplace injuries. Appendix C gives a sample report submitted to an industrial site after administration of the SCS.

Notes of Caution

Because many SCS scales were predictive of reports to actively care and there were differences in RPS scores according to injury rate (i.e., injury index scores), it might seem tempting to use the SCS to identify individuals in order to select safe employees or to target certain individuals for intervention. However, it is not suggested that any part of the SCS be used for the purpose of personnel selection. The SCS was given to employees under the assumption that individuals would not and could not be identified. The demand characteristics of the SCS would be very different if employees believed it would be used to make personnel decisions such as hiring, firing, or promotions. The questions from many of the subscales seem transparent enough that given the strong motivation to present ones self as low risk or willing to actively care, it should be possible to do so.

Furthermore, although the ACS subscales predicted significant variance in RAC, it should be emphasized that the current study did not incorporate a methodology to allow causal relationships to be shown. It is not known whether helping others leads to a healthier personality, whether those with a healthier personality are more likely to help others, or if other factors lead to both.

Lessons Learned, Suggested Revisions to the SCS, and Follow-Up Research

One problem with this study was the relatively low SCS return rate for the TX plant (41.6%). A probable reason for the low return rate was that no specific time was set aside where employees were administered the survey. Employees were only told the survey was available and they were urged to take it on their own time by their supervisors. In order to gain an acceptable return rate in the future, the problems with low return rates such as restriction of range through only certain types of employees responding (e.g., those who want to give management a piece of their mind vs. those who feel most positively about the organization) should be stressed to management.

This information might make it more likely that resources will be allocated to create a situation where a high return rate is probable.

Because common method variance is always a potential problem as an alternative explanation for criterion-related validity when assessing predictor and criterion variables using the same method (e.g., both from the same survey), it is important to incorporate controls to reduce this as an explanation for results. The incorporation of scales hypothesized not to relate to AC in addition to scales hypothesized to relate to AC in the current study was an attempt at this, however, more could have been done.

For example, although not included in the version of the SCS used in the current research, subsequent administrations of the SCS will include items from the Crowne and Marlow (1960) social desirability scale. A lie scale will also be added to the SCS. Therefore, follow up studies using the SCS could control for the amount of variance in criterion scores as a result of employees simply attempting to present themselves in the most positive light. Furthermore, error variance could be reduced by eliminating surveys completed with high lie scores, which could indicate dishonest or random answering of questions.

Furthermore, there were person factors hypothesized not to predict AC which were significantly correlated with RAC and also entered into some of the regression equations to predict RAC (e.g., reactance, cognitive failures, risky lifestyle). Risky lifestyle and cognitive failure, although entered into the regression equation to predict RAC, did not show strong correlations with RAC (e.g., r= -.23 & -.21, respectively). Reactance, on the other hand, did show a relatively high correlation with RAC (r= -.38). Although reactance was not hypothesized to be a significant predictor of RAC, the negative relationship between reactance and willingness to go beyond the call of duty for occupational safety is reasonable from post hoc considerations. Specifically,

occupational safety is often perceived as following top-down policies and mandates, and compliance with safety rules is typically managed with fault-finding investigations, interpersonal confrontations, discipline sessions, and letters of condemnation. Given a top-down, rule-enforcement perception of corporate safety, it seems reasonable that persons scoring high on reactance would be relatively unwilling to go beyond the call of duty and actively care for the safety of other employees.

Along these lines, Ludwig and Geller (1992) compared a top-down directive approach to increasing safety belt use among pizza delivery drivers with a participative consensus-building approach. They found the consensus method led to more long term safety belt use. Furthermore, one individual, presumably high in reactance, used his safety belt 100 percent of the time before the directive intervention. However, when the intervention began, this individual dropped to near zero percent belt use and remained there throughout the intervention and follow-up phases of the study.

Furthermore, as suggested by Greenberger, Porter, Miceli, and Strasser (1991) members of vulnerable populations, such as entry level and hourly workers, might be less likely to assert their personal control in such situations by speaking out and expressing their opinions, but instead might participate in an attempts to sabotage new programs. Thus, the post hoc interpretation of the current findings warrants an extension of the AC model. Future tests of the AC model will include reactance as a predictor of propensity to actively care.

Perhaps the most important follow-up research to be done regarding AC should focus on two separate but related areas. First, research should be accomplished to assess what specific activities, if any, lead to changes in ACS factors. Some person factors (e.g., self-efficacy) might be relatively easy to change over the short term (e.g., weeks or months), whereas others (e.g., self-esteem) might be more stable. Second,

research is needed to determine if changes in the ACS factors lead to increased actual AC behaviors.

Furthermore, follow-up research regarding risk propensity should not only focus on additional testing of the RPS variables, but also on the ACS variables found to differentiate high vs. low injury index scores (e.g., personal control, self-efficacy, optimism, and self-esteem). No other studies have been found relating these or similar person factors to injury involvement.

Summary

The SCS was shown to be a reliable tool to assess person factors related to actively caring for safety. After eliminating 32 items from the survey, inter-item correlations were either maintained or increased for each SCS subscale. The administration of the reduced SCS should now take approximately 45 minutes versus an hour to take the full SCS.

The SCS also showed criterion-related validity. The significant correlations between the ACS factors and RAC are evidence for concurrent validity (e.g., the predictor variables were predictive of the criterion, which were both measured concurrently).

The construct validity of the AC model was supported in a general way. The factor analysis revealed one AC factor (uniquely defined by belonging, extraversion, and personal control) and one risk propensity factor (uniquely defined by cognitive failures and reactance). Furthermore, the ACS measures were more highly correlated with each other than with measures from the RPS (i.e., variables hypothesized not to predict AC), and the correlations between the ACS measures and RAC were higher than the correlations between the RPS measures and RAC. Therefore, while more work is needed to determine the construct validity of the AC model, the current study does lend general support for a construct of propensity to actively care.

There were two very interesting interactions found among SCS variables. The interaction between focus of AC (behavior, person environment) and level of AC (should, willing, often) indicated employees were most willing to actively care from a behavior-focus, yet least likely to report they often did actively care from a behavior-focus, indicating a large potential to increase behavior-focused AC. In addition, the interaction between perceived level of support for safety and perception of risk showed that for employees with low safety perceptions (i.e., low SPS scores), those with higher perceptions of risk were least likely to actively care compared with employees who perceived their jobs as less risky. However, when safety perceptions were medium or high, level of risk had no effect. This indicated the importance of efforts to increase the visible support of safety efforts and of assessing safety perceptions before introducing interventions to increase the salience of hazards.

Furthermore, the stepwise regressions to predict injury rate (i.e., injury index scores) with RPS scores were disappointing, only explaining 5.4 percent of variance in injury index scores. However, when injury index scores were divided into high, medium, and low, significant differences were found in expected directions in all measures except extraversion. Therefore, although more exploratory work is needed to determine the person factors which relate to increased injury, the current study did lend support to several potential predictors of future injury rate.

Conclusions

The SCS is presented as a reliable and valid research tool, especially for the study of person factors related to AC attitudes and behaviors, the further exploration of person factors related to injury rate, and exploring the interactions found between focus and level of AC and between risk perception and perception of safety support from management. Furthermore, the SCS is presented as a practical applied tool for industry to assess the levels of person factors related to AC behaviors, to assess the perception

of management, peer, and personal responsibility for safety efforts for entire plant populations as well as across various work groups, and to help evaluate interventions designed to bring about a safer workplace.

Follow up research regarding the AC concept should include the study of possible ways of increasing the AC factors as well as using the SCS to assess these changes and their relation to the degree of AC. Furthermore, most research regarding injury propensity, as well as the current study, used concurrent measures as dependent variables (e.g., dependent variables were measured at the same time as independent variables). Criterion-related validity studies should be done for both ACS and RPS measures using criterion variables taken subsequent to predictor variables (e.g., predictive validity studies). Future research should also include behavioral indicators of AC to supplement to self-report measures.

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Table 1

Each SCS Scale, the Number of Full Scale Items, Cronbach's Alpha for the Full Scale, the Number of Items Deleted, and Cronbach's Alpha for the Reduced Scale

Scale	Full # of Items	Full Scale Alpha	# of Items Deleted	Reduced Scale Alpha
Personal Control	18	.75	5	.76
Self-Efficacy	22	.87	8	.88
Reactance	11	.72	3	.75
Optimism	7	.75	0	.75
Self-Esteem	9	.72	1	.76
Cognitive Failures	13	.86	0	.86
Extraversion	9	.71	2	.75
Risky Lifestyle	12	.55	4	.78
Safety Perception	32	.84	6	.87
Belonging	13	.86	3	.86

Table 2

Full and Reduced Survey Alpha for Each SCS Scale for Each Company

Scale	WA		EXXON		TN		GA	
	Full α	Red α	Full α	Red α	Full α	Red α	Full α	Red α
Pers.Control	.75	.76	.76	.70	.79	.78	.75	.77
Self-Efficacy	.82	.86	.89	.86	.85	.87	.88	.90
Reactance	.76	.77	.78	.79	.67	.71	.70	.74
Optimism	.72	--	.81	--	.70	--	.76	--
Self-Esteem	.70	.74	.75	.78	.60	.63	.76	.81
Cog. Failures	.85	--	.86	--	.85	--	.87	--
Extraversion	.77	.80	.73	.75	.67	.71	.66	.72
Risky Lifestyle	.54	.73	.60	.72	.61	.77	.59	.84
Safety Percep.	.82	.84	.86	.89	.84	.87	.86	.89
Belonging	.79	.85	.89	.89	.81	.79	.88	.87

Table 3

The Intercorrelations Among the Combined Site ACS Variables, RPS Variables, and Criterion Variables (n=709)

	Bel	P. Cont	S. Eff	S. Est	Opt	Extra	R. Life	React	Cog. F	Inj Ind	RAC
Variables Hypothesized to be Related to AC (ACS)											
Belonging	-										
Pers. Control	.36	-									
Self-Efficacy	.38	.48	-								
Self-Esteem	.36	.41	.62	-							
Optimism	.43	.41	.52	.52	-						
Extraversion	.31	.22	.33	.28	.19	-					
Variables Hypothesized not to be Related to AC (RPS)											
Risky Life	-.18	-.10	-.14	-.09	-.19	.06	-				
Reactance	-.33	-.26	-.46	-.31	-.34	-.15	.26	-			
Cog. Failures	-.19	-.33	-.57	-.53	-.40	-.14	.08	.33	-		
Criterion Variables											
Injury Index	-.10	-.13	-.09	-.14	-.14	-.05	.19	.13	.11	-	
RAC	.55	.52	.46	.37	.35	.43	-.23	-.38	-.21	-.08	-

All correlations are significant at the .01 level except extraversion with risky lifestyle and extraversion with injury index.

Table 4

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and Combined RAC as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	F
1	Belonging		.59	.34	368.70 *
2	Personal Control	.44	.69	.47	313.51 *
3	Extraversion	.13	.72	.51	248.18 *
4	Self-Efficacy	.20	.73	.53	200.32 *
5	Risky Lifestyle	-.18	.74	.55	169.72 *
6	Cognitive Failures	.12	.74	.55	145.20 *
7	Reactance	-.14	.75	.56	128.92 *
8	Optimism	-.09	.75	.57	114.12 *

* $p < .05$

Table 5

Summary Results from the Multiple Stepwise Regression Analysis with the Reduced Actively Caring Person Factors as the Independent Variables and Combined RAC as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	F
1	Belonging		.58	.34	362.49 *
2	Personal Control	.44	.68	.47	307.28 *
3	Extraversion	.32	.72	.52	255.85 *
4	Risky Lifestyle	-.20	.74	.54	206.32 *
5	Self-Efficacy	.14	.74	.55	170.64 *
6	Cognitive Failures	.11	.74	.54	145.33 *
7	Reactance	-.13	.75	.56	127.94 *

* $p < .05$

Table 6

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and WA RAC as the Dependent Variable (n=157)

Step	Variable	Partial R.	Model R	R^2	F
1	Belonging		.65	.43	114.57 *
2	Extraversion	.40	.72	.51	81.72 *
3	Personal Control	.36	.76	.52	70.08 *
4	Risky Lifestyle	-.30	.79	.62	61.42 *
5	Cognitive Failures	.17	.79	.63	51.15 *
6	Self-Efficacy	.21	.80	.65	45.48 *

* $p < .05$

Table 7

Summary Results from the Multiple Stepwise Regression Analysis with the Reduced Actively Caring Person Factors as the Independent Variables and WA RAC as the Dependent Variable (n=157)

Step	Variable	Partial R.	Model R	R^2	F
1	Belonging		.62	.38	96.92 *
2	Personal Control	.44	.71	.51	78.78 *
3	Extraversion	.39	.76	.58	70.98 *
4	Risky Lifestyle	-.21	.77	.60	57.07 *
5	Cognitive Failures	.22	.79	.62	49.18 *
6	Optimism	.19	.80	.63	43.27 *

* $p < .05$

Table 8

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and TX RAC as the Dependent Variable (n=131)

Step	Variable	Partial R.	Model R	R^2	F
1	Belonging		.48	.23	38.38 *
2	Reactance	-.39	.59	.35	34.16 *
3	Personal Control	.33	.64	.42	30.03 *
4	Self-Efficacy	.23	.67	.45	25.38 *
5	Optimism	-.19	.68	.47	21.82 *

* $p < .05$

Table 9

Summary Results from the Multiple Stepwise Regression Analysis With the Reduced Actively Caring Person Factors as the Independent Variables and TX RAC as the Dependent Variable (n=131)

Step	Variable	Partial R.	Model R	R^2	F
1	Belonging		.48	.23	39.49 *
2	Reactance	-.41	.60	.36	36.14 *
3	Personal Control	.36	.67	.44	33.92 *

* $p < .05$

Table 10

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and TN RAC as the Dependent Variable (n=201)

Step	Variable	Partial R.	Model R	R^2	F
1	Personal Control		.61	.37	114.71 *
2	Belonging	.40	.68	.47	87.45 *
3	Reactance	-.22	.70	.50	64.72 *
4	Self-Efficacy	.19	.72	.51	51.73 *
5	Cognitive Failures	.25	.74	.54	46.41 *
6	Optimism	-.17	.75	.56	40.54 *
7	Risky Lifestyle	-.20	.76	.57	37.12 *
8	Extraversion	.18	.77	.59	34.15

* $p < .05$

Table 11

Summary Results from the Multiple Stepwise Regression Analysis with the Reduced Actively Caring Person Factors as the Independent Variables and TN RAC as the Dependent Variable (n=201)

Step	Variable	Partial R.	Model R	R^2	F
1	Personal Control		.57	.33	97.39 *
2	Belonging	.39	.65	.43	74.91 *
3	Self-Efficacy	.26	.68	.47	57.71 *
4	Risky Lifestyle	-.24	.71	.50	48.68 *
5	Extraversion	.29	.73	.54	45.58 *
6	Cognitive Failures	.17	.74	.55	39.94 *
7	Optimism	-.15	.75	.56	35.40 *

* $p < .05$

Table 12

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and GA RAC as the Dependent Variable (n=220)

Step	Variable	Partial R.	Model R	R^2	F
1	Self-Efficacy		.64	.41	150.90 *
2	Belonging	.46	.73	.54	124.69 *
3	Extraversion	.26	.26	.57	94.27 *
4	Personal Control	.22	.77	.59	76.73 *

* $p < .05$

Table 13

Summary Results from the Multiple Stepwise Regression Analysis with the Reduced Actively Caring Person Factors as the Independent Variables and GA RAC as the Dependent Variable (n=220)

Step	Variable	Partial R.	Model R	R^2	F
1	Belonging		.63	.39	140.93 *
2	Self-Efficacy	.44	.72	.51	113.91 *
3	Extraversion	.34	.76	.57	95.37 *
4	Personal Control	.27	.78	.60	80.80 *

* $p < .05$

Table 14

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and Combined RACp as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	t
1	Belonging		.53	.28	16.60 *
2	Extraversion	.32	.59	.35	8.89 *
3	Personal Control	.28	.64	.40	7.71 *
4	Risky Lifestyle	-.14	.64	.42	-3.76 *
5	Self-Efficacy	.11	.65	.42	2.92 *
6	Cognitive Failures	.13	.66	.43	3.48 *
7	Optimism	-.11	.66	.44	-2.88 *

* $p < .05$

Table 15

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and Reduced RACp as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	t
1	Belonging		.51	.26	15.90 *
2	Extraversion	.16	.60	.35	9.94 *
3	Personal Control	.27	.63	.40	7.44 *
4	Risky Lifestyle	-.16	.65	.42	-4.31 *
5	Cognitive Failures	.09	.65	.42	2.32 *
6	Self-Efficacy	.13	.66	.43	3.41 *
7	Optimism	-.09	.66	.43	-2.31 *

* $p < .05$

Table 16

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and Combined RACe as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	t
1	Belonging		.53	.28	16.54 *
2	Personal Control	.38	.62	.39	11.05 *
3	Extraversion	.23	.65	.42	6.39 *
4	Reactance	-.21	.67	.45	-5.76 *
5	Risky Lifestyle	-.11	.67	.45	-2.93 *

* $p < .05$

Table 17

Summary Results from the Multiple Stepwise Regression Analysis the Reduced Actively Caring Person Factors as the Independent Variables and Combined RACe as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	t
1	Belonging		.53	.28	16.54 *
2	Personal Control	.38	.62	.39	11.05 *
3	Extraversion	.23	.65	.42	6.39 *
4	Reactance	-.21	.67	.45	-5.76 *
5	Risky Lifestyle	-.11	.67	.45	-2.93 *

* $p < .05$

Table 18

Summary Results from the Multiple Stepwise Regression Analysis with the Full Actively Caring Person Factors as the Independent Variables and Combined RACb as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	t
1	Personal Control		.53	.28	16.74 *
2	Belonging	.37	.62	.38	10.42 *
3	Self-Efficacy	.25	.65	.42	6.99 *
4	Extraversion	.15	.66	.43	4.03 *
5	Risky Lifestyle	-.15	.67	.45	-3.91 *
6	Cognitive Failures	.09	.67	.45	2.50 *
7	Reactance	-.10	.67	.46	-2.54 *

* $p < .05$

Table 19

Summary Results from the Multiple Stepwise Regression Analysis with the Reduced Actively Caring Person Factors as the Independent Variables and Combined RACb as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	t
1	Personal Control		.53	.28	16.65 *
2	Belonging	.38	.62	.38	10.75 *
3	Extraversion	.23	.64	.42	6.24 *
4	Self-Efficacy	.16	.66	.43	4.17 *
5	Risky Lifestyle	-.14	.66	.44	-3.74 *

* $p < .05$

Table 20

TX, GA, and TN Regression to Predict RAC Cross Validated with WA Regression Equation

Site	R	R^2	F
TX	.50	.25	43.46 *
GA	.69	.47	194.69 *
TN	.64	.41	138.97 *
Average	.61	.38	

* $p < .05$

Table 21

TX, WA, and TN Regression to Predict RAC Cross Validated with GA Regression Equation

Site	R	R^2	F
TX	.55	.30	54.82 *
WA	.74	.55	190.85 *
TN	.72	.52	168.58 *
Average	.67	.46	

* $p < .05$

Table 22

Factor Loadings, Communalities, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, and Bartlett's Test of Sphericity for Common (i.e., Maximum-Likelihood) Factor Analysis with an Oblique (Oblimin) Rotation

Scale	F1	F2	Com
Belonging	.75	-.01	.56
Extraversion	.80	.26	.57
P. Control	.60	-.23	.51
Cog. Failures	.09	.86	.69
Reactance	.03	.68	.45
Optimism	.52	-.40	.57
Self-Efficacy	.48	-.55	.72
Self-Esteem	.48	-.55	.63
Eigenvalues	3.64	1.06	
% of Variance	46.60	13.30	

Table 23

Factor Scores for Factors 1 and 2 Entered into a Simple Regression to Predict RAC

Site	R	R^2	F
Factor 1 with RAC	.68	.46	599.90 *
Factor 2 with RAC	.32	.10	83.30 *

* $p < .01$

Table 24

Summary Results from the Multiple Stepwise Regression Analysis With the Reduced Actively Caring Person Factors as the Independent Variables and Injury Index as the Dependent Variable (n=709)

Step	Variable	Partial R.	Model R	R^2	t
1	Risky Lifestyle		.19	.04	5.21*
2	Self-Esteem	.13	.23	.05	-3.44*

* $p < .05$

Table 25

Summary Results from the Multivariate Analysis of Variance of AC Person Factors

Source of Variance	Wilks' Lambda	Hypoth. df	Error df	Multivariate F
Injury Index	.93	22	1374	2.16**
Site	.93	33	2024	1.50*
Injury Index by Site	.90	55	3183	1.32

** $p < .01$

* $p < .05$

Table 26

Summary Results from the Univariate Analysis of Variances for Each SCS Subscale Across Injury Index Scores

Scale	High Injury	Med Injury	Low Injury	Model df	Error df	F
Personal Control	43.18	48.96	49.60	2	705	6.30**
Self-Efficacy	46.27	53.23	53.21	2	705	4.98**
Optimism	21.63	23.40	24.61	2	705	6.75**
Self-Esteem	27.54	30.56	31.44	2	705	5.47**
Belonging	34.27	35.38	36.43	2	705	2.52
Reactance	23.54	20.45	19.51	2	705	5.91**
Cognitive Failures	35.82	32.70	31.12	2	705	3.85*
Extraversion	23.18	25.07	25.01	2	705	1.06
Risky Lifestyle	24.18	20.92	18.88	2	705	10.20**
Safety Perception	87.63	89.11	92.34	2	705	3.89*

** $p < .01$

* $p < .05$

Table 27

Post Hoc Tests for Each Dependent Variable Across Injury Index Scores

Personal Control

	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	0.63	6.42	-0.71	-0.55	2.76
Med	-0.63	0.00	5.79	-0.55	-1.51	2.01
High	-6.42	-5.79	0.00	2.76	2.01	-5.12

Self-Efficacy

	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	0.02	6.97	-1.79	-1.38	2.49
Med	-0.02	0.00	6.94	-1.38	-0.84	2.61
High	-6.97	-6.94	0.00	2.49	2.61	-6.07

Optimism

	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	3.09	4.04	-0.48	0.41	0.49
Med	-3.09	0.00	0.95	0.41	-1.03	-0.81
High	-4.04	-0.95	0.00	0.49	-0.81	-3.48

Self-Esteem

	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	0.88	3.89	-0.53	0.00	1.14
Med	-0.88	0.00	3.01	0.00	-1.14	0.17
High	-3.89	-3.01	0.00	1.14	0.17	-3.85

Positive Student's t values show pairs of means that are significantly ($p<.05$) different.

Table 27 (continued)

Post Hoc Tests for Each Dependent Variable Across Injury Index Scores

Belonging

	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	1.05	2.16	-0.65	-0.02	-1.17
Med	-1.05	0.00	1.11	-0.02	-1.38	-2.33
High	-2.16	-1.11	0.00	-1.17	-2.33	-4.66

Reactance

	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	3.09	4.04	-3.88	0.23	1.27
Med	-3.09	0.00	0.95	0.23	-1.15	0.05
High	-4.04	-0.95	0.00	1.27	0.05	-0.54

Cognitive Failures

	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	3.12	4.71	-6.56	-1.71	0.03
Med	-3.12	0.00	1.59	-1.71	-1.94	0.08
High	-4.71	-1.59	0.00	0.03	0.08	-0.91

Extraversion

	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	0.06	1.89	-1.04	-0.75	-0.69
Med	-0.06	0.00	1.83	-0.75	-0.49	-0.67
High	-1.89	-1.83	0.00	-0.69	-0.67	-3.50

Positive Student's t values show pairs of means that are significantly ($p<.05$) different.

Table 27 (continued)

Post Hoc Tests for Each Dependent Variable Across Injury Index Scores

	Risky Lifestyle					
	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	3.25	5.30	-4.89	-0.35	1.81
Med	-3.25	0.00	2.05	-0.35	-1.44	0.92
High	-5.30	-2.05	0.00	1.81	0.92	-0.68

	Safety Perception					
	Mean Differences			Student's t		
	Low	Med	High	Low	Med	High
Low	0.00	3.23	4.71	-1.48	0.77	2.90
Med	-3.23	0.00	1.47	0.77	-3.15	-6.39
High	-4.71	-1.47	0.00	2.90	-6.39	-10.66

Positive Student's t values show pairs of means that are significantly ($p<.05$) different.

Table 28

Univariate Analysis of Variances for Each SCS Subscale Across Sites

	WA	TX	GA	TN	Model df	Error df	F
Personal Control	51.39	50.24	47.94	48.87	3	704	11.311**
Self-Efficacy	53.29	54.44	52.54	52.74	3	704	2.132
Optimism	25.01	25.04	23.69	24.11	3	704	4.570**
Self-Esteem	31.67	32.40	30.92	30.43	3	704	5.671**
Belonging	36.66	35.14	35.43	37.42	3	704	6.700**
Reactance	20.29	19.94	19.86	19.04	3	704	2.380
Cognitive Failures	30.96	29.85	31.40	32.98	3	704	4.606**
Extraversion	24.29	24.39	24.95	25.99	3	704	6.335**
Risky Lifestyle	19.10	21.08	18.31	19.47	3	704	6.258**
Safety Perception	88.97	93.25	88.70	96.07	3	704	15.797**
RAC	137.85	135.42	134.18	139.88	3	704	4.656**
Injury Index	7.10	6.30	6.35	6.48	3	704	5.483**

** $p < .01$

Table 29

Post Hoc Tests for Each Dependent Variable Across Sites

Injury Index by Site

	Mean Differences				Student's t			
	WA	TN	GA	TX	WA	TN	GA	TX
WA	0.00	0.61	0.75	0.80	-0.44	0.20	0.34	0.34
TN	-0.61	0.00	0.14	0.18	0.20	-0.39	-0.24	-0.25
GA	-0.75	-0.14	0.00	0.05	0.34	-0.24	-0.37	-0.38
TX	-0.80	-0.18	-0.05	0.00	0.34	-0.25	-0.38	-0.48

Belonging by Site

	Mean Differences				Student's t			
	TN	WA	GA	TX	TN	WA	GA	TX
TN	0.00	0.76	1.99	2.29	-1.08	-0.39	0.93	1.07
WA	-0.76	0.00	1.23	1.52	-0.39	-1.23	0.10	0.24
GA	-1.99	-1.23	0.00	0.29	0.93	0.10	-1.03	-0.90
TX	-2.29	-1.52	-0.29	0.00	1.07	0.24	-0.90	-1.34

Personal Control by Site

	Mean Differences				Student's t			
	WA	TX	TN	GA	WA	TX	TN	GA
WA	0.00	1.15	2.53	3.45	-1.34	-0.25	1.26	2.21
TX	-1.15	0.00	1.37	2.30	-0.25	-1.46	0.04	0.99
TN	-2.53	-1.37	0.00	0.92	1.26	0.04	-1.18	-0.23
GA	-3.45	-2.30	-0.92	0.00	2.21	0.99	-0.23	-1.13

Positive Student's t values show pairs of means that are significantly ($p<.05$) different.

Table 29 (continued)

Post Hoc Tests for Each Dependent Variable Across Sites

Self-Efficacy by Site

	Mean Differences				Student's t			
	TX	WA	TN	GA	TX	WA	TN	GA
TX	0.00	1.15	1.71	1.91	-1.76	-0.54	0.10	0.33
WA	-1.15	0.00	0.55	0.75	-0.54	-1.62	-0.97	-0.74
TN	-1.71	-0.55	0.00	0.20	0.10	-0.97	-1.42	-1.19
GA	-1.91	-0.75	-0.20	0.00	0.33	-0.74	-1.19	-1.36

Reactance by Site

	Mean Differences				Student's t			
	WA	TX	GA	TN	WA	TX	GA	TN
WA	0.00	0.36	0.44	1.26	-1.04	-0.73	-0.52	0.28
TX	-0.36	0.00	0.08	0.90	-0.73	-1.13	-0.93	-0.13
GA	-0.44	-0.08	0.00	0.82	-0.52	-0.93	-0.87	-0.07
TN	-1.26	-0.90	-0.82	0.00	0.28	-0.13	-0.07	-0.91

Self-Esteem by Site

	Mean Differences				Student's t			
	TX	WA	GA	TN	TX	WA	GA	TN
TX	0.00	0.72	1.47	1.96	-1.11	-0.34	0.48	0.95
WA	-0.72	0.00	0.75	1.24	-0.34	-1.02	-0.19	0.28
GA	-1.47	-0.75	0.00	0.49	0.48	-0.19	-0.86	-0.39
TN	-1.96	-1.24	-0.49	0.00	0.95	0.28	-0.39	-0.90

Positive Student's t values show pairs of means that are significantly ($p<.05$) different.

Table 29 (continued)

Post Hoc Tests for Each Dependent Variable Across Sites

Extraversion by Site

	Mean Differences				Student's t			
	TN	GA	TX	WA	TN	GA	TX	WA
TN	0.00	1.04	1.60	1.70	-0.81	0.25	0.69	0.83
GA	-1.04	0.00	0.56	0.66	0.25	-0.77	-0.34	-0.19
TX	-1.60	-0.56	0.00	0.10	0.69	-0.34	-1.00	-0.86
WA	-1.70	-0.66	-0.10	0.00	0.83	-0.19	-0.86	-0.92

Risky Lifestyle by Site

	Mean Differences				Student's t			
	TX	TN	WA	GA	TX	TN	WA	GA
TX	0.00	1.61	1.99	2.77	-1.42	0.32	0.63	1.50
TN	-1.61	0.00	0.38	1.16	0.32	-1.15	-0.85	0.04
WA	-1.99	-0.38	0.00	0.78	0.63	-0.85	-1.30	-0.42
GA	-2.77	-1.16	-0.78	0.00	1.50	0.04	-0.42	-1.10

Cognitive Failures by Site

	Mean Differences				Student's t			
	TN	GA	WA	TX	TN	GA	WA	TX
TN	0.00	1.57	2.01	3.13	-1.53	0.08	0.38	1.41
GA	-1.57	0.00	0.44	1.56	0.08	-1.46	-1.16	-0.13
WA	-2.01	-0.44	0.00	1.11	0.38	-1.16	-1.73	-0.70
TX	-3.13	-1.56	-1.11	0.00	1.41	-0.13	-0.70	-1.89

Positive Student's t values show pairs of means that are significantly ($p<.05$) different.

Table 29 (continued)

Post Hoc Tests for Each Dependent Variable Across Sites

Optimism by Site

	Mean Differences				Student's t			
	TX	WA	TN	GA	TX	WA	TN	GA
TX	0.00	0.03	0.93	1.35	-1.01	-0.94	0.01	0.45
WA	-0.03	0.00	0.90	1.32	-0.94	-0.93	0.02	0.46
TN	-0.93	-0.90	0.00	0.42	0.01	0.02	-0.82	-0.37
GA	-1.35	-1.32	-0.42	0.00	0.45	0.46	-0.37	-0.78

Safety Perceptions by Site

	Mean Differences				Student's t			
	TN	TX	WA	GA	TN	TX	WA	GA
TN	0.00	2.82	7.10	7.37	-2.43	0.08	4.50	4.99
TX	-2.82	0.00	4.28	4.55	0.08	-3.01	1.40	1.86
WA	-7.10	-4.28	0.00	0.26	4.50	1.40	-2.76	-2.29
GA	-7.37	-4.55	-0.26	0.00	4.99	1.86	-2.29	-2.32

Positive Student's t values show pairs of means that are significantly ($p<.05$) different.

Table 30

Mean RAC Scores for Site, Focus of Actively Caring (Person, Behavior, Environment) and Level of Actively Caring (Should, Willing, and Often)

Level	WA	TX	GA	TN
Behavior, Often	3.55	3.50	3.36	3.48
Behavior, Should	3.90	3.90	3.85	3.91
Behavior, Willing	3.99	3.90	3.80	3.95
Environment, Often	3.80	3.68	3.63	3.87
Environment, Should	4.01	3.83	3.84	3.99
Environment, Willing	3.83	3.76	3.70	3.93
Person, Often	3.85	3.66	3.77	3.91
Person, Should	3.90	3.80	3.82	4.02
Person, Willing	3.64	3.81	3.82	3.92

Table 31

Summary Results from the Three-Way Analysis of Variance Table for Site, Focus of Actively Caring (Person, Behavior, Environment) and Level of Actively Caring (Should, Willing, and Often)

Source†	Model df	Error df	Sum of Squares	F
Site	3	6368	25.56	23.53 **
Focus (P/E/B)	2	6369	6.14	8.48 **
Site*P/E/B	6	6365	9.52	4.38 **
Level (S/W/O)	2	6369	55.66	76.86 **
Site*(S/W/O)	6	6365	2.30	1.06
P/E/B*S/W/O	4	6367	41.59	28.71 **
Site*P/E/B*S/W/O	12	6359	6.67	1.53

** $p < .01$

† Site = Each company (e.g., WA, TX, TN, and GA)

P/E/B = Person, environment, or behavior focused actively caring score

S/W/O = Should, willing, or often actively care

Table 32

Post Hoc Tests for Focus (i.e., P/E/B) and Level (i.e., S/W/O) of AC

Person, Behavior, and Environment

	Mean Differences			Student's t		
	person	environment	behavior	person	environment	behavior
Person	0.00	0.01	0.09	-0.04	-0.02	0.05
Environment	-0.01	0.00	0.07	-0.02	-0.04	0.03
Behavior	-0.09	-0.07	0.00	0.05	0.03	-0.04

Should, Willing, Often

	Mean Differences			Student's t		
	Should	Willing	Often	Should	Willing	Often
Should	0.00	0.06	0.23	-0.04	0.02	0.19
Willing	-0.06	0.00	0.17	0.02	-0.04	0.13
Often	-0.23	-0.17	0.00	0.19	0.13	-0.04

Positive Student's t values show pairs of means that are significantly ($p<.05$) different.

Table 33

Multiple Comparisons Between Select Focus and Levels of AC

	Behavior/Willing vs. Environment/Willing	Behavior/Willing vs. Person/Willing	Behavior/Often vs. Environment/Often
Estimate	0.10	0.10	-0.28
Std Error	0.03	0.03	0.03
t Ratio	3.11	2.98	-8.83
Prob>|t|	0.01	0.01	0.01

Table 34

Factor Loadings, Individual Scale Measures of Sampling Adequacy (MSA), Communalities, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, and Bartlett's Test of Sphericity for Common (i.e., Maximum-Likelihood) Factor Analysis with Oblique (Oblimin) Rotation

	F1	F2	F3	Comm
Q1	-.07	.23	.63	.46
Q2	-.09	.30	.56	.42
Q4	.53	-.05	.23	.42
Q5	.54	.16	.13	.43
Q6	.08	-.17	.56	.34
Q7	.77	.05	-.13	.56
Q9	.14	.63	-.05	.43
Q10	.13	-.12	.70	.54
Q12	.63	-.14	-.01	.37
Q13	.71	.04	-.01	.51
Q17	.64	-.33	.01	.43
Q19	.02	.69	-.02	.47
Q22	-.05	-.05	.74	.52
Q25	.64	.16	.06	.52
Q27	.05	.72	.09	.57
Q30	.59	.12	.00	.40
Q32	.66	.18	.01	.53
Q34	.28	.05	.44	.37
Q35	.71	.24	-.11	.57
Q36	.46	-.02	.20	.32
Q38	.06	.62	.04	.42
Q41	.26	.22	.20	.23
% of Variance	28.20	8.70	7.70	

Table 35.
Questions from the SCS Factors of Management Support for Safety, Peer Support for Safety, and Personal Responsibility for Safety.

SCS Questions reflecting Management Support for Safety

4 When told about safety hazards, supervisors are appreciative and try to correct them quickly.
5 My manager is well informed about relevant safety issues.
7 The management at my plant is willing to invest money and effort to improve our safety performance.
12 At my plant work productivity and quality usually have a higher priority than work safety. (rev)
13 The managers in my plant really care about safety and try to reduce risk levels as much as possible.
17 Management places most of the blame for an accident on the injured employee.(rev)
25 Working safely is the Number One priority in my plant.
30 I have received adequate job safety training.
32 Information needed to work safely is made available to all employees.
35 Management here seems genuinely interested in reducing injury rates.
36 Safety audits are conducted regularly in my department to check the use of personal protective equipment.

SCS Questions reflecting Peer Support for Safety

1 Generally, when employees in my group are warned about working unsafely, they change their behavior and begin working more safely.
2 Employees do not like it when coworkers do not follow safety policy, even when no harm is done.
6 If I confront my coworkers about their unsafe behaviors, they will react negatively and think I should mind my own business. (rev)
10 Employees in my work group give each other verbal praise for working safely.
22 Employees seen behaving unsafely in my department are usually given corrective feedback by their coworkers.
34 Employees in my work group participate in defining safe work practices.

SCS Questions reflecting Personal Responsibility for Safety

9 It is the responsibility of each employee to seek out opportunities to prevent injury.
19 I have more respect for workers who work safely than for workers who work unsafely.
27 When a safety regulation is issued, I try to follow it as best I can.
38 I know how to do my job safely.
41 If I received a minor injury on the job, I would report it.

Table 36

Analysis of Variance Table for the ACS According to Overall Safety Perception (SP) and Perceived Risk Level (Risk)

Source	Model df	Error df	Sum of Squares	F
Safety Perception (SP)	2	705	19.38	56.63 **
Perceived Risk Level (RP)	2	705	1.07	3.14 *
SP*RP	4	703	2.97	4.33 **

Table 37

Select Multiple Comparisons Between Levels of Safety Perceptions (SP) and Levels of Perceived Risk (RP) for RAC Scores

	High RP/Low SP vs. Med RP/ Low SP	Med RP/Low SP vs. Low RP/ Low SP	High RP/High SP vs. Med RP/ High SP	Med RP/High SP vs. Low RP/ High SP
Mean Differences	-0.96	-0.83	0.03	0.20
Std Error	0.51	0.36	0.12	0.42
t Ratio	-1.90	-2.33	0.23	0.49
Prob>|t|	0.05	0.02	0.82	0.63

Table 38

Analysis of Variance Table for the ACS According to Management Support for Safety (Mgmt) and Perceived Risk Level (Risk)

Source	Model df	Error df	Sum of Squares	F
Management Support for Safety (Mgmt)	2	705	22.27	62.28 **
Perceived Risk Level (Risk)	2	705	5.79	16.20 **
Mgmt*Risk	4	703	6.50	9.09 **

Table 39

Analysis of Variance Table for the ACS According to Peer Support for Safety (Peer) and Perceived Risk Level (Risk)

Source	Model df	Error df	Sum of Squares	F
Peer Support for Safety (Peer)	2	705	16.37	44.28 **
Perceived Risk Level (Risk)	2	705	.91	2.47
Peer*Risk	4	703	.92	1.24

Table 40

Analysis of Variance Table for the ACS According to Personal Responsibility for Safety (Resp) and Perceived Risk Level (Risk)

Source	Model df	Error df	Sum of Squares	F
Personal Responsibility for Safety (Resp)	2	705	33.28	103.66 **
Perceived Risk Level (Risk)	2	705	1.09	3.39 *
Resp*Risk	4	703	1.07	1.66

Table 41

Select Multiple Comparisons Between Levels of Management Support (MS) and Levels of Perceived Risk (RP) for RAC Scores

	High RP/Low MS vs. Med RP/ Low MS	Med RP/Low MS vs. Low RP/ Low MS	High RP/High MS vs. Med RP/ High MS	Med RP/High MS vs. Low RP/ High MS
Mean Differences	-1.89	0.05	0.05	-0.05
Std Error	0.32	0.16	0.07	0.12
t Ratio	-5.84	0.30	0.63	-0.41
Prob>|t|	0.01	0.77	0.53	0.69

Front

C.C. Manufacturing

Thank You for ACTIVELY CARING

Date: _____

Please describe specifically the observed ACTIVELY CARING behavior: (see back for examples)

_____

_____

_____

_____

_____

_____

Observer's Code:

The first letter of the city where you were born	The first letter of your mother's maiden name	The number of the month you were born
_____	_____	_____

Recipient's Code:

The first letter of the city where you were born	The first letter of your mother's maiden name	The number of the month you were born
_____	_____	_____

_____ ¢ **Thank You** Limit: 55 ¢

Observer's Name _____

Recipient's Name _____

Back

Examples of ACTIVELY CARING Behaviors:

- Recognizing and correcting an unsafe condition.
- Reminding a coworker not to perform an unsafe act.
- Removing or cleaning unsafe objects or debris from a work area.
- Giving positive feedback to a coworker for working safely.
- Reporting a near miss.
- Making a task safer.
- Other

Hoechst Celanese

Elaine George Dave Salyer

Tom Tillman Jim Woods

Department 1490

Figure 1. Actively caring thank you card used at Pilot Study 1.

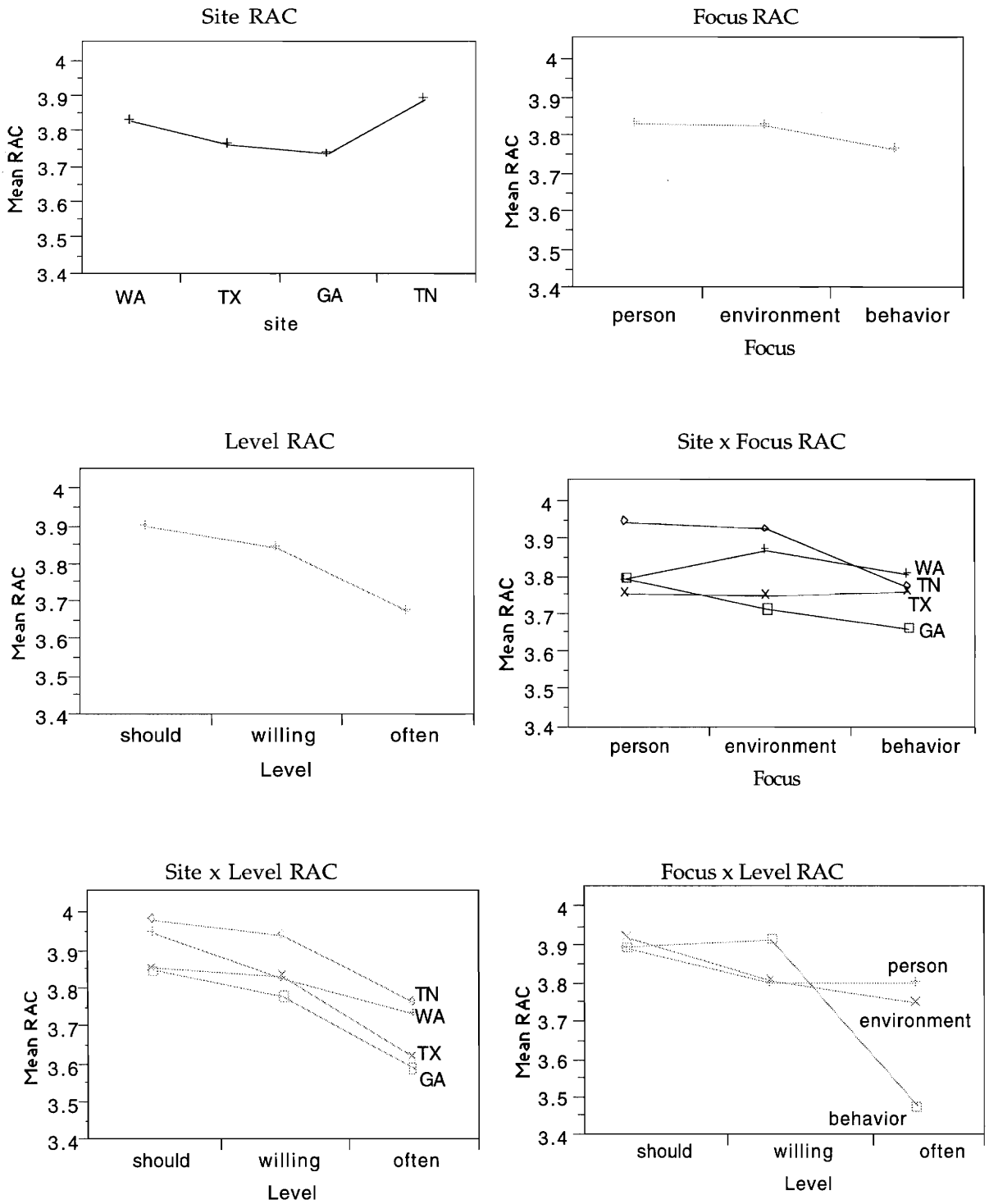


Figure 2. Main and interaction effect graphs for site, focus (person, environment, and behavior), and level of AC (should, willing, and often).

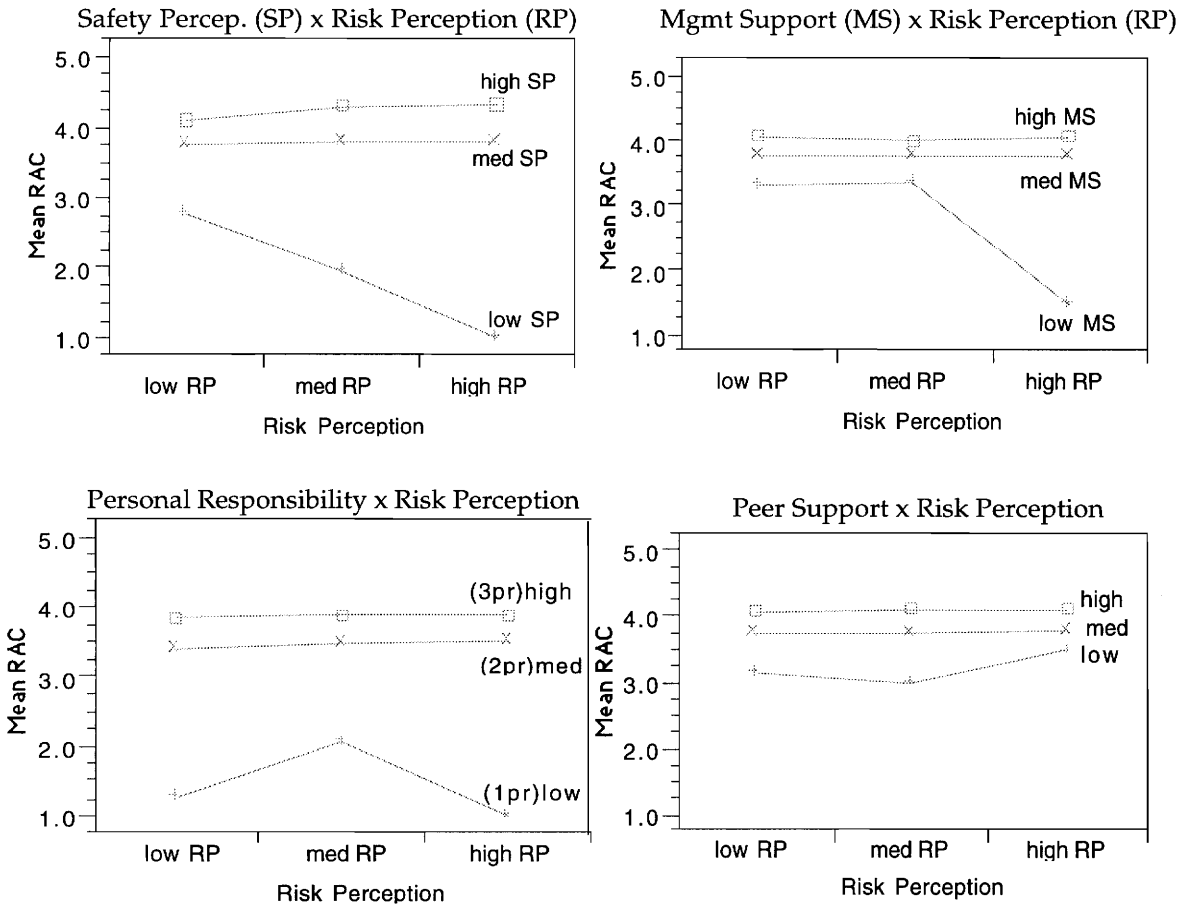


Figure 3. Safety perception (i.e., overall safety perception, management support, peer support, and personal responsibility for safety) by risk perception interaction graphs.

Appendix A

The Safety Culture Survey Questions in the Order Administered to The Four Industrial Sites.

1 Generally, when employees in my group are warned about working unsafely, they change their behavior and begin working more safely.
2 Employees do not like it when coworkers do not follow safety policy, even when no harm is done.
3 The risk level of my job concerns me quite a bit.
4 When told about safety hazards, supervisors are appreciative and try to correct them quickly.
5 My manager is well informed about relevant safety issues.
6 If I confront my coworkers about their unsafe behaviors, they will react negatively and think I should mind my own business.
7 The management at my plant is willing to invest money and effort to improve our safety performance.
8 I am willing to praise other employees for working safely.
9 It is the responsibility of each employee to seek out opportunities to prevent injury.
10 Employees in my work group give each other verbal praise for working safely.
11 I am willing to pick up after another employee in order to maintain good housekeeping
12 At my plant work productivity and quality usually have a higher priority than work safety.
13 The managers in my plant really care about safety and try to reduce risk levels as much as possible.
14 In my work group, more attention is given to unsafe acts than safe acts.
15 It is only a matter of time before I will get involved in a work-related accident.
16 When I see a potential safety hazard (e.g., oil spill), I am willing to correct it my self if possible.
17 Management places most of the blame for an accident on the injured employee.
18 Alcohol or drug abuse is a problem in my plant.
19 I have more respect for workers who work safely than for workers who work unsafely.
20 I am reluctant to discuss my "near misses" with coworkers.
21 I am willing to warn my coworkers about working unsafely.
22 Employees seen behaving unsafely in my department are usually given corrective feedback by their coworkers.
23 Compared to other plants, I think mine is rather risky.
24 I am willing to do whatever I can to improve safety, even confronting my coworkers about their unsafe acts.
25 Working safely is the Number One priority in my plant.
26 I am willing to pick up workplace litter that I did not cause myself.
27 When a safety regulation is issued, I try to follow it as best I can.
28 Most injuries are caused by equipment problems.
29 The OSHA recordable injury rate is an accurate reflection of safety at my plant.
30 I have received adequate job safety training.
31 Many first aid cases in my plant go unreported.
32 Information needed to work safely is made available to all employees.
33 It is common for employees to be disciplined for having a work injury.
34 Employees in my work group participate in defining safe work practices.
35 Management here seems genuinely interested in reducing injury rates.
36 Safety audits are conducted regularly in my department to check the use of personal protective equipment.

37 If I notice an unsafe feature in equipment outside my work area, I am willing to take corrective action (e.g., notify my supervisor or complete appropriate paper work).
38 I know how to do my job safely.
39 I am willing to observe the work practices of another employee in order to provide direct feedback to him/her.
40 Most employees in my group would not feel comfortable if their work practices were observed and recorded by a coworker.
41 If I received a minor injury on the job, I would report it.
42 I can easily adapt to new and unusual situations.
43 Rules and regulations trigger a sense of resistance in me.
44 I usually do whatever I can to improve safety, even confront other employees about their unsafe acts.
45 I sometimes forget why I went from one part of the house to another?
46 Employees should pick up litter in the workplace even if they did not cause the litter.
47 I enjoy contradicting others.
48 I am a rather lively person.
49 When I am told I can't do something, I react against it by thinking, "That's exactly what I'm going to do."
50 I often make decisions on the spur of the moment.
51 When I notice an unsafe feature in equipment outside my work area, I usually take corrective action (e.g., notify a supervisor or complete appropriate paperwork).
52 The thought of having to depend on others is unpleasant to me.
53 I enjoy going out a lot.
54 I don't like it when people try to give me advice.
55 I enjoy meeting new people.
56 When someone comes to a coworker with a personal problem, the coworker should try to listen without being judgmental.
57 I would call myself "happy-go-lucky".
58 I often fail to notice signposts on the road?
59 I like mixing with people.
60 When people tell me what to do, I want to do just the opposite.
61 If an employee gets down or depressed that person's coworkers should to try to make him/her feel better.
62 It makes me angry when someone is presented to me as an example to follow.
63 I like to be around plenty of activity and excitement.
64 It pleases me to see others conform to society's expectations.
65 When people talk to me I almost always have a "ready answer."
66 I am skeptical of strong praise.
67 Employees should observe the work practices of their coworkers in order to provide corrective feedback to him or her.
68 I react negatively when someone tries to tell me what to do.
69 My coworkers do many helpful things for each other.
70 I feel I have a number of good qualities.
71 I have often praised a coworker after seeing him/her working safely.
72 I frequently confuse right and left when giving directions?
73 Employees should pick up after one another to maintain good housekeeping.
74 I hardly ever expect things to go my way.
75 All in all, I am inclined to feel I am a failure.
76 I am able to do things as well as most other people.
77 I resist the attempts of others to influence me.
78 If somebody tries hard enough, he or she can do anything.

79 If I know a coworker is going to do a hazardous job, I am willing to remind him/her of the hazards (even if the coworker is familiar with the job).
80 I distrust my coworkers.
81 At times, I think I am no good at all.
82 In uncertain or difficult times, I usually expect the best to happen.
83 I feel close to my coworkers.
84 When I'm given a job to do, I usually do it better than others would.
85 I sometimes bump into things or people?
86 I rarely count on good things happening to me.
87 I enjoy being with my coworkers.
88 When a coworker is sick or injured, I usually send a "get well card" or otherwise let the person know he/she is being thought of.
89 I understand my coworkers.
90 Most people don't realize the extent to which their injuries are controlled by bad luck.
91 People who never get injured are just plain lucky.
92 I feel a need to be friends with my coworkers.
93 My coworkers do not really understand each other.
94 Employees should do whatever they can to improve safety, even confront other employees about their unsafe acts.
95 I often forget whether I've turned off a light or the coffeepot, or locked the door?
96 When I see litter in the workplace, I usually pick it up, even if I did not do the littering.
97 People's injuries result from their own carelessness.
98 I am directly responsible for my own safety.
99 I sometimes forget which way to turn on a road I know well but rarely use?
100 When a coworker is sick or injured, I am willing to send a "get well card" or otherwise let the person know he/she is being thought of.
101 Most people I know can do a better job than I.
102 I trust my coworkers.
103 On the whole, I am satisfied with myself.
104 I feel like I really belong to my work group.
105 Whenever someone is injured, it's usually due to something he/she has done or has not done.
106 My coworkers are not very close at all.
107 If someone knows a coworker is going to do a hazardous job, they should remind him/her of the hazards (even if the coworker is familiar with the job).
108 My coworkers share much in common.
109 When workers notice an unsafe feature in equipment outside their work area, they should take corrective action (e.g., notify their supervisor or complete appropriate paperwork).
110 Whether I start early or put it off until the last minute, I usually do a better job than most.
111 My coworkers are not afraid to share personal information with each other.
112 I sometimes fail to see what I want in a supermarket (although it's right there)?
113 People can change what might happen tomorrow by what they do today.
114 I feel I don't have much to be proud of.
115 When I see a coworker looking down or depressed I often attempt to make that person feel better.
116 If anything can go wrong for me, it probably will.
117 I always look on the bright side of things.

118 I certainly feel useless at times.
119 I often forget where I put something like a newspaper or a book?
120 There is nothing a person can do to stop bad things from happening.
121 When someone takes a disliking to me, there's little I can do to change matters.
122 I often warn my coworkers when I see them working unsafely
123 I dislike my coworkers.
124 Things never work out the way I want them to.
125 It's better to be smart than lucky.
126 No matter how hard people try to prevent accidents, they are bound to happen.
127 I often daydream when I ought to be listening to something?
128 I believe every cloud has a silver lining.
129 If people follow safe life practices, they can avoid many unnecessary injuries.
130 I possess a number of qualities that make me better than others.
131 Employees should praise each other for working safely.
132 One of the best ways to handle problems is to just not think about them.
133 Whether people get injured is a matter of fate, chance, or luck.
134 Most injuries are due to a persons carelessness or inattention.
135 I wish I could have more respect for myself.
136 If things start out well in the morning it's going to be a good day no matter what I do.
137 Most incidents that result in injuries are largely preventable.
138 It is no use worrying about current events or public affairs; I can't do anything about them anyway.
139 When employee's see a potential safety hazard (e.g., oil spill) they should correct it themselves if possible.
140 When I work on a committee, I usually let other people do most of the planning.
141 If it is worth starting, it is worth finishing.
142 At home, I often start doing one thing and get distracted into doing something else (unintentionally)?
143 I am the kind of person people can count on.
144 I do my job the very best I know how.
145 When an employee is sick or injured, that person's coworkers should send a "get well card" or otherwise let the person know he/she is being thought of.
146 Why bother to vote, one vote can't make a difference.
147 It is more important to work for the good of the team than to work for personal good.
148 I would never let a friend down when he/she expects something of me.
149 People would be a lot better off if they could live far away from other people and have little to do with them.
150 I have observed the work practices of a coworker in order to provide corrective feedback to him/her.
151 People should give some time for the good of their town or community.
152 Cheating is not so bad as long as nobody knows.
153 I usually volunteer for special community projects.
154 When given a task I stick to it even if things I like to do better come along.
155 When a coworker comes to me with a personal problem, I try to listen without being judgmental.
156 When I make plans, I am certain I can make them work.
157 If I can't do a job the first time, I keep trying until I can.
158 It is difficult for me to make new friends.
159 I pick up after other coworkers in order to maintain good housekeeping.

160 When I set important goals for myself, I rarely achieve them.
161 I give up on things before completing them.
162 If I see someone I would like to meet, I go to that person instead of waiting for him/her to come to me.
163 One of my problems is that I cannot get down to work when I should.
164 If something looks complicated, I will not bother to try it.
165 When I decide to do something, I go right to work on it.
166 When trying to learn something new, I soon give up if I am not initially successful.
167 If I know a coworker is going to do a hazardous job, I often remind him/her of the hazards (even if the coworker is familiar with the job).
168 When unexpected problems occur, I don't handle them well.
169 I avoid trying to learn new things when they look too difficult for me.
170 I sometimes forget what I came to the store to buy?
171 Failure just makes me try harder.
172 I do not handle myself well in social gatherings.
173 If a coworker came to me with a personal problem, I would be willing to listen without being judgmental.
174 I feel insecure about my ability to do things.
175 I am a self-reliant person.
176 I have acquired my friends through my personal abilities at making friends.
177 I give up easily.
178 I do not seem capable of dealing with most problems that come up in life.
179 When I see a potential safety hazard (e.g., oil spill) I usually correct it myself if possible.
180 I often drop things?
181 Employee's should warn their coworkers when they are observed working unsafely
182 I often find myself putting things in the wrong place when I'm done with them - like putting the milk in the cereal cupboard?
183 If a coworker gets down or depressed I am willing to try to make that person feel better.
184 How many cigarettes do you smoke per day?

1) None
2) Less than 5
3) 6-10
4) 11-15
5) 16-20
6) More than 1 pack

185 During a typical week, how many ounces of alcohol do you consume? (one ounce of alcohol = 1-12 oz. beer, 1 glass of wine, or 1 mixed drink)

1) None
2) Less than 6
3) 6-12
4) 12-18
5) 19-24
6) 25 or more

186 How many times within the last year did you operate a vehicle after having three (3) or more alcoholic drinks within two (2) hours of driving?

1) None
2) 1
3) 2
4) 3
5) 4
6) 5 or more

187 On your last 10 vehicle trips, how many times did you use your safety belt?

1) None
2) 1-2
3) 3-4
4) 5-6
5) 7-8
6) 9-10

188 When the speed limit is 55 mph, I usually drive

1) 1-5 mph below the limit
2) At the limit
3) 1-5 mph above the limit
4) 6-10 mph above the limit
5) 11-15 mph above the limit
6) 16 mph or more above the limit

189 What percentage of time do you try to beat a yellow light?

1) Never
2) 10-20%
3) 30-40%
4) 50-60%
5) 70-80%
6) 90-100%

190 What percentage of time do you travel faster than the posted speed limit?

1) Never
2) 10-20%
3) 30-40%
4) 50-60%
5) 70-80%
6) 90-100%

191 If all speed limits were eliminated, and you were driving the sports car of your choice on the open highway with no other cars in sight, how fast would you travel?

1) less than 50 mph
2) 51-65 mph
3) 66-80 mph
4) 81-95 mph
5) 96-110 mph
6) More than 110 mph

192 I anger easily when behind the wheels of my vehicle.

1) Never
2) Very Rarely
3) Rarely
4) Often
5) Very Often
6) Always

193 I try to get revenge when I'm cut off on the highway by passing or staying on the tail of the offender.

1) Never
2) Very Rarely
3) Rarely
4) Often
5) Very Often
6) Always

194 On your last 10 motorcycle rides how many times did you wear a helmet?

1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't ride a motorcycle

195 On your last 10 bicycle rides how many times did you wear a helmet?

1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't ride a bicycle

196 In the last 10 times you mowed the lawn, how many times did you use safety glasses or goggles?

1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't mow the lawn

197 In the last 10 times you used a chainsaw, how many times did you use safety glasses or goggles?

1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't use a chainsaw

198 In the last 10 times you used a chainsaw, how many times did you use hearing protection?

1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't use a chainsaw

199 How often have you checked the operation of a smoke detector in your home?

1) About once a month
2) About once every 6 months
3) About once a year
4) About once every 2-3 years
5) Never checked them
6) Don't have smoke detectors

200 How often do you practice a fire evacuation plan for your home?

1) About once a month
2) About once every 6 months
3) About once a year
4) About once every 2-3 years
5) Never checked them
6) Don't have a fire evacuation plan

201 How many OSHA Recordable injuries have you had in the last 12 months?

1) None
2) 1
3) 2
4) 3
5) 4
6) 5 or more

202 How many First Aid Case injuries have you had in the last 12 months?

1) None
2) 1-2
3) 3-4
4) 5-6
5) 7-8
6) 9 or more

203 How many Near Misses have you had on the job in the last 30 days?

1) None
2) 1-2
3) 3-4
4) 5-6
5) 7-8
6) 9 or more

204 How many work days have you missed over the past 12 months as a result of a job-related injury

1) None
2) 1-3
3) 4-6
4) 7-9
5) 10-12
6) 13 or more

205 How many work days have you missed over the past 12 months as a result of illness?

1) None
2) 1-3
3) 4-6
4) 7-9
5) 10-12
6) 13 or more

Appendix B

The "Unshuffled" Safety Culture Survey (Items reduced through the internal consistency analysis are printed in italics.)

Actively Caring Scale (ACS)

Self-Esteem

70 I feel I have a number of good qualities.
75 All in all, I am inclined to feel I am a failure. (rev)
76 I am able to do things as well as most other people.
114 I feel I don't have much to be proud of. (rev)
103 On the whole, I am satisfied with myself.
135 I wish I could have more respect for myself. (rev)
118 I certainly feel useless at times. (rev)
81 At times, I think I am no good at all. (rev)
• *130 I possess a number of qualities that make me better than others.*

Self-Efficacy

• *84 When I'm given a job to do, I usually do it better than others would.*
• *101 Most people I know can do a better job than I. (rev)*
• *110 Whether I start early or put it off until the last minute, I usually do a better job than most.*
• *156 When I make plans, I am certain I can make them work.*
163 One of my problems is that I cannot get down to work when I should. (rev)
157 If I can't do a job the first time, I keep trying until I can.
158 It is difficult for me to make new friends. (rev)
160 When I set important goals for myself, I rarely achieve them. (rev)
161 I give up on things before completing them. (rev)
• *162 If I see someone I would like to meet, I go to that person instead of waiting for him/her to come to me.*
164 If something looks complicated, I will not bother to try it. (rev) (Double Check)
• *165 When I decide to do something, I go right to work on it.*
166 When trying to learn something new, I soon give up if I am not initially successful. (rev)
168 When unexpected problems occur, I don't handle them well. (rev)
169 I avoid trying to learn new things when they look too difficult for me. (rev)
171 Failure just makes me try harder.
172 I do not handle myself well in social gatherings. (rev)
174 I feel insecure about my ability to do things. (rev)
• *175 I am a self-reliant person.*
• *176 I have acquired my friends through my personal abilities at making friends.*
177 I give up easily. (rev)
178 I do not seem capable of dealing with most problems that come up in life. (rev)

Optimism

82 In uncertain or difficult times, I usually expect the best to happen.
116 If anything can go wrong for me, it probably will. (rev)
117 I always look on the bright side of things.
74 I hardly ever expect things to go my way. (rev)
124 Things never work out the way I want them to. (rev)
128 I believe every cloud has a silver lining.
86 I rarely count on good things happening to me. (rev)

Personal Control

- *15 It is only a matter of time before I will get involved in a work-related accident. (rev)*

78 If somebody tries hard enough, he or she can do anything.

- *90 Most people don't realize the extent to which their injuries are controlled by bad luck. (rev)*

91 People who never get injured are just plain lucky. (rev)
97 People's injuries result from their own carelessness.
98 I am directly responsible for my own safety.
105 Whenever someone is injured, it's usually due to something he/she has done or has not done.
113 People can change what might happen tomorrow by what they do today.
120 There is nothing a person can do to stop bad things from happening. (rev)

- *121 When someone takes a disliking to me, there's little I can do to change matters. (rev)*

125 It's better to be smart than lucky.

- *126 No matter how hard people try to prevent accidents, they are bound to happen. (rev)*

129 If people follow safe life practices, they can avoid many unnecessary injuries.
132 One of the best ways to handle problems is to just not think about them. (rev)
133 Whether people get injured is a matter of fate, chance, or luck. (rev)
134 Most injuries are due to a persons carelessness or inattention.

- *136 If things start out well in the morning it's going to be a good day no matter what I do. (rev)*

137 Most incidents that result in injuries are largely preventable.

Belonging

102 I trust my coworkers.

- *93 My coworkers do not really understand each other. (rev)*

80 I distrust my coworkers. (rev)
83. I feel close to my coworkers.
87 I enjoy being with my coworkers.
89 I understand my coworkers.
123 I dislike my coworkers. (rev)
106 My coworkers are not very close at all. (rev)
108 My coworkers share much in common.
69 My coworkers do many helpful things for each other.
104 I feel like I really belong to my work group.

- *111 My coworkers are not afraid to share personal information with each other.*
- *92 I feel a need to be friends with my coworkers.*

RAC Subscales

Behavior Focused AC

8 I am willing to praise other employees for working safely.
71 I often praise coworkers when I see them working safely.
131 Employees should praise each other for working safely.

21 I am willing to warn my coworkers about their unsafe behavior.
122 I often warn my coworkers when I see them working unsafely
181 Employees should warn their coworkers when they observe them working unsafely.

39 I am willing to observe the work practices of coworkers in order to provide safety-related feedback to them.
67 Employees should observe the work practices of their coworkers in order to provide safety-related feedback to them.
150 I have observed the work practices of a coworker in order to provide safety-related feedback to him/her.

79 If I know a coworker is going to do a hazardous job, I am willing to remind him/her of the hazards (even if the employee is familiar with the job).
107 If someone knows a coworker is going to do a hazardous job, they should remind him/her of the hazards (even if the employee is familiar with the job).
167 If I know a coworker is going to do a hazardous job, I often remind him/her of the hazards (even if the employee is familiar with the job).

Environment Focused AC

11 I am willing to pick up after another employee to maintain good housekeeping.
73 Employees should pick up after one another to maintain good housekeeping.
159 I often pick up after other coworkers to maintain good housekeeping.

16 When I see a potential safety hazard (e.g., oil spill), I am willing to correct it my self if possible.
139 When employees see a potential safety hazard (e.g., oil spill) they should correct it themselves if possible.
179 When I see a potential safety hazard (e.g., oil spill) I usually correct it myself if possible.

26 I am willing to pick up workplace litter that I did not cause myself.
46 Employees should pick up litter in the workplace even if they did not cause the litter.
96 When I see litter in the workplace, I usually pick it up, even if I did not do the littering.

37 If I notice an unsafe feature in the equipment outside my work area, I am willing to take corrective action (e.g., notify my supervisor or complete appropriate paper work).
51 When I notice an unsafe feature in the equipment outside my work area, I usually take corrective action (e.g., notify a supervisor or complete appropriate paperwork).
109 When workers notice an unsafe feature in the equipment outside their work area, they should take corrective action (e.g., notify their supervisor or complete appropriate paperwork).

Person Focused AC

24 If an employee needs assistance with a task, I am willing to help, even if it causes me inconvenience.
44 When an employee needs assistance with a task, I help, even if it causes me inconvenience.
94 When an employee needs assistance with a task, other employees should help, even if it causes them inconvenience.

56 When someone comes to a coworker with a personal problem, the coworker should try to listen without being judgmental.
155 When a coworker comes to me with a personal problem, I try to listen without being judgmental.
173 If a coworker came to me with a personal problem, I would be willing to listen without being judgmental.

61 If an employee gets down or depressed that person's coworkers should to try to make him/her feel better.
115 When I see a coworker looking down or depressed I often attempt to make that person feel better.
183 If a coworker gets down or depressed, I am willing to try to make that person feel better.

88 When a coworker is sick or injured, I usually send a "get well card" or otherwise let the person know he/she is being thought of.
100 When a coworker is sick or injured, I am willing to send a "get well card" or otherwise let the person know he/she is being thought of.
145 When an employee is sick or injured, that person's coworkers should send a "get well card" or otherwise let the person know he/she is being thought of.

Risk Propensity Scale

Risky Lifestyle

- *184 How many cigarettes do you smoke per day?*
  1) None *4) 11-15*
  2) Less than 5 *5) 16-20*
  3) 6-10 *6) More than 1 pack*

185 During a typical week, how many ounces of alcohol do you consume? (one ounce of alcohol = 1-12 oz. beer, 1 glass of wine, or 1 mixed drink)
1) None 4) 12-18
2) Less than 6 5) 19-24
3) 6-12 6) 25 or more

186 How many times within the last year did you operate a vehicle after having three (3) or more alcoholic drinks within two (2) hours of driving?
1) None 4) 3
2) 1 5) 4
3) 2 6) 5 or more

- *187 On your last 10 vehicle trips, how many times did you use your safety belt?*
  1) None
  2) 1-2
  3) 3-4
  4) 5-6
  5) 7-8
  6) 9-10

188 When the speed limit is 55 mph, I usually drive
1) 1-5 mph below the limit
2) At the limit
3) 1-5 mph above the limit
4) 6-10 mph above the limit
5) 11-15 mph above the limit
6) 16 mph or more above the limit

189 What percentage of time do you try to beat a yellow light?
1) Never
2) 10-20%
3) 30-40%
4) 50-60%
5) 70-80%
6) 90-100%

190 What percentage of time do you travel faster than the posted speed limit?
1) Never
2) 10-20%
3) 30-40%
4) 50-60%
5) 70-80%
6) 90-100%

191 If all speed limits were eliminated, and you were driving the sports car of your choice on the open highway with no other cars in sight, how fast would you travel?
1) less than 50 mph
2) 51-65 mph
3) 66-80 mph
4) 81-95 mph
5) 96-110 mph
6) More than 110 mph

192 I anger easily when behind the wheels of my vehicle.
1) Never
2) Very Rarely
3) Rarely
4) Often
5) Very Often
6) Always

193 I try to get revenge when I'm cut off on the highway by passing or staying on the tail of the offender.
1) Never
2) Very Rarely
3) Rarely
4) Often
5) Very Often
6) Always

- *194 On your last 10 motorcycle rides how many times did you wear a helmet? (rev)*
  1) none
  2) 1-2
  3) 3-5
  4) 6-8
  5) 9-10
  6) Don't ride a motorcycle

195 On your last 10 bicycle rides how many times did you wear a helmet? (rev)
1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't ride a bicycle

- *196 In the last 10 times you mowed the lawn, how many times did you use safety glasses or goggles? (rev)*

1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't mow the lawn

197 In the last 10 times you used a chainsaw, how many times did you use safety glasses or goggles? (rev)
1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't use a chainsaw

198 In the last 10 times you used a chainsaw, how many times did you use hearing protection? (rev)
1) none
2) 1-2
3) 3-5
4) 6-8
5) 9-10
6) Don't use a chainsaw

199 How often have you checked the operation of a smoke detector in your home?
1) About once a month
2) About once every 6 months
3) About once a year
4) About once every 2-3 years
5) Never checked them
6) Don't have smoke detectors

200 How often do you practice a fire evacuation plan for your home?
1) About once a month
2) About once every 6 months
3) About once a year
4) About once every 2-3 years
5) Never checked them
6) Don't have a fire evacuation plan

Cognitive Failures

45 I sometimes forget why I went from one part of the house to another.
58 I often fail to notice signposts on the road.
85 I sometimes bump into things or people.
95 I often forget whether I've turned off a light or the coffeepot, or locked the door.
99 I sometimes forget which way to turn on a road I know well but rarely use.
112 I sometimes fail to see what I want in a supermarket (although it's right there).
119 I often forget where I put something like a newspaper or a book.
127 I often daydream when I ought to be listening to something.
142 At home, I often start doing one thing and get distracted into doing something else (unintentionally).
170 I sometimes forget what I came to the store to buy.
180 I often drop things.
182 I often find myself putting things in the wrong place when I'm done with them - like putting the milk in the cereal cupboard.
72 I frequently confuse right and left when giving directions.

Reactance

43 Rules and regulations trigger a sense of resistance in me.
47 I enjoy contradicting others.
49 When I am told I can't do something, I react against it by thinking, "That's exactly what I'm going to do."
54 I don't like it when people try to give me advice.

60 When people tell me what to do, I want to do just the opposite.
62 It makes me angry when someone is presented to me as an example to follow.
64 It pleases me to see others conform to society's expectations. (rev)
- *66 I am skeptical of strong praise.*

68 I react negatively when someone tries to tell me what to do.
52 The thought of having to depend on others is unpleasant to me.
- *77 I resist the attempts of others to influence me.*

Extraversion

48 I am a rather lively person.
55 I enjoy meeting new people.
53 I enjoy going out a lot.
57 I would call myself "happy-go-lucky".
59 I like mixing with people.
- *50 I often make decisions on the spur of the moment.*

63 I like to be around plenty of activity and excitement.
- *65 When people talk to me I almost always have a "ready answer."*

42 I can easily adapt to new and unusual situations.

Safety Perception Scale

1 Generally, when employees in my group are warned about working unsafely, they change their behavior and begin working more safely.
2 Employees do not like it when coworkers do not follow safety policy, even when no harm is done.
- *3 The risk level of my job concerns me quite a bit. (rev)*

4 When told about safety hazards, supervisors are appreciative and try to correct them quickly.
5 My manager is well informed about relevant safety issues.
6 If I confront my coworkers about their unsafe behaviors, they will react negatively and think I should mind my own business. (rev)
7 The management at my plant is willing to invest money and effort to improve our safety performance.
9 It is the responsibility of each employee to seek out opportunities to prevent injury.
10 Employees in my work group give each other verbal praise for working safely.
12 At my plant work productivity and quality usually have a higher priority than work safety. (rev)
13 The managers in my plant really care about safety and try to reduce risk levels as much as possible.
- *14 In my work group, more attention is given to unsafe acts than safe acts. (rev)*

17 Management places most of the blame for an accident on the injured employee. (rev)
18 Alcohol or drug abuse is a problem in my plant. (rev)
19 I have more respect for workers who work safely than for workers who work unsafely.
- *20 I am reluctant to discuss my "near misses" with coworkers. (rev)*

22 Employees seen behaving unsafely in my department are usually given corrective feedback by their coworkers.
23 Compared to other plants, I think mine is rather risky. (rev)
25 Working safely is the Number One priority in my plant.
27 When a safety regulation is issued, I try to follow it as best I can.

- *28 Most injuries are caused by equipment problems. (rev)*
- *29 The OSHA recordable injury rate is an accurate reflection of safety at my plant. (rev)*

30 I have received adequate job safety training.
31 Many first aid cases in my plant go unreported. (rev)
32 Information needed to work safely is made available to all employees.

- *33 It is common for employees to be disciplined for having a work injury. (rev)*

34 Employees in my work group participate in defining safe work practices.
35 Management here seems genuinely interested in reducing injury rates.
36 Safety audits are conducted regularly in my department to check the use of personal protective equipment.
38 I know how to do my job safely.
40 Most employees in my group would not feel comfortable if their work practices were observed and recorded by a coworker. (rev)
41 If I received a minor injury on the job, I would report it.

Injury Index

201 How many OSHA Recordable injuries have you had in the last 12 months?

1) None	4) 3
2) 1	5) 4
3) 2	6) 5 or more

202 How many First Aid Case injuries have you had in the last 12 months?

1) None	4) 5-6
2) 1-2	5) 7-8
3) 3-4	6) 9 or more

203 How many Near Misses have you had on the job in the last 30 days?

1) None	4) 5-6
2) 1-2	5) 7-8
3) 3-4	6) 9 or more

204 How many work days have you missed over the past 12 months as a result of a job-related injury

1) None	4) 7-9
2) 1-3	5) 10-12
3) 4-6	6) 13 or more

205 How many work days have you missed over the past 12 months as a result of illness?

1) None	4) 7-9
2) 1-3	5) 10-12
3) 4-6	6) 13 or more

Appendix C

An Example of a Summary of the SCS Administered to an Industrial Site.

Report of the

Safety Culture Survey

taken at

Site A

November, 1994

154 Total Surveys Completed

Operations	85
Maintenance	31
Managers	12
Office	11
Unknown	15

Contents

The Safety Culture Survey

The Safety Culture Survey (SCS) is a combination of three separate scales, each measuring a unique component of employee health and safety.

Safety Perception Scale (SPS)

The SPS was developed as a result of assessing employees' perceptions of safety and health issues in a variety of corporate settings, including plants within *Ford Motor Company, Chrysler, General Motors, Exxon Chemical, Hoechst Celanese, Sara Lee Knit Products,* and the *Tennessee Valley Authority*. This scale measures employees' opinions and attitudes about their current safety culture. The scale addresses a variety of safety issues, including general safety climate, peer support for safety, management support for safety, safety training, and alcohol/drug abuse. The SPS also includes the actively caring **(AC) subscale** which assesses the level of employee actively caring.

Actively Caring Scale (ACS)

The ACS measures person factors (expectancies or mood states) related to one's propensity to actively care for the safety of others. Employees demonstrate actively caring when they act to improve the safety of their fellow employees. Actively caring can be directed to environment, person, or behavior factors. *Environment*-directed actively caring is the reorganization or redistribution of resources in an attempt to benefit others (e.g., cleaning another's work area, donating blood), *person*-focused actively caring is the attempt to make another person feel better (e.g., intervening in a crisis, actively listening, sending a get-well card), and *behavior*-focused actively caring is attempting to influence another person's behavior in desired directions (e.g., giving corrective feedback to a co-worker performing an unsafe behavior or praising a fellow co-worker for protecting the safety of another employee). The ACS includes six sub-scales: *Extraversion, Self-Esteem, Belongingness, Self-Efficacy, Personal Control, and Optimism.* The latter three person factors combine to indicate an individual's perceived *Empowerment*.

Risk Propensity Scale (RPS)

The RPS measures person factors related to an individual's propensity to engage in risky behaviors which increase the likelihood of a "near miss" or an injury. The RPS includes four sub-scales: *Risky Lifestyles* (the frequency a person puts him/herself in relatively risky situations), *Cognitive Failures* (mental distractions that can lead to an injury), *Psychological Reactance* (resistance to comply with mandates or rules), and *Extraversion/Introversion* (one's general approach or style when responding to others -- outgoing, impulsive, and sociable vs. quiet, retiring, and introspective).

SITE A Safety Culture Survey (SCS) Executive Summary

This administration of the SCS was given as a baseline measure (e.g., it is a measure of where *SITE A* is now regarding the person factors relating to safety). After training and/or other interventions, the SCS should be readministered to determine any effects on these person factors.

If behaviors change without subsequent attitude change, the change might be relatively short term. Regular (e.g., yearly) administrations of the SCS can help determine if behavior change interventions are being done in a way which also leads to the attitude change required for long-term continuous improvement.

Although the most meaningful interpretation of the SCS results will come from a comparison between the responses from the current results with results taken from *SITE A* employees at a later time, comparisons across *SITE A* positions and between *SITE A* and other sites can suggest areas for improvement or where attention and support should be focused.

Safety Perception Scale (SPS)

- Managers perceived safety significantly more positively than did the other work groups.
- *Site B* perceived safety significantly more positively than did *SITE A*. (*Site B* is a manufacturing plant which had been through behavior-based safety training prior to completing their SCS.)
- Individual questions with *SITE A* and *Site B* scores are listed in Appendix A.

The Level of Actively Caring (AC Subscale)

- The graphs in Appendix C indicate similar Environment and Person-focused AC subscale scores between *SITE A* and *Site B*. However, there are significant differences between *SITE A* and *Site B* regarding Behavior-focused AC. *SITE A* employees feel they *should* and are *willing* to AC for their coworkers behavior significantly more than they *often* do so.

Person Factors Related to the Propensity to Actively Care (ACS)

- The correlation between ACS factors and willingness to actively care was .69, which is very good when trying to predict human behavior. Therefore, *SITE A* employees with higher perceptions of group belonging, self-esteem, optimism, personal control, and self-efficacy are more willing to AC. This information is useful because now we can be more confident that increasing the ACS factors at *SITE A* will lead to increased individual and group involvement in safety efforts, and eventually to a safer workplace.

Risk Propensity Scale (RPS)

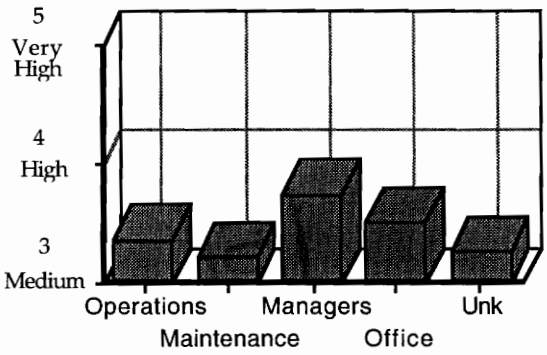
- Overall, *SITE A* employees had low RPS scores. Although the level of Reactance (e.g., feeling threatened by top-down mandates and directives) was highest among the maintenance group, it was still quite low. However, the maintenance group had relatively high Risky Lifestyle scores (e.g., frequency a person puts him/herself in relatively risky situations).

Interpretation of SCS Results

The Safety Perception Scale (SPS)

The three sections of the SCS were analyzed and scored separately. The first section analyzed is the SPS. This scale assesses employees current ***perceptions*** and ***opinions*** regarding safety issues. The results are separated into opinions from each organizational position. Also included in the position breakdown are 15 unknowns. These scores represent individuals who did not put an identifying code on the SCS. Although some of these individuals probably forgot to include their code, many probably felt uncomfortable writing anything which could be used to identify them. The unknown group is often most skeptical and distrustful of management. Furthermore, the differences among *SITE A* employees and between *SITE A* and *Site B* might seem very small, however differences of only .2 are statistically significant at the .05 level. This means that if one group's average score was 3.0 on a SCS question and another group's average score was 3.2, the chance of such a difference occurring randomly (e.g., the difference really not meaning anything) will only happen 5 times out of 100.

Safety Perception Scale

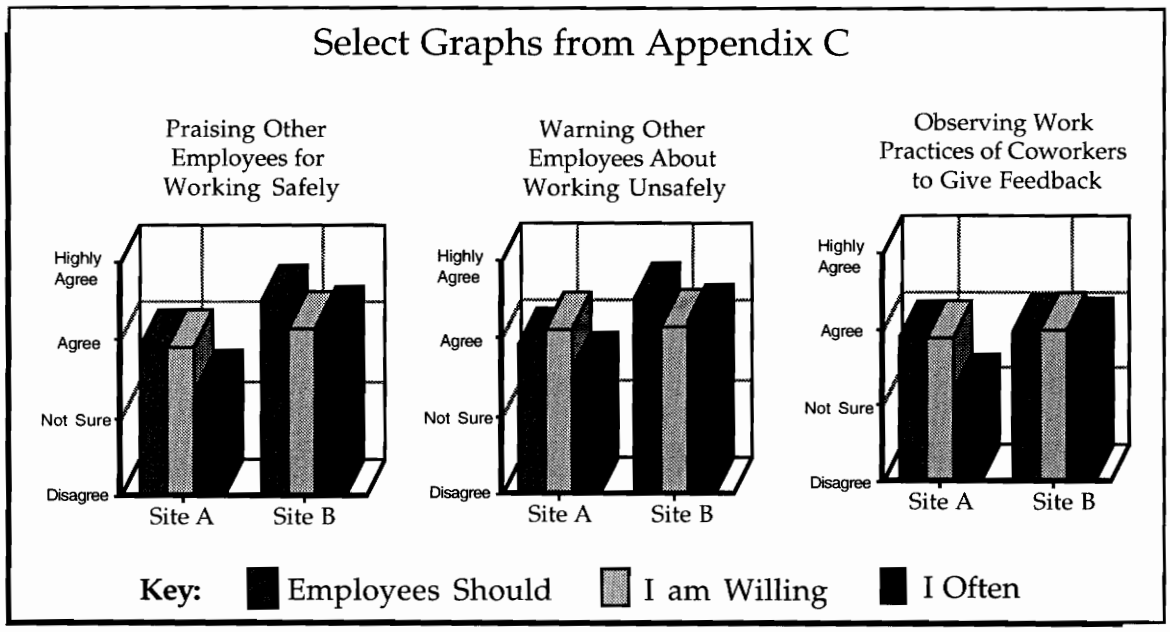


Site A = 3.5 Site B = 3.8

The graph below depicts the overall safety perception (i.e., SPS score) of *SITE A* employees broken down by organizational position. The higher the bars on the graph the more employees agreed safety is positive. Below the graph is the average SPS score from *Site B* as a comparison to the *SITE A* average SPS score. *Site B* is a manufacturing plant which has been through behavior-based safety training (prior to completing their SCS). *Site B* perceived safety significantly more positively than did *SITE A*. Also, there were significant differences regarding safety perception across the SITE A organizational positions. Managers perceived safety significantly more positively than did the other work groups. Appendix A lists each question from the SPS according to management support, peer support, and personal responsibility for safety and compares *SITE A* and *Site B* scores for these questions.

Willingness to Actively Care

The actively care (AC) subscale assesses the extent to which employees AC from a *behavior, person* and *environment* perspective. Each base question from the AC subscale was asked from three different perspectives: If employees feel they *should*, if employees are *willing*, and if employees *often* do AC. When employees feel they *should* AC and are *willing* to AC more than they *do* AC, there is potential for relatively quick improvements in safety following appropriate training. Furthermore, when employees are *willing* to AC more than they feel they *should* or actually *do* AC, they are willing to "stretch" or go beyond the call of duty for safety, but might need support and direction for doing so. Appendix C lists the base questions from the AC subscale and a graphical representation of the average responses for both *SITE A* and *Site B* employees. The graphs in Appendix C indicate similar Environment and Person-focused AC subscale scores between *SITE A* and *Site B*. However, there are significant differences between *SITE A* and *Site B* regarding Behavior-focused AC. Below are three select behavior-focused graphs from Appendix C. These graphs indicate employees feel they *should* and are *willing* to AC for their coworkers behavior significantly more than they *often* do so. This indicates a greater potential for improvement in safety than if *SITE A* employees were also low on the *should* and *willing* categories.



Predicting Who Will Actively Care

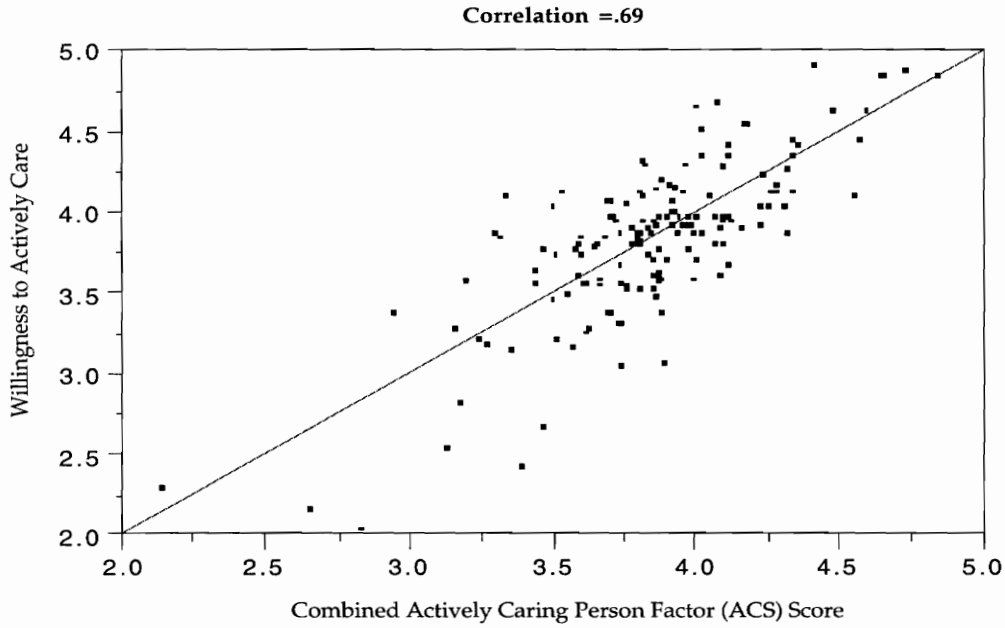
The Actively Caring Scale (ACS) measures person factors related to one's propensity to actively care for the safety of others. The person factors which increase one's propensity to actively care are:

1. Self-Esteem- "*I am valuable.*" People need to feel good about themselves; when we don't, we don't care about making a difference in the lives of others.
2. Belongingness- "*I belong to a team.*" A total safety culture (TSC) depends on a sense of group cohesion. This state leads to individuals reaching out to help other team members.
3. Self-Efficacy- "*I can do it.*" Individuals need to believe they have sufficient resources (including training, skills, materials, and time) to get the job done safely.
4. Personal Control- "*I am in control.*" People feel in control when they believe they are responsible for (and can influence) outcomes.
5. Optimism- "*I expect the best.*" Optimism is very important to believing one can make a difference. It is the expectation that one's individual efforts will produce beneficial outcomes. According to the self-fulfilling prophecy, people who expect the best usually get the best.

ACS Factors at SITE A

Theory and research suggests individuals with high ACS scores are more likely to get involved and AC for safety. However, it is important to see if our AC model actually explains behaviors and attitudes among *SITE A* employees. The figure below depicts a correlation between the overall AC score (e.g., willingness to actively care) on the y axis (left side) and an ACS score (obtained by combining the average scores from the six ACS factors) on the x axis (bottom). Correlations of 1.0 indicate a perfect relationship between two variables (e.g., you can predict perfectly scores from one variable if scores on the other are known). For many sciences (e.g., physics, chemistry) almost perfect correlations are needed and expected (e.g., correlations of .99) between variables before the information is thought to be useful. However, predicting human behavior is much more difficult. Therefore, even small correlations (e.g., .30) are often considered good. The correlation between ACS factors and willingness to actively care was .69, which is very good when trying to predict human behavior. Therefore, the figure shows that *SITE A* employees with higher perceptions of group belonging, self-esteem, optimism, personal control, and self-efficacy reported more propensity to AC. This information is useful because now we can be more confident that increasing the ACS factors at *SITE A* will lead to increased individual and group involvement in safety efforts, and eventually to a safer workplace.

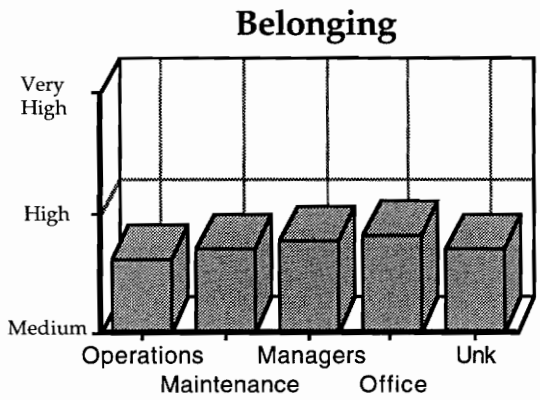
Relationship Between Actively Caring Person Factors and Willingness to Actively Care

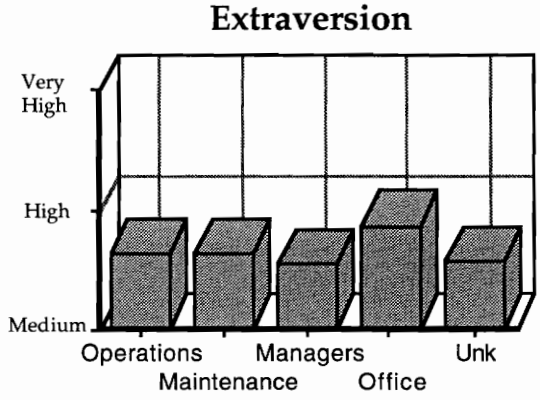


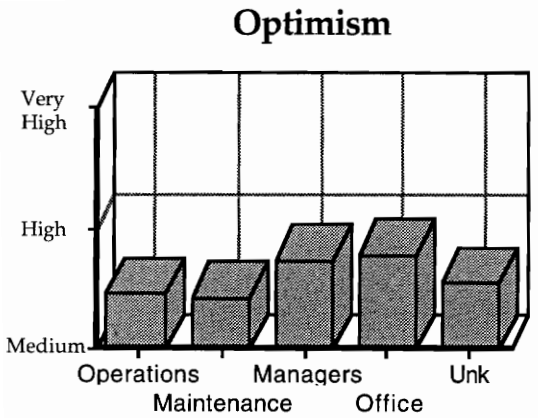
Creating and Maintaining an Environment to Support AC Behaviors

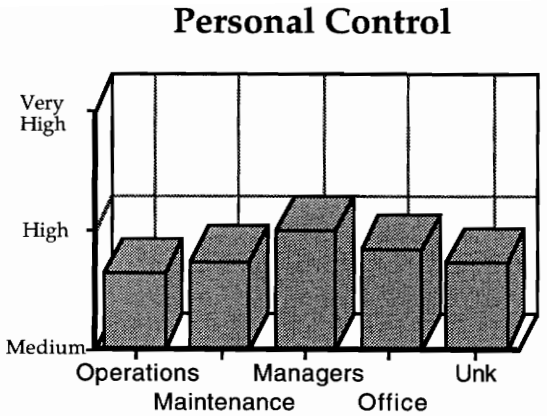
Below, the AC person factors are graphed for each organizational position. The higher the bars on the graphs, the more employees agreed with questions relating to each ACS factor. These graphs show many ACS scores to be moderately high. Therefore, *SITE A* employees on average, show potential to achieve a total safety culture.

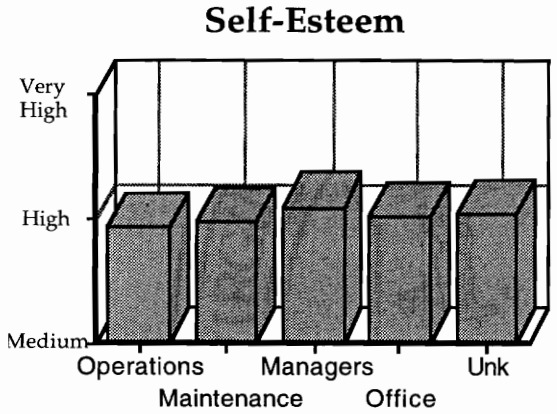
SITE A ACS Graphs

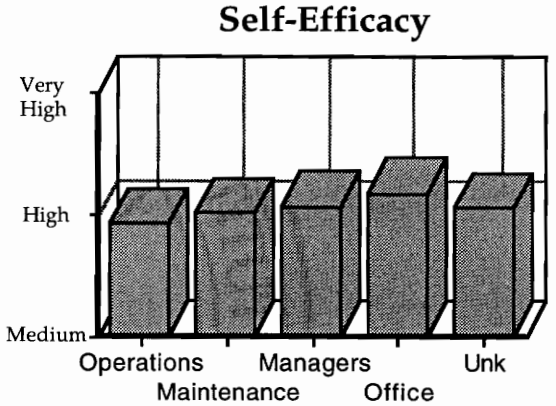












How to Increase ACS Factors

Interventions to increase ACS factors can take many forms. For example, some people seem to have a natural sense of self-worth, personal control, or optimism. But it's important to remember that all of these determinants of actively caring can be taught and nurtured. To bring about self-esteem, you can compliment people on a job well-done. When giving corrective feedback, separate the person from the unacceptable behavior, focus on the individual's actions, and don't hesitate to admit you've made similar mistakes yourself.

Belongingness and teamwork can be promoted by recognizing group safety efforts, not only individual achievement. There's a lot of talk about teamwork these days, and unfortunately, some companies are talking it into the ground. Enable teams to develop through empowering experiences, not lectures, mandates, or policy.

Self-efficacy, personal control, and optimism contribute to feeling empowered-- the personal feeling that "I can make a difference." Self-efficacy can be increased by giving employees sufficient resources (including time and personnel) to do the task at hand according to the relevant job safety analysis.

A person's sense of "being in control" can be developed through various techniques. People need responsibility, the freedom to make mistakes, and the training to know how to do assignments correctly. They also need to believe the beneficial consequences they're experiencing are the result of their behavior, at least to some extent.

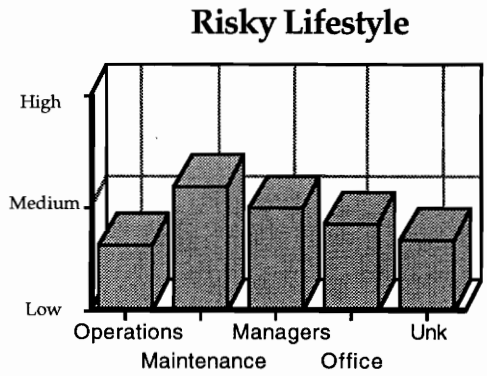
You can increase optimism by recognizing the "small wins" in life, the little successes that can add up to big achievements. Good planning also leads to optimism; giving people a sense that "we know how we're going to do this."

Risk Propensity Scale (RPS)

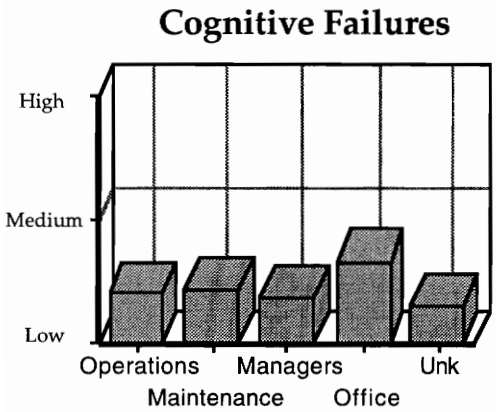
The RPS measures lifestyle and person factors which increase the likelihood of engaging in risky behaviors and eventually experiencing a "near miss" or injury. It should be noted that although risk-takers are more likely to be involved in a "near miss" or injury, having a risky personality is not all bad. For example, life is full of risks and in order to get ahead we must often take chances. Those with risky personalities are not only more likely to take chances regarding occupational safety but also in business and social situations. Therefore, it is not surprising that most CEO's of organizations score higher on risk propensity measures. A challenge for industry is to create a culture where taking risks regarding safety is not rewarded (e.g., employees should not be rewarded for meeting production goals at the expense of safety). A culture that supports safe behavior is especially important when it includes a large number of risk takers who would be quick to take risks if it would help them get ahead. The RPS includes three sub-scales: *Risky Lifestyles, Cognitive Failures, and Psychological Reactance* .

Risky Lifestyle (RL). All behavior puts people at some level of risk. Some behaviors help to reduce risk in certain situations. Driving a vehicle, for example, increases one's risk to some degree, depending on the driving conditions. These risks can be reduced by using safety belts and driving defensively. The RL sub-scale assesses the frequency a person puts him/herself in relatively risky situations (e.g., nonuse of PPE when using a chainsaw or power tools, hunting without blaze orange, drinking and driving, etc.).

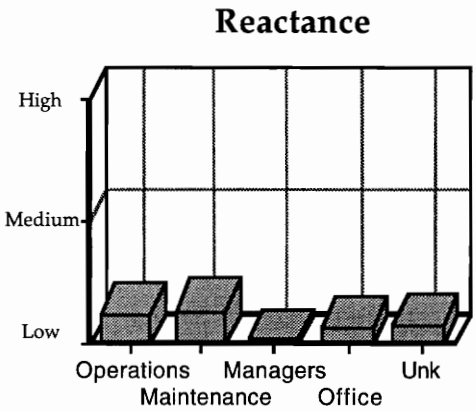
Given the principle of generalization, we presume the risk level a person accepts in a given situation (e.g., while driving) will transfer to other situations. This scale assesses one's personal risk level. The graph to above shows significant differences between *SITE A* groups. The maintenance group shows the highest risky lifestyle scores.



Cognitive Failures (CF). The CF sub-scale measures the degree and frequency a person experiences mental lapses or distractions conducive to experiencing a "near miss" or injury. Both catastrophic (resulting in injury or death) and insignificant mental errors can be seen as reflecting a breakdown in our cognitive processing. It has been demonstrated that people who are more likely to drop or bump into objects, not pay attention, or forget things are more likely to be involved in vehicle collisions and industrial accidents. The graph to the right shows relatively few reports of cognitive failures at *SITE A* .



Psychological Reactance (PR). Individuals are predisposed in varying degrees to preserve their personal freedom or react aggressively to a perceived threat to personal freedom. When one's perceived freedom is lost or threatened (e.g., by an external controlling agent), one will experience an unpleasant state (termed reactance) resulting in a desire to recover the lost or threatened freedom. Safety regulations often use very directive language (e.g., you are ***required*** to use hearing protection, you ***must*** use steel toed shoes). Individuals high in psychological reactance may actually act in ways counter to top-down safety mandates in an attempt to assert their personal freedom. Although the overall level of *SITE A* reactance was low, it was highest for the maintenance group.



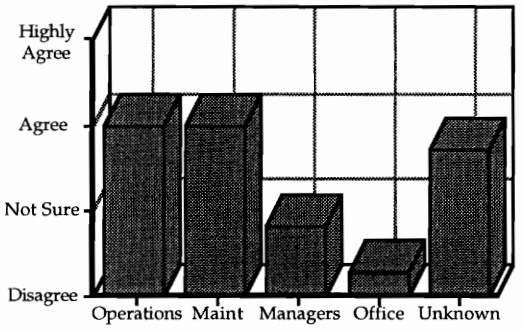
Appendix A. SITE A vs. Site B Safety Perception Scale Items

The table below lists questions and responses from the SITE A Safety Perception Subscale form the SCS. The numbers in the columns represent the average answers for each question. The numbers have been highlighted where there are large differences between Sites. It should be reiterated that these answers reflect ***opinions*** and ***perceptions*** of employees, not ***necessarily*** actual on-the-job behaviors. The scale ranged from 1-5 with 1=Highly Disagree, 2=Disagree, 3=Not Sure, 4=Agree and 5=Highly Agree.

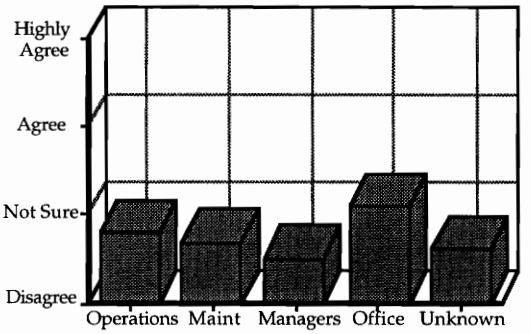
Q#	SPS Questions reflecting Management Support for Safety	Site A	Site B
4	When told about safety hazards, supervisors are appreciative and try to correct them quickly.	**3.3**	**3.87**
5	My manager is well informed about relevant safety issues.	**3.8**	**4.04**
7	The management at my plant is willing to invest money and effort to improve our safety performance.	3.6	3.79
12	At my plant work productivity and quality usually have a higher priority than work safety.	**3**	**2.61**
13	The managers in my plant really care about safety and try to reduce risk levels as much as possible.	**3.6**	**3.85**
15	Management places most of the blame for an accident on the injured employee.	3.4	3.38
24	Working safely is the Number One priority in my plant.	**3.5**	**3.92**
27	I have received adequate job safety training.	**3.8**	**4.01**
29	Information needed to work safely is made available to all employees.	**3.9**	**4.11**
31	Management here seems genuinely interested in reducing injury rates.	**3.8**	**4.12**
	SPS Questions reflecting Peer Support for Safety		
1	Generally, when employees in my group are warned about working unsafely, they change their behavior and begin working more safely.	3.8	3.97
2	Employees do not like it when coworkers do not follow safety policy, even when no harm is done.	**3.6**	**3.86**
6	If I confront my coworkers about their unsafe behaviors, they will react negatively and think I should mind my own business.	**2.7**	**2.38**
10	Employees in my work group give each other verbal praise for working safely.	**2.9**	**3.40**
20	Employees seen behaving unsafely in my department are usually given corrective feedback by their coworkers.	**3.3**	**3.72**
30	Employees in my work group participate in defining safe work practices.	**3.4**	**3.85**
	SPS Questions reflecting Personal Responsibility for Safety		
9	It is the responsibility of each employee to seek out opportunities to prevent injury.	4.4	4.34
17	I have more respect for workers who work safely than for workers who work unsafely.	4.1	4.15
26	When a safety regulation is issued, I try to follow it as best I can.	4.1	4.19
34	I know how to do my job safely.	4.3	4.31
38	If I received a minor injury on the job, I would report it.	3.3	3.43
	Other SPS Questions		
3	The risk level of my job concerns me quite a bit.	3.7	3.72
16	Alcohol or drug abuse is a problem at my plant.	**2.7**	**2.28**
22	Compared to other plants, I think mine is rather risky.	**2.5**	**2.10**
28	Many first aid cases in my plant go unreported	**3.1**	**2.81**
32	Safety Audits are conducted regularly in my department to check the use of personal protective equipment.	**3.1**	**3.63**

Appendix B. Questions from the SPS According to SITE A Position

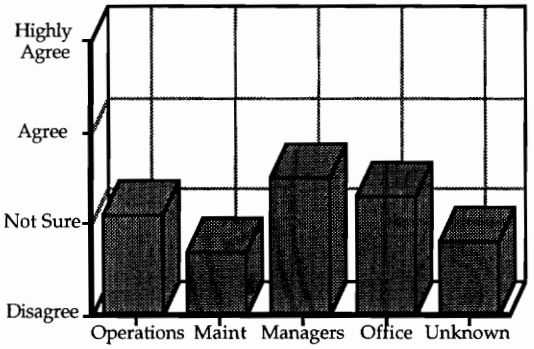
The risk level of my job concerns me quite a bit.



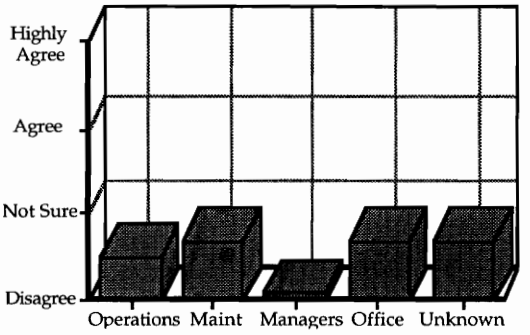
Alcohol or drug abuse is a problem at my plant.



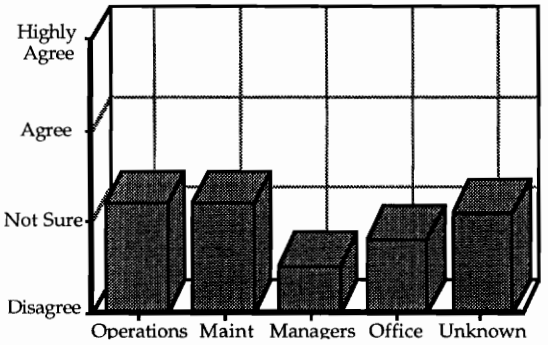
Near misses are consistently reported and investigated at our plant.



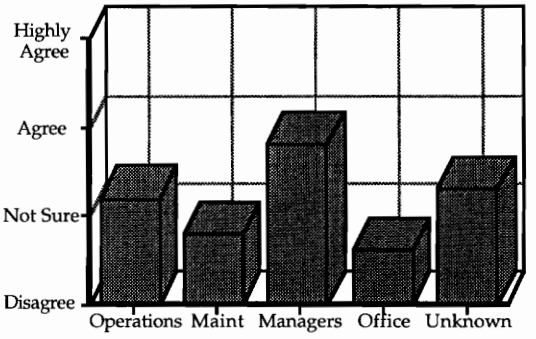
Compared to other plants, I think mine is rather risky.



Many first aid cases in my plant go unreported

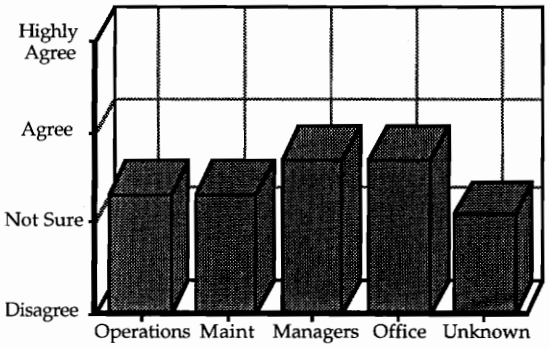


Safety Audits are conducted regularly in my department to check the use of personal protective equipment.

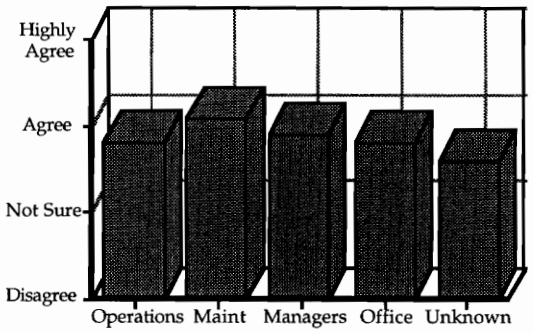


Appendix B Continued

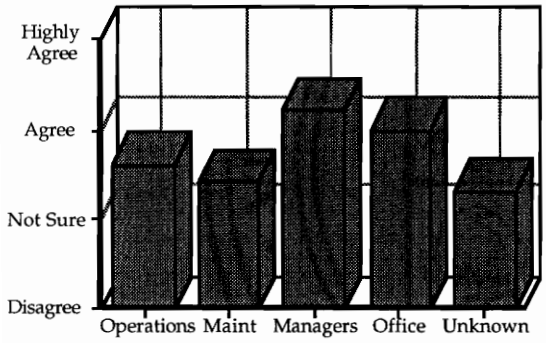
When told about safety hazards, supervisors are appreciative and try to correct them quickly.



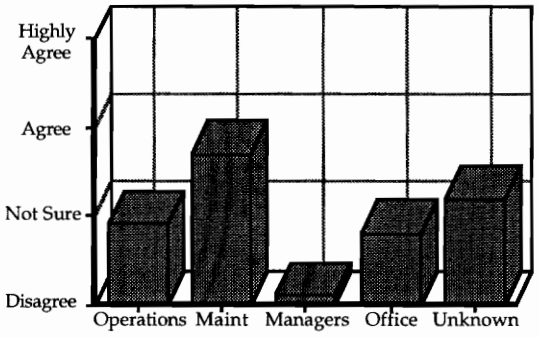
My manager is well informed about relevant safety issues.



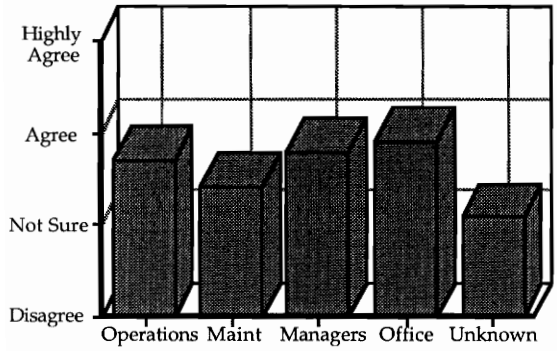
The management at my plant is willing to invest money and effort to improve our safety performance.



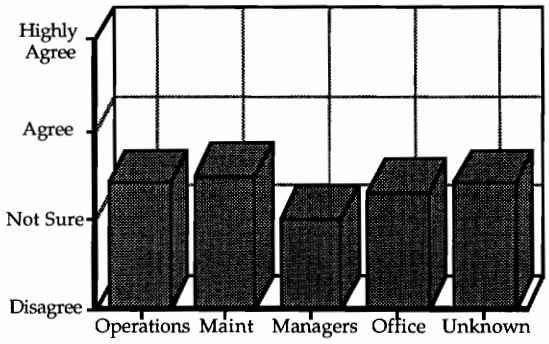
At my plant work productivity and quality usually have a higher priority than work safety.



The managers in my plant really care about safety and try to reduce risk levels as much as possible.

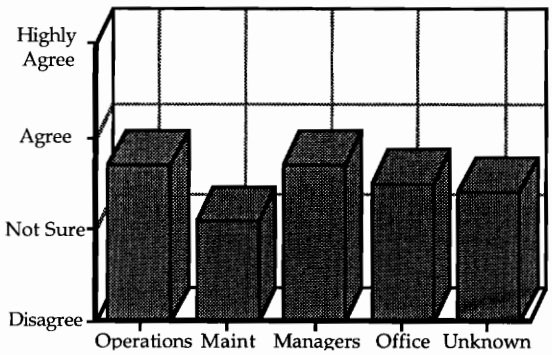


Management places most of the blame for an accident on the injured employee.

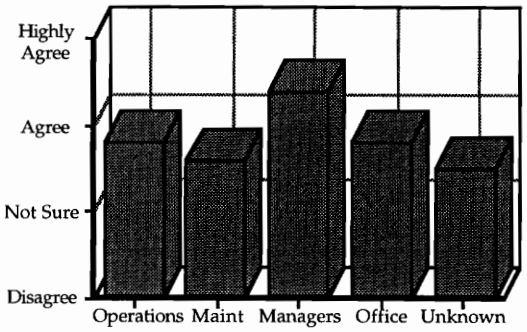


Appendix B Continued

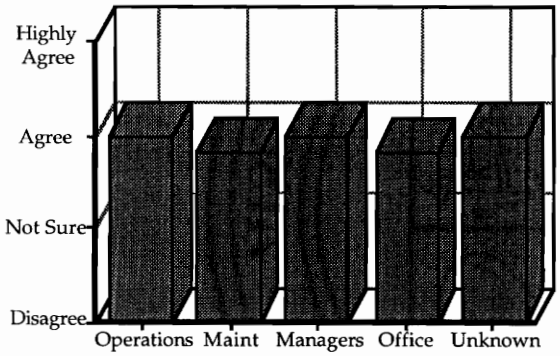
Working safely is the Number One priority in my plant.



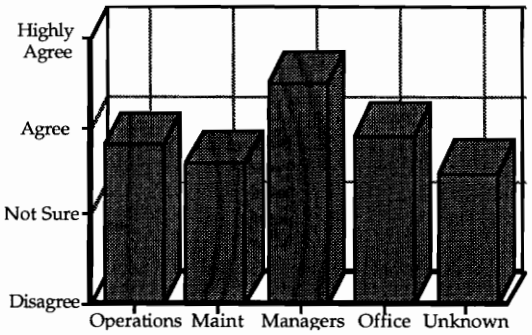
I have received adequate job safety training.



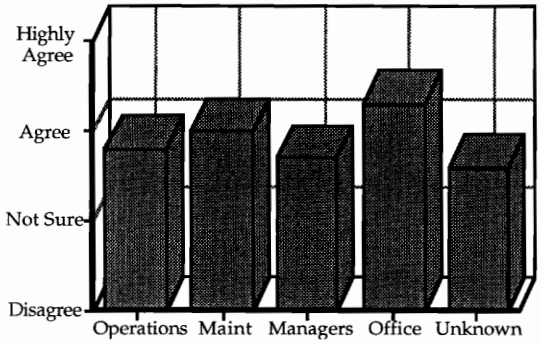
Information needed to work safely is made available to all employees.



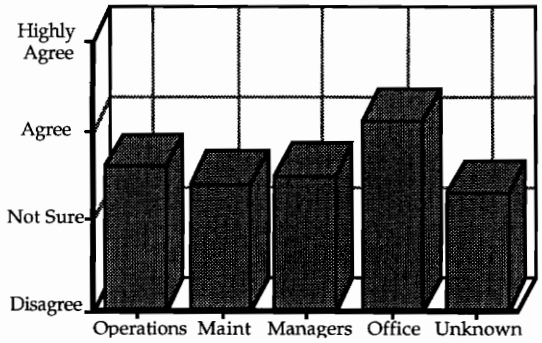
Management here seems genuinely interested in reducing injury rates.



Generally, when employees in my group are warned about working unsafely, they change their behavior and begin working more safely.

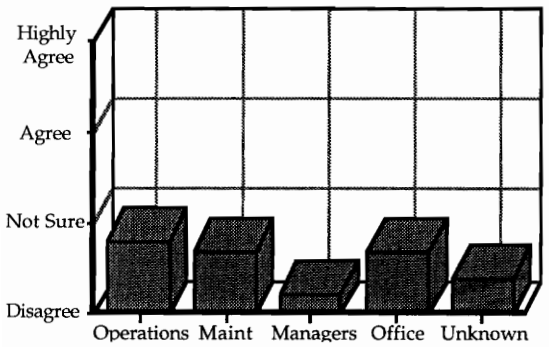


Employees do not like it when coworkers do not follow safety policy, even when no harm is done.

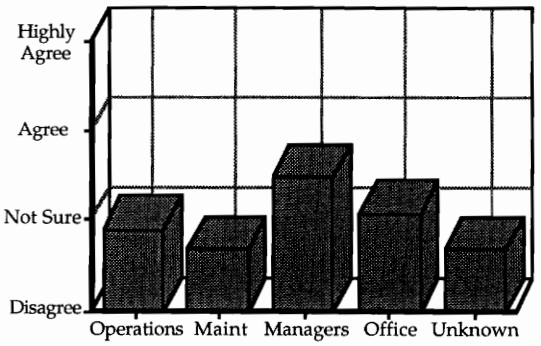


Appendix B Continued

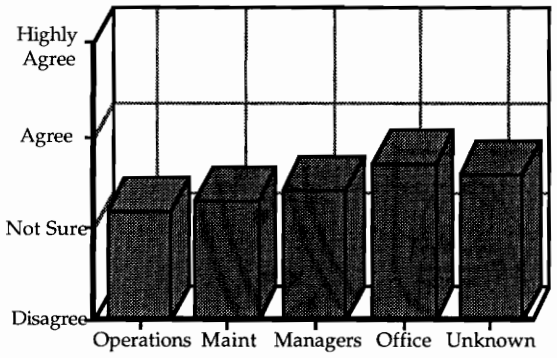
If I confront my coworkers about their unsafe behaviors, they will react negatively and think I should mind my own business.



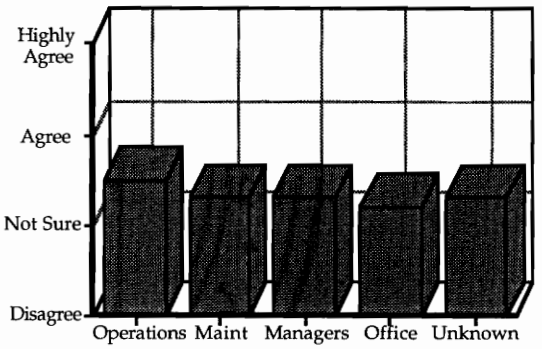
Employees in my work group give each other verbal praise for working safely.



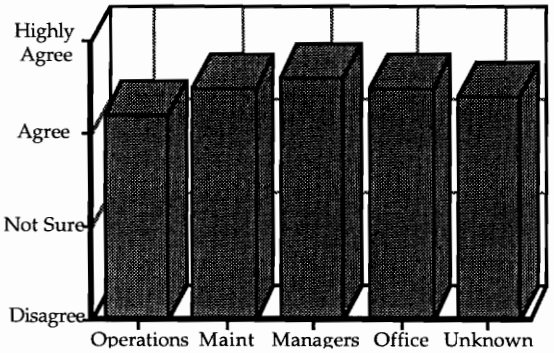
Employees seen behaving unsafely in my department are usually given corrective feedback by their coworkers.



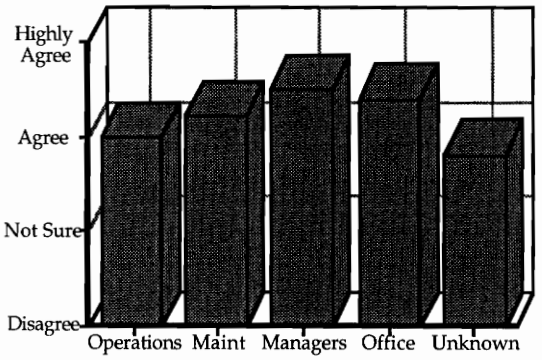
Employees in my work group participate in defining safe work practices.



It is the responsibility of each employee to seek out opportunities to prevent injury.

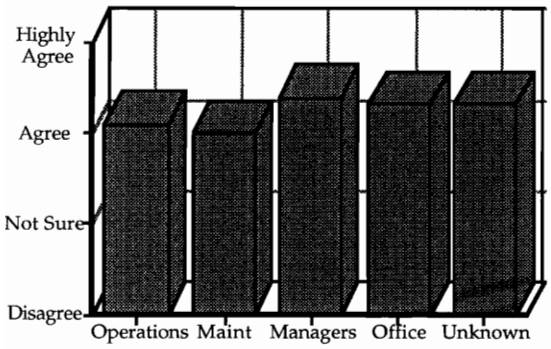


I have more respect for workers who work safely than for workers who work unsafely.

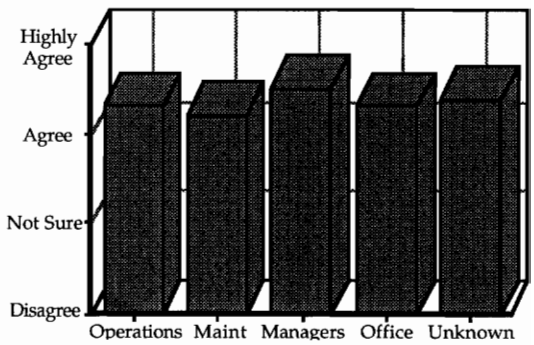


Appendix B Continued

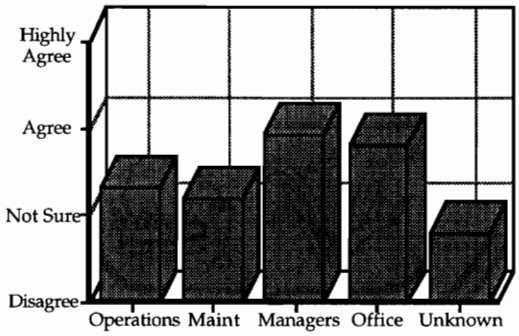
When a safety regulation is issued, I try to follow it as best I can.



I know how to do my job safely.

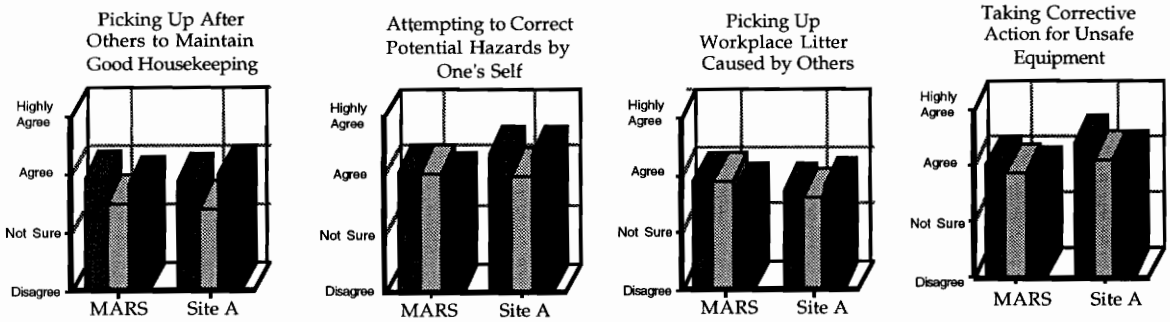


If I received a minor injury on the job, I would report it.

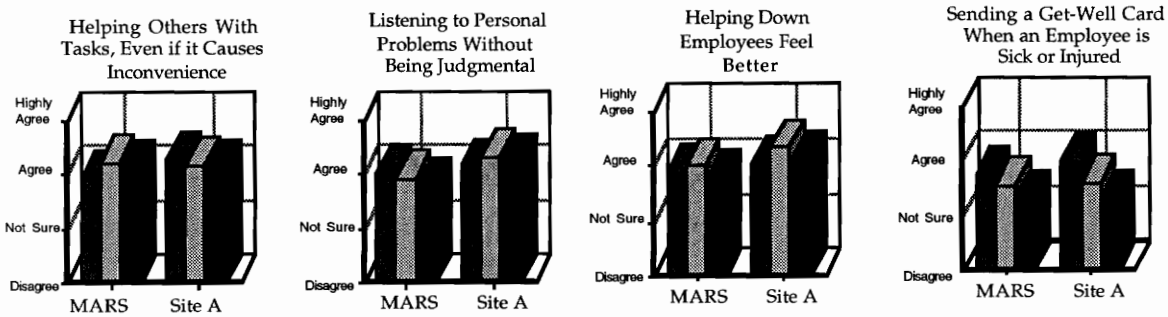


Appendix C. The AC Subscale

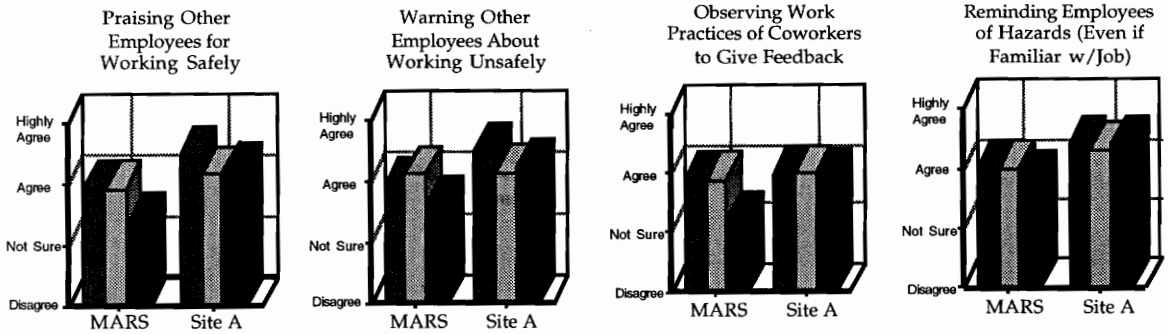
Environment Focused Actively Caring



Person Focused Actively Caring



Behavior Focused Actively Caring



Key: Employees Should | I am Willing | I Often

VITA

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Education

Virginia Polytechnic Institute and State University, Blacksburg, VA

Major: Applied-Experimental Psychology
Degree: Doctor of Philosophy 1995
Development and Evaluation of a Safety Culture Survey for Occupational Health and Safety. (Chair: E. Scott Geller, Ph.D.)

Virginia Polytechnic Institute and State University, Blacksburg, VA

Major: Applied-Experimental Psychology
Degree: Master of Science 1991
Thesis: Evaluation of a Large-Scale Intervention Project to Increase Safety Belt Use in Eight Virginia Communities. (Chair: E. Scott Geller, Ph.D.)

West Chester University, West Chester, PA

Major: Industrial/Organizational Psychology
Degree: Master of Arts 1990
Thesis: Effects of Behavioral and Outcome Feedback on Both Simple and Complex Tasks. (Chair: Phillip K. Duncan, Ph.D.)

Old Dominion University, Norfolk, VA

Major: Psychology
Degree: Bachelor of Science 1987

Professional Experience

12/93 - present. Senior Industrial Safety Consultant, Make-A-Difference, Inc., Newport, VA. Specialization in industrial safety intervention design and evaluation, design and delivery of industrial safety training, desktop publishing, and workbook preparation for behavior change programs. I have direct consulting experience with a number of companies, including Exxon Chemical, Sara Lee Knit Products, Columbian Chemical, Cape Industries, Westinghouse, and Newport News Shipbuilding. I have prepared training materials and workbooks on a variety of safety and behavior change topics including "actively caring," behavioral auditing, hand safety, eye and ear safety, driver safety, confined space/fire permitting, and back safety/ergonomics. Supervisor: E. Scott Geller, Ph.D.

4/94 -11/94. Senior Research Associate, Management Systems Laboratory, Department of Industrial and Systems Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA. Worked as part of a team implementing behavior-based industrial safety programs at a large nuclear facility. I was involved in designing instructional materials, teaching employee workshops, and facilitating employee implementation teams. Supervisor: Anne Doss, Ph.D.

9/91 - 12/93 Occupational Safety Co-op with Hoechst Celanese Corporation, Narrows, VA. Development, evaluation, and documentation of various occupational safety programs. I co-developed an occupational safety climate questionnaire, a survey instrument to predict an employee's willingness to intervene on the behalf of a co-worker's safety, various safety audit forms, and an employee feedback system. I assisted with the curriculum development and have team taught a number of plant-wide *Employee Health and Safety Workshops*, as well as various department-level safety workshops. Safety Manager: Steve Wachnowsky, M.S.

8/92 - 5/93 GTA Instructor, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA. Taught two semesters of *Psychological Research Methods*. Supervisors: Drs. J.A. Sgro & H. J. Crawford.

1/91 - 4/91 Graduate Teaching Assistant, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA. Taught one semester of *Personality Research Methods Lab*. Supervisor: J.A. Sgro, Ph.D.

1/90 - 2/91 Co-principle Investigator and Project Coordinator on contract from the Virginia Department of Motor Vehicles, Virginia Polytechnic Institute and State University, Blacksburg, VA ($30,000). I coordinated conferences and training seminars, gave technical assistance to community police departments, disseminated project materials, and assembled and analyzed data. I recruited and managed a team of "Retired Senior Volunteer" data collectors in four different project control locations throughout the state of Virginia. I wrote quarterly reports and co-wrote the final report to the Virginia DMV. Co-principal Investigator: E. Scott Geller, Ph.D.

8/89 - 1/90 Graduate Research Assistant, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA. Worked on a team which developed the design, theoretical orientation, and intervention strategies for a driver safety grant from the Safety and Loss Council of Domino's Pizza Corporation. Principal Investigator: E. Scott Geller, Ph.D.

8/89 - 1/90 Graduate Teaching Assistant, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA. Discussion leader for the weekly discussion section of *Introductory Psychology*. Supervisor: J.A. Sgro, Ph.D.

1/89 - 6/89 Graduate Intern, Training and Development Department, Unisys Corporation, Paoli, PA. Assisted in the administration and needs analysis of the Unisys Defense Systems After Hours Continuing Education Program. I developed, distributed, and evaluated a faculty survey allowing instructors to give feedback on ways to improve the administration of the program. I

organized the program's annual awards banquet and performed various other administrative tasks. Supervisor: Brenda Grove, M.A.

9/88 - 5/89 Graduate Assistant, Residence Life Department, West Chester University, West Chester, PA. Selected, supervised, and evaluated the desk assistant staff of a university dormitory. I monitored student employee payroll, advised and counseled undergraduate students on academic and personal issues, and performed various other administrative and committee assignments. Supervisor: Latona Williams.

5/88 - 8/88 Graduate Assistant, Office of Public Relations, West Chester University, West Chester, PA. Wrote press releases about university news for university and local/regional newspapers. I contacted and interviewed individuals for university related stories, and performed various supportive duties. Supervisor: Pat Donahue.

10/87 - 5/88 Personnel Coordinator, Downingtown Industrial/Agricultural School, Downingtown, PA. Worked independently to carry out various human resource tasks. I wrote the draft for the organization's employee handbook, incorporating current EEOC regulations and guidelines. I wrote drafts of job descriptions and employee evaluation forms for various organizational positions. Executive Director: Hersey Grey.

Professional Services

- 1991-1994 Student Reviewer for the *Journal of Applied Behavior Analysis.*
- 1/90 - 2/91 Virginia Tech representative to the Virginia Safety Belt Implementation Task Force.
- 5/85 - 5/86 Associate Justice on the Old Dominion University Honor Council.

Areas of Interest

- Occupational and Community Health and Safety
- Industrial/Organizational Psychology
- Applied Behavior Analysis
- Research Methodology
- Assessment of Individual Differences

Honors

- B.A. Cum Laude
- Psi Chi National Honor Society Member

Research Articles in Refereed Journals

Roberts, D. S., & Geller, E. S. (1995) An actively caring model for occupational safety: A field test. Applied and Preventive Psychology, 4, 53-59.

Roberts, D. S., & Geller, E. S. (1994). A statewide intervention to increase safety belt use: Adding to the impact of a belt use law. American Journal of Health Promotion, 8, 172-174.

Geller, E. S., Roberts, D. S., Gilmore, M. R. Predicting propensity to actively care for occupational safety. Journal of Safety Research. Accepted for publication pending revisions

Research Abstracts and Conference Proceedings

Buemeyer, C.M., Rasmussen, D., Roberts, D.S., Martin, C., & Gershenoff, A. (1994). Red Cross blood donors vs. a sample of students: An assessment of differences between groups on"actively caring" person factors. Virginia Journal of Science, 45, 110.

Patarryo, O., Nuttycombe, K., Roberts, D.S., Martin, C., & Gershnoff, A. (1994). How environmental differences in university dining halls affect employees actively caring behaviors. Virginia Journal of Science, 45, 117.

Pettinger, Jr., C.B., Kalsher, M., Roberts, D.S., & Glindemann, K.E. (1994). Alcohol testing through cognitive behavioral fitness tests. Virginia Journal of Science, 45, 118.

Roberts, D.S., Geller, E.S., Maddox, K.L., & Fitch, W. (1994). Increasing Stair Safety on a university campus: A comparison of field tests. Virginia Journal of Science, 45, 120.

Davis, J.C., Jaxtheimer, K.A., Roberts, D.S., & Glindemann, K.E. (May, 1993). Alcoholic beverage selection and its relationship to subsequent intoxication at a university fraternity party. Virginia Journal of Science, 44, 112.

Kline, K.A., Satz, J.M. & Roberts, D.S. (March 1993). The "Actively Caring" model for occupational safety: Comparing alternative measures of optimism. Student/Faculty Information Exchange for Enhancing Undergraduate Research for the 39th annual meeting of the Southeastern Psychological Association.

Roberts, D.S., Buermeyer, C.M., & Geller, E.S. (1993). "Actively Caring" in the workplace: A model for increasing corporate safety. Proceedings of the 13th Annual Convention of the Florida Association for Behavior Analysis, Ft. Lauderdale, Florida.

Satz, J.M., Glindemann, K.E., Roberts, D.S., Freeman, C.M., & Barn, L.A. (1992). What do college students prefer to drink?: An examination of alcoholic beverage selection by type and quantity. Student/Faculty Information Exchange for Enhancing Undergraduate Research, 2, 86.

Geller, E.S., Ludwig, T.D., Needleman, L.D., Gilmore, M.R., & Roberts, D.S. (1990). A Behavior Change Taxonomy for Improving Road Safety. Proceedings of the OECD International Road Safety Symposium, September 19-21, 1990, Copenhagen, Denmark.

Training Manuals

Geller, E. S., & Roberts, D. S. (1993). Leading the Revolution: Continuous improvement through empowerment. Newport, VA: Make-A-Difference, Inc.

Geller, E. S., & Gilmore, M. R., & Roberts, D.S. (1993). Achieving total safety management through employee involvement: Second Edition. Newport, VA: Make-A-Difference, Inc.

Geller, E. S., & Roberts, D. S. (1992). Achieving a total safety culture through employee involvement: First Edition. Newport, VA: Make-A-Difference, Inc.

Technical Reports

Geller, E. S., & Roberts, D. S. (1993). Culture safety analysis: An analysis of the Safety Climate Survey at the Sanford Yarn Plant. Technical Report submittd to Sara Lee Knit Products, Sanford, NC. (48 pages).

Geller, E. S., & Gilmore, M. R., & Roberts, D.S. (1992). Safety Climate Survey: Initial data analysis for the Mont Belvieu Plastics Plant. Technical Report submittd to Exxon Chemical Company, Mont Belvieu, TX. (50 pages).

Geller, E. S., Gilmore, M. R., & Roberts, D.S. (1992). Safety Climate Survey: Initial data analysis for the Baytown Olefins Plant. Technical Report submittd to Exxon Chemical Company, Baytown, TX (81 pages).

Roberts, D.S., & Glindemann, K.E. (1992). Fitness for duty testing for occupational safety: Evaluation of current techniques. Technical report submitted to Hoechst Celanese Corporation, Celco Plant, Narrows VA (9 pages).

Roberts, D.S., & Geller, E.S. (1991). Safety belt and child passenger safety law demonstration grant program. Final report for contract DTNH22-89-Z-05278, Commonwealth of Virginia Department of Motor Vehicles (77 pages).

Professional Presentations

Buermeyer, C.M., Geller, E.S., Roberts, D.S., & Rasmussen, D.D. (1994). Red Cross blood donors vs. a sample of students: An assessment of differences on actively caring person states. Paper to be presented at the 14th Annual Convention of the Florida Association for Behavior Analysis, Orlando, Florida.

Buermeyer, C.M, Geller, E.S., Roberts, D.S., Previ, L.C., & Jantz, T. (1994). The effects of an intensive freshman orientation program on actively caring behaviors. Paper presented at the 20th annual convention of the Association for Behavior Analysis, Atlanta, GA.

Glindemann, K.E., Buermeyer, C.M., Roberts, D.S., Mohla, A, & Ludwig, T.D. (1994). Examining the relationship between intentions to consume alcohol and actual drinking behavior: A series of field tests. Paper presented at the 20th annual convention of the Association for Behavior Analysis, Atlanta, GA.

Pettinger, Jr. C.B., Roberts, D.S., Doss, A., Casali, S., & McClintock, M. (1994). Attempts to increase safety at a nuclear facility through behavior analysis. Paper presented at the 20th annual convention of the Association for Behavior Analysis, Atlanta, GA.

Roberts, D.S., Glindemann, K.E., Jones III, J.P., Nuttycombe, K., & Geller, E.S. (1994). Increasing stair safety procedures: Other focused vs. self-focused written prompts. Paper presented at the 20th annual convention of the Association for Behavior Analysis, Atlanta, GA.

Geller, E. S., & Roberts, D. S. (1993). Beyond behavior modification for continuous improvement in occupational safety. Invited address presented at the 4th annual Florida Association for Behavior Analysis/Organizational Behavior Management Network Conference, St. Petersburg Beach, FL.

Roberts, D.S., Patarroyo, O., Lay, I., & Rasmussen, D. (1993). Increasing safe behaviors: Other-focused versus self-focused antecedents. Poster presented at the 10th Annual Meeting of the Southeastern Association for Behavior Analysis, Chapel Hill, North Carolina.

Buermeyer, C.M., Jones, J.P., Previ, L.C., & Roberts, D.S. (1993). Using visual and social prompts to increase stair safety in a university setting. Poster presented at the 13th Annual Convention of the Florida Association for Behavior Analysis, Ft. Lauderdale, Florida.

Smoot, D.A., Roberts, D.S., Trail, T.E., Woolfolk, H., Buermeyer, C., Barn, L.A., Holland, M.S. & Satz, J.M. (1993). Leadership and behavioral auditing as determinants of safe and unsafe behavior: A field demonstration. Symposium presented at the 19th Annual Association for Behavior Analysis, Chicago, IL.

Davis, J.C., Jaxtheimer, K.A., Roberts, D.S., & Glindemann, K.E. (1993). Alcoholic Beverage Selection and its Relationship to Subsequent Intoxication at a University Fraternity Party. Paper presented at the annual meeting of the Virginia Academy of Science, Norfolk, Virginia.

Roberts, D.S., & Geller, E.S. (1993). An actively caring model for occupational safety. Symposium presented at the annual meeting of the Association for Behavior Analysis, Chicago, Illinois.

Roberts, D. S., Geller, E. S., Gilmore, M. R., Christoff, D., & Starcher, R. (1993). Industry-based test of an "actively caring" model for promoting health and safety. Paper presented at the annual meeting of the American Psychological Society, Chicago, IL.

Holland, M. S., Roberts, D. S., Glindemann, K. E., & Metzler, A. S. (1993). Developing a methodology and intervention procedures for increasing bicycle safety on a university campus. Poster presented annual meeting of the Virginia Psychological Association, Virginia Beach, VA.

Roberts, D. S. Scanlon, J., Benedetto, J., & Geller, E. S. (1993). Actively caring for industrial safety: Integrating behavior analysis with humanistic psychology. Poster presented at the annual meeting of the Virginia Psychological Association, Virginia Beach, VA.

Roberts, D. S., Scanlon, J., Glago, K., & Fermo, C. (1992). Development of an "actively caring" thank you card to promote occupational health and safety. Poster presented at the Southeastern Psychological Association, Asheville, NC.

Geller, E. S. (1992). Invited panel discussion involving T. D. Berry, K. E. Glindemann, T. D. Ludwig, and D. S. Roberts. Industry and community applications of behavioral

science: Making a difference. Presented at the annual meeting of the American Psychological Association, Washington D.C.

Ludwig, T.D., Geller, E.S., & Roberts, D.S. (1992). A direct comparison of assigned vs. participatory goal setting: Which one delivers? Poster presented at the annual meeting of the American Psychological Association, Washington D.C.

Roberts, D.S., Geller, E.S., & Ludwig, T.D. (1992). Industry based research to develop an actively caring model for injury control. Poster presented at the annual meeting of the American Psychological Association, Washington D.C.

Satz, J.M., Roberts, D.S , Glindemann, K.E, & Freeman, C.M. (1992). What do students drink when they want to get drunk? An examination of alcoholic beverage selection by type and quantity. Poster presented at the Southeastern Psychological Association, Knoxville, TN.

Roberts, D. S., & Geller, E.S. (1992). Identifying employees who will actively care for occupational health and safety. Paper presented at the annual meeting of the South Eastern Psychological Association, Knoxville, TN.

Glindemann, K.E., Roberts, D.S., Clarke, S.W., & Geller, E.S. (1992). Evaluating ways to fool an alcohol breathalyzer. Poster presented at the annual meeting of the Southeastern Association for Behavior Analysis, Charleston, SC.

Roberts, D.S., Rumrill, K., & Wadell, R. (1991). Using public information, incentives, and enforcement to increase communitywide safety belt use throughout the state of Virginia. Paper presented at the annual meeting of the Association for Behavior Analysis, Atlanta, GA.

Roberts, D.S., Wright, G., & Griffin-Hamilton, M. (1991). Statewide community programs to increase safety belt use. Paper presented at the annual meeting of the Southeastern Psychological Association, New Orleans, LA.

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