Investigating the Impact of Specific, Global, and Social Comparison Feedback on Safety Behaviors

Dissertation submitted to the faculty of Virginia Polytechnic Institute and State University in partial fulfillment of the degree Doctor of Philosophy in Psychology

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INVESTIGATING THE IMPACT OF SPECIFIC, GLOBAL, AND SOCIAL COMPARISON FEEDBACK ON SAFETY BEHAVIORS

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(ABSTRACT)

Behavior-based safety feedback is increasingly used by organizations to reduce the frequency and severity of work-related injuries. Improvements in safety performance have been demonstrated in numerous settings following behavior-based (BB) safety feedback. The relative impact of global, specific, and social comparison BB feedback on safety behaviors was assessed in the current study. A 2 Feedback Level (Specific, Global) X 2 Feedback Type (Social Comparison, No Social Comparison) analysis of covariance was used to test the hypothesis that specific, social comparison feedback would lead to the greatest improvement in safety percent safe scores. Participants were 97 employees from Shifts 1 and 2 of a soft-drink bottling company in southeastern United States. Results from the study demonstrated a main effect for feedback type. Social comparison feedback led to significantly higher percent safe scores than no social comparison feedback conditions (M=.78 and .68, respectively). Follow-up chi-square analyses and practical considerations suggest global/SCF is optimal for improving safety performance. Limitations of the study and future implications for BB safety feedback research are provided.

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INTRODUCTION

The Problem

Injuries and deaths occurring on the job due to at-risk work behaviors are a significant problem in the United States (Baker, Conroy, & Johnston, 1992). Each year approximately 11.3 million employees are seriously injured and nearly 11,000 workers are killed on the job. Today it is estimated that employers pay $155 billion in direct costs (e.g., workers' compensation, insurance premiums) associated with workplace injuries, amounting to over $1,400 per work-related injury (Baker et al., 1992; Miller, 1997; The National Committee for Injury Prevention and Control, 1989).

Injury Prevention

At-risk *behavior* is the primary cause of work-related injuries (Califano, 1979). Improving health and reduced injuries through behavior change efforts has been emphasized in journal articles (e.g., Roberts, 1987), government reports (e.g., Harris, 1980, 1981), conference proceedings (e.g., Geller, 1988; Tolsma, 1987), and throughout entire journal issues (e.g., Geller, 1991; Lawson, Sleet, & Amoni, 1984; Roberts & Brooks, 1987). As Roberts, Fanurik, and Layfield (1987) point out, “What people *do* influences the quality of life, and people *doing* is the realm of psychology, the science of behavior” (p. 105). Research addressing the identification, improvement, and maintenance of behaviors that prevent workplace injury is greatly needed (Institute of Medicine, 1988) and should be based on the success of previous applications of behavior analysis (e.g., Elder, Geller, Hovell, & Mayer, 1994; Geller, 1984,1988,1996; Geller, Rudd, Kalsher, Streff, & Lehman, 1987; Winett, King, & Altman, 1989).

Safety Triad

Moving from at-risk to safe work habits is key to injury avoidance on the job. Through the course of a workday, employees face hundreds of instances where they choose to work safely or at-risk. Unfortunately, workers are often reinforced for performing tasks in an at-risk manner because doing so is typically faster, easier, more comfortable, and more efficient or convenient than following the safe procedures (Geller, 1998a). Examples of at-risk choices include: not wearing protective gear, failing to follow standard energy-controlled lock-out procedures, lifting a heavy object without a hoist, standing on a machine instead of a ladder, etc. In addition to the natural consequences like ease and comfort, *external factors* often further reinforce at-risk behavior. For instance, workers may feel management pressure to take safety short-cuts for production.

The Safety Triad proposed by Geller (1996) emphasizes the importance of environment, person, and behavior-based factors to explain and ultimately improve organizational safety. Environmental factors include equipment and organizational cultural factors (e.g., management support) that impact safety. Person factors include individual states (e.g., self-esteem, personal control, optimism) that influence one's willingness to look out for personal safety and the safety of others. Behavior-based factors include observable activities (e.g., behavioral observations and feedback) which impact organizational safety.

Critical Observation Checklist (CBC)

The CBC is a safety-improvement tool, providing objective information about workers' safety performance (cf. Geller, 1996; Krause, Hidley, & Hodson, 1996). To develop a CBC, front-line employees work together to select a number of critically important safety behaviors to target as a group. Then they operationalize these behaviors. For instance, safe lifting behavior

can be defined according to certain steps, such as: a) hold load close to body; b) bend knees not back; c) move feet and turn instead of twisting; and d) use a hoist with loads over a designated weight. These behaviors with operational definitions are then listed on the checklist with corresponding columns for safe and at-risk behaviors.

Employees use this checklist to make observations of fellow employees and offer constructive behavioral feedback. Specifically, an observer categorizes specific behaviors as either safe or at-risk while observing an individual work. Although data from the CBC can be analyzed in many ways, the percentage of safe behavior occurrences, termed a *percent safe score*, is typically calculated over time (e.g., 74% safe for Week 1, 79% safe for Week 2, etc.). Overall, the information obtained from observation checklists can include individual and/or group performance and can be assessed for each behavior, or given as an overall percentage across behaviors.

The number and nature of behaviors selected for the CBC vary as a function of the type of industry, the unique injury statistics for a given organization or work area, the scope of the observation process, and the collective experience of the individuals constructing the CBC (e.g., safety leaders, consultants, safety committee members, plant managers). Also, the observation schedules vary according to the individual characteristics and available time/resources of the organization.

The information from CBCs are used to develop proactive strategies to reduce the probability of injury occurrence. This corrective action process has been labeled “DO IT” (Geller, 1996; 1998a,b). Simply, DO IT involves: a) Defining critical behaviors to increase or decrease, b) Observing target behaviors during a baseline phase to set specific goals for achievement and to understand outside conditions influencing the target behavior, c) Intervening

to change the target behaviors in the desired direction, and d) Testing the impact of the intervention by continuing to observe the target behaviors. If desired results are not achieved, target behaviors are re-defined or other interventions are implemented. When improvement goals are met, other target behaviors can be selected.

Behavior-Based Safety

The antecedent-behavior-consequence model of applied behavior analysis has been used frequently and successfully to prevent occupational injuries (e.g., Alavosius & Sulzer-Azaroff, 1986; Komaki, Collins, & Penn, 1978; Streff, Kalsher, & Geller, 1993). Antecedents or activators, *direct* one's focus and attention on relevant safety behaviors needed for a given task. For instance, a safety sign may be placed above a particularly dangerous machine reminding workers to always use safety guards in the correct manner. Effective activators are simple, memorable, and tied closely to consequences (Geller, 1996).

Consequences follow behavior and *motivate* the future occurrence of either safe or at-risk behaviors. For instance, incentives (e.g., pizza party for reaching 80% safe) can be used as a consequence to promote safe work practices. The most effective consequences are extremely likely to occur, follow the desired behavior closely, and are meaningful for the individual. Broadly, applied behavior analysis offers a great deal to the field of injury control by enhancing the understanding of the determinants of at-risk behavior and guiding the development of effective behavior change interventions (e.g., Elder et al., 1994; Geller, 1996, 1998c; Krause et al., 1996; Petersen, 1989).

Overall, behavior-based approaches to injury control have a number of advantages over other safety approaches, including: a) they can be administered by people with minimal professional training (McSween, 1995); b) they can reach people in the natural setting where a

problem occurs such as a particular work area (Geller, 1996); c) the leaders in these settings can be taught the behavior-change techniques most likely to work under specific circumstances (Baer, Wolf, & Risley, 1968, 1987; Daniels, 1989; Geller, 1998c); and d) they are cost-effective (Daniels, 1989; Sulzer-Azaroff & de Santamaria, 1980).

Behavior-Based Feedback and Safety Performance

The beneficial impact of behavior-based (BB) feedback on organizational safety performance is well established. Improvement in safety-related behaviors following BB feedback have been demonstrated in a number of organizational settings including: a plastics manufacturing plant (Sulzer-Azaroff & de Santamaria, 1980), a metal fabrications plant (Zohar, Cohen & Azar, 1980), a bakery (Komaki, Barwick & Scott, 1978), a public work's department (Komaki, Heinzmann, & Lawson, 1980), a university chemical laboratory (Sulzer-Azaroff, 1978), and a university cafeteria (Geller, Eason, Phillips, & Pierson, 1980). As researchers point out, "Informational feedback on performance has been shown to be a simple, effective, and durable method for promoting safety" (Fellner & Sulzer-Azaroff, 1984, p. 7).

Although research demonstrates that BB feedback improves organizational safety performance, less is known about specific characteristics of BB feedback driving these results. To maximize the effectiveness of BB safety feedback, empirical tests of various types of feedback are needed. To this end, the present research compared the effects of specific versus global BB feedback and the impact of social comparison information on safety behavior.

Specific versus Global Feedback

Two common forms of BB feedback are present in the safety literature: specific and global. Briefly, specific BB feedback is defined as the 'percentage of safe behavior occurrences for a given time period for *each* specific, target behavior' (e.g., Bend knees when lifting is 45%

safe for Week 1) and has been studied in various safety feedback articles (Alavosius & Sulzer-Azaroff, 1986; Komaki et al., 1980). In contrast, global BB feedback is defined as an 'overall safety score based on the percentage of safe behavior occurrences for a given time period across *all* target behaviors' (e.g., 76% safe for Week 1) and has been evaluated in numerous occupational safety studies (Austin et al., 1996; Chhokar & Wallin, 1984; Cooper et al., 1994; Komaki et al., 1978; Komaki et al., 1982; Reber & Wallin, 1984; Reber, Wallin, & Chhokar, 1990).

Although there is ample evidence that both specific and global BB feedback lead to beneficial behavior change, no published research has systematically compared these two feedback approaches. As Boyce and Geller (1998) state, "A systematic evaluation of providing specific versus global performance feedback when targeting multiple behaviors to produce maintenance is also needed" (p. 28). Although theories of generalized responding lead one to expect greater improvement in safety performance with global feedback, behavioral theory predicts specific feedback to be superior to global feedback in influencing target safety practices.

Specific Feedback

Specific BB feedback may be most effective in influencing organizational safety performance. In fact, safety interventions based on the principles of applied behavior analysis often take the form of operationalizing specific, objective behaviors to target, and later posting percent safe scores based on each behavior target (Geller, 1996; Krause et al., 1996). Interventions to improve safety performance typically involve modifying or changing the salience of the antecedents and/or consequences of the *specific* safety behaviors target (McSween, 1995). This has led some leading safety researchers to strongly maintain that

specific, not global, BB feedback will have the most profound impact on percent safe scores and should replace global BB feedback in actual organizational settings (Sulzer-Azaroff, 1998).

Interestingly, some organizational performance literature suggests that the only behaviors affected by feedback are those *specifically* target for feedback. For instance, when assessing the impact of specific feedback on two of four behaviors within a common response set, Fredericksen et al. (1982) demonstrated that improvement in two target areas (proper form documentation and proper document filing) based on specific feedback had no impact on the remaining behaviors (proper chart placement and proper signature acquisition). In a second trial, the latter two behaviors improved with specific feedback, with no changes in the prior two behaviors target. The authors showed that feedback is a powerful tool to improve behavior when it is applied in a *specific* manner to a *particular* target behavior, questioned if improvements to certain behaviors would later impact other non-specified behaviors.

Also, Ilgen and Moore (1987) demonstrated that specific feedback improved proof reading performance in correcting spelling errors. Specifically, they found that specific feedback (i.e., correct versus incorrect response) led to significantly faster and more accurate proofreading performance than global feedback (i.e., amount of time spent on task). Similarly, Early (1988) found that in processing phone magazine subscriptions, specific feedback (i.e., you produced a given amount of subscriptions over/under the goal) led to significantly more subscriptions processed than general feedback (i.e., you exceeded/did not exceed the goal). Early maintains specific feedback provides an individual information which allows him/her to form a more precise and detailed strategy to accomplish a given task.

Support for the benefits of specific feedback on *safety* performance was demonstrated with lift truck operators over a twelve-week period. In two studies, the use of specific feedback

and goal-setting with 14 behaviors led to a 44% and 61% decrease in percent at-risk scores over a three-month period (Cohen & Jensen, 1984). Also, when workers in a paper mill received weekly, specific BB feedback they showed significant and successive improvements in percent safe scores over a three-month time span. This improvement was accompanied by a 50% reduction in injuries during this time (Fellner & Sulzer-Azaroff, 1984). In a follow-up study, improvements in percent safe scores were demonstrated with specific BB feedback, and the addition of goal-setting had no impact on percent safe scores (Fellner & Sulzer-Azaroff, 1986).

Further, specific BB feedback combined with a safety awareness program led to percent safe increases over a six-week period from 65% to 82% and 46% to 76% for transport training center employees (Grant, 1990). Similar results were found with university kitchen workers who received daily, specific feedback on seven target behaviors (Geller et al., 1990) and with plastics workers receiving daily, specific feedback for nine target behaviors leading to a 36% reduction in chemical exposures (Hopkins et al., 1986). Also, percent safe scores for complete vehicular stops at intersections improved with specific BB feedback (plus goal-setting) over a 15-week period (Ludwig & Geller, 1997). Finally, specific BB feedback and goal-setting led to a significant improvement in percent safe scores with manufacturing plant workers over a six-month time period, leading to a substantial decrease in injuries and a $55,000 return on investment (Sulzer-Azaroff et al., 1990). A comprehensive review of BB safety feedback articles is provided in Appendix A.

Global Feedback

Global BB feedback has been recommended over specific feedback as a strategy for enhancing and maintaining performance (Krause et al., 1996). Global feedback in safety research is typically defined as a percent safe score across several behaviors (i.e., the global, overall

category in Appendix A). Global feedback may also be defined in terms of broad, behavioral categories (i.e., the global, response class category in Appendix A) such as lifting, which can be reduced to specific behaviors (or response components) such as checking load, bending knees, holding load close, etc.

Theoretical support for using global feedback is driven by theories of generalized responding. Specifically, for a given set of behaviors, overall feedback without information regarding the specific behaviors contributing to the results should lead to more vigilant attention to *all* behaviors, resulting in longer-term and generalized improvement (Boyce & Geller, 1998; Stokes & Baer, 1977). As Boyce and Geller (1998) point out, "Providing general feedback as opposed to specific feedback and targeting multiple behaviors decreases the likelihood that any one behavior will become associated with the consequences provided for performance improvement" (p. 21).

Empirical support for this assertion has been demonstrated in industrial settings. For instance, global feedback (both overall and by response class) was provided to social workers regarding their lifting and transporting of handicapped patients. Global feedback led to improvement of percent safe scores for 34 of 36 behaviors and "these improvements tended to maintain as feedback was faded" (Alavosius & Sulzer-Azaroff, 1986, p. 261). Similarly, global feedback (overall and by response class) led to a percent safe increase from 8% to 78% with light assembly workers across 16 behaviors over an 11-week period (Cooper & Newbold, 1994). Interestingly, Cooper and Newbold (1994) note, "Improvements in the data were met with cheers, applause, and whistles as the three target and overall plant performance data was presented" (p. 39).

Also, global BB feedback and incentives improved the safety behaviors of roofers from 51% to 90% on the ground and from 55% to 95% on roofs across 25 behaviors over a four-week period (Austin et al., 1996). When global feedback was combined with training and goal-setting, percent safe scores (percentage of workers performing 100% safe) increased with metal fabrication workers (n=55) from 65% to 95% across 35 behaviors. Improvements from feedback were significant beyond levels attained with training and goal-setting alone over a 42-week period (Chhokar & Wallin, 1984).

Similar results were found with British cellophane workers who experienced significant increases in percent safe scores following goal-setting and global BB feedback. The increases in percent safe scores corresponded with nearly a 50% reduction in injuries over a six-month period (Cooper et al., 1994).

Increases in percent safe scores from 70% to 96% and 78% to 99% were demonstrated with manufacturing workers following global feedback BB used with training and goal-setting, leading to a significant drop in injury rates (Komaki et al., 1978). Global feedback also led to significant improvements (11% increase) in percent safe scores over baseline and training conditions with poultry processing employees over a 46-week period (Komaki et al., 1982).

The benefits of global feedback were also demonstrated with four sections of a city's vehicle maintenance division across the following behavioral categories: proper use of tools, use of safety equipment, housekeeping, and general safety procedures. For all target areas, percent safe scores increased significantly following the introduction of global feedback. Not surprisingly, the average number of lost time incidents declined from 3 to 1.8 (per 100,000 hours) following the presentation of global BB feedback (Komaki et al., 1980). Finally, the benefits of overall global BB feedback with training and goal-setting led to significant

improvements in percent safe scores (percentage of employees performing 100% safe) and significant reductions in injury rates with farm machinery workers (Reber & Wallin, 1984; Reber et al., 1990).

Overall, theoretical and empirical support has been demonstrated for both global and specific BB feedback as ways to improve occupational safety performance. However, the author could not find any published research assessing the *relative* effectiveness of these two approaches with safety. As such, the planned comparisons in the current research will contribute to the feedback literature.

Social Comparison Feedback (SCF)

Social comparison feedback has rarely been studied in the safety literature, particularly with respect to behavior-based safety. Social comparison feedback is defined as information demonstrating an individual's performance in comparison to a relevant comparison group. The importance of social comparison feedback is grounded in Festinger's (1955) seminal article, "A Theory of Social Comparison Processes." Festinger (1955) argues that in Western cultures individuals are driven to continually improve performance and that we seek out similar others with whom to gauge our own performance. Thus, evaluations of our own performance are determined by our relative standing in comparison to others.

Although Festinger (1955) discusses social comparison information in terms of an objective, self-evaluative motive, his concept of the unidirectional drive upward suggests that individuals are motivated to improve their own performance as well as outperform the comparison group. In clarifying this issue, Wood (1989) maintains, "…people not only wish to evaluate their abilities, they also feel pressure to continually improve them. When combined with

the desire to compare with similar others, this drive upward leads the individual to strive toward a point slightly better than that of comparison others" (p. 232).

This desire to outperform similar others is reflected in the uniqueness bias, or constructive social comparison, in which individuals manufacture self-serving consensus estimates to match their highly positive self-opinions (Goethals, Messick, & Allison, 1996). Simply put, individuals "…want social comparison information to confirm the correctness of their opinions and the high level of their abilities" (Goethals et al., 1996, p. 151). This is consistent with findings from social psychology which demonstrate that average self-rated job performance lies at the 78th percentile (Meyer, 1980), and that individuals have unrealistically positive views of themselves (Taylor & Brown, 1988). Overall, self-rated performance is typically inflated beyond actual performance levels and the ratings yielded from coworkers (Farh, Werbel, & Bedeian, 1988; Harris & Schaubroeck, 1988; Mabe & West, 1982).

The combination of overly optimistic self-views and the unidirectional drive upward suggests social comparison feedback can serve a motivational purpose in influencing organizational performance, including percent safe scores. Simply put, the use of BB feedback with social comparison information, also referred to as normative feedback, should serve as a motivational referent by which individuals gauge their safety performance with others.

If expectations of one's performance are higher than actual performance, which is likely given the inflated nature of self-appraisals, individuals should be motivated to improve their own performance. This is especially true when one considers the unidirectional drive upward. The collective desire to outperform others should lead to organizational improvement of safety following social comparison feedback.

Empirical Support for SCF

Empirical evidence suggests that social comparison feedback does, in fact, lead to improved task performance. For example, participants performing a word completion task demonstrated significant improvements in performance following the presentation of social comparison feedback (Mathieu & Button, 1992). Also, the introduction of SCF in a work-related simulation led to significant improvement in subsequent task performance over a no SCF condition (Mitchell, Rothman, & Liden, 1985).

In terms of percent safe scores with product handling in a microelectronics plant, SCF led to a significant improvement in percent safe scores over a no SCF feedback condition (Goltz et al., 1989). Also, the introduction of social comparison feedback led to significant improvement over a pre-feedback condition on a mental rotations task (Tindale, Kulik, & Scott, 1991). Finally, the use of SCF has been shown to interact with other factors, including self-efficacy (Bandura, 1982; Early & Erez, 1991), performance goals (Meyer & Gellatly, 1988; Rakestraw & Weiss, 1981), and internal motivation (Harackiewicz, Sansone, & Manderlink, 1985; Sansone, 1989).

Evidence Against SCF

Some research suggests that social comparison feedback has either no impact, or a negative impact, on subsequent task performance. One aspect of Festinger's (1955) research suggests that individuals are motivated to reduce discrepancies in abilities between themselves and the referent group. In other words, poor performers will be motivated to improve but exceptional performers may be motivated to perform less effectively. This pressure to conform to the mean is heightened when there is a strong sense of group cohesion (Corollary VIIA of Derivation E in Festinger, 1955). Although the majority of Festinger's (1955) theory supports the

positive influence of SCF on performance, some aspects of his theory suggest that mean group performance would not be changed with SCF.

Other theories suggest negative performance information will *not* motivate individuals to improve their performance. Taylor and Brown (1988) maintain that individuals process information through rose-colored filters such that negative information about the self is simply ignored. Otherwise, this information is relegated to 'pockets of incompetence' and dismissed as unimportant. As Ilgen, Fisher, and Taylor (1979) suggest, "Negative feedback, on the other hand, may be denied by the recipient because of an unwillingness to accept such knowledge about himself or herself" (p. 354). The implication for safety performance is that negative SCF regarding percent safe scores may be simply ignored or considered unimportant.

There is empirical support for the theoretical assertion that SCF will *not* lead to improved performance. For example, in completing a word search task, SCF led to slightly diminished performance on subsequent trials. However, performance feedback without SCF resulted in significant improvement in task performance on later trials (Johnson et al., 1996). Similarly, SCF had no significant impact on actual job performance, although subjective measures of satisfaction with the feedback process improved. Specifically, organizational leaders who received SCF were more willing to discuss the feedback and were more satisfied with the feedback process than their no-SCF counterparts. However, when asked about modifying future behavior to improve job performance, non-significant differences were found between participants in the SCF and no-SCF conditions. In other words, SCF had no impact on leader's intentions to improve their future job performance (Smither, Wohlers, & London, 1995).

In sum, there is contradictory evidence regarding the influence of SCF on task performance. Although some research demonstrates that SCF has a beneficial impact on task

performance, other research suggests SCF has no impact, or even a negative impact, on subsequent task performance.

Social Comparison Feedback at the Group Level

Leading organizations (including the organization targeted for the proposed study) are moving toward 'team-oriented' work groups, where performance is assessed at the group rather than individual level (Geller, 1998b). This movement toward work-teams has dramatic implications for SCF research. Simply, social comparison research may have more practical value when couched in terms of work team performance then individual performance. Although Festinger (1955) does not make explicit predictions regarding social comparison processes at the team level, he maintains that people "tend to move into groups" which leads to group identification in which a group's abilities and beliefs are compared to the opinions and abilities of other groups or the society at large (p. 136). To this end, leading BB safety researchers have assessed percent safe scores at the team level in comparison to the overall organization (Goltz et al., 1990). However, the relative impact of SCF versus no SCF had not been previously addressed at the work-team level with regard to percent safe improvements.

Overview of Current Study

There is a plethora of research suggesting BB feedback leads to increases in safe work practices and reductions in injury rates. However, less is known about the specific *types* of feedback which lead to the greatest improvement in safety performance. More specifically, the existing body of literature does not address the relative impact of specific *versus* global feedback and SCF *versus* no SCF on percent safe scores. These comparisons were made systematically in the current research.

An investigation of response generalization (Stokes & Baer, 1977) was originally proposed in which distinctions were to be made between target and non-target safety behaviors. It was expected that specific, social comparison feedback would be most effective in improving the safety performance of target behaviors, based on theories of behavior analysis and social comparison. Conversely, global, social comparison feedback was expected to be most effective at improving the safety of non-target safety behaviors, consistent with theories of generalized responding and social comparison processes. Upon completion of the study, a flaw was detected with the feedback delivery for participants in the global feedback condition. Specifically, no distinction was made between target and non-target behaviors. Accordingly, assertions about the comparative influence of global and specific feedback on target versus non-target behaviors were no longer viable.

Instead, comparisons between feedback conditions across *all* behaviors were made. This is more appropriate because the same 13 behaviors appeared on all feedback sheets. Given that the majority of behaviors are "target behaviors" (9 of 13) and specific feedback was originally predicted to be more effective with target behaviors, it is logical to conclude that specific feedback will outperform global feedback when all behaviors are combined. So, the following revised hypotheses are put forward, consistent with the spirit of the original predictions.

Revised Hypothesis 1: Across *all* behaviors, specific feedback will lead to higher percent safe scores than global feedback.

Revised Hypothesis 2: Across *all* behaviors, social comparison feedback will lead to higher percent safe scores than a no social comparison feedback condition.

Revised Hypothesis 3: Across *all* behaviors, specific, social comparison feedback will lead to the highest percent safe score.

METHOD

Participants and Setting

Participants were 97 employees from Shifts 1 and 2 of a soft-drink bottling facility located in the southeastern United States. The majority of employees are male (69%) and Caucasian (82%). Information regarding worker's safety related opinions at the facility compared to other facilities within the parent company is provided in Appendix B.

Both cans and plastic bottles are filled with the product and distributed via conveyers to large “labeling” machines, and then to large “packaging” (i.e., palatizers) machines. The facility consists of four production lines, a warehouse, and a laboratory area. Because the daily activities of the laboratory are very dissimilar to the other areas, laboratory observations were not included. Lines 1 and 2 of the plant are connected and employees working on these lines fill large canisters and 2 and 3 liter bottles, respectively. The third line is similar in appearance to Lines 1 and 2, although 20 oz. plastic bottles are filled on this line. Employees working in the warehouse transport and store filled cans and bottles. Although daily work practices include more frequent lifting and forktruck driving in this area, as compared to the production lines, similar safety behaviors are required in all areas. Finally, employees on Line 4 fill 12 oz. cans with the product.

The layout of the facility is ergonomically sound and equipment and machinery are well kept and modern. This is consistent with “corporate’s” goal to reduce injury costs by $15 million dollars by 2005. No fatalities have occurred at this site within the last five years, although 75 restricted workdays and 12 lost days due to injury occurred in 1998. The majority of injuries are back strains/sprains and hand/head abrasions.

The work flow at the facility is inconsistent. For example, high activity levels at a given time of day were often followed by "down-time" in which very little work activity occurs. Also, lines were sometimes "shut-down" for the day (or for an entire shift) due to machinery problems, chemical contamination etc. Not surprisingly, anticipating high versus low work flow periods was very difficult. This work flow inconsistency is demonstrated by large variations in the number of observations made each day. The number of daily observations across feedback conditions ranged from 1 to 223. The mean number of observations was 78, with an extremely large standard deviation around this mean number of observations (49.7; See Appendix C).

Site-Specific Observation Checklist

The behaviors included on the CBC were chosen by the safety manager and safety steering committee with guidance from the author (Appendix D). Given the high percentage of back injuries, specific lifting behaviors were chosen. Because of past near-misses and incidents with driving fork-lift trucks, specific forktruck behaviors were also included on the CBC. In addition to protective gear, generic safety concerns were chosen for the checklist, including stacking (danger of pallets tipping over), handrail use (slips occur on stairs with wet surface areas from the sanitation procedures), and overhead conveyer avoidance (causing head abrasions).

Site-Specific Areas

The employees were categorized into four similarly-sized groups. Group A represents employees on Lines 1 and 2 of the plant (filling large canisters and 2 and 3 liter bottles, respectively). Group B represents employees on Line 3 (20 oz. plastic bottles). Group C represents employees in the warehouse (all cans and bottles). Group D represents employees on Line 4 (12 oz. cans). The tasks and requirements of the employees in these four groups are

relatively similar, although loading and lifting occur more frequently in the warehouse. Specific injuries numbers weren't given, but injury reports are similar across groups according to the safety director at the facility.

Experimental Design

Following two weeks of baseline observations, the influence of specific versus global feedback and SCF versus no SCF on percent safe scores was assessed for six weeks. Shift 1 participants (n=50) received global feedback. Shift 2 participants (n=47) received specific feedback. For both shifts, participants in Groups A and B (n=45) received SCF, and participants in Groups C and D (n=52) did not receive SCF. Baseline performance was used as the covariate in the 2 Feedback Level (Specific, Global) X 2 Feedback Type (SCF, NoSCF) factorial design.

Procedure

Baseline. For two consecutive weeks following BB safety education/training, employees on Shifts 1 and 2 were observed systematically with a CBC, as described earlier. Overall percent safe scores were established each day across all behaviors for each feedback condition. Mean percent safe scores for the feedback conditions at baseline were as follows: Global/SCF (.67), Global/No SCF (.62), Specific/SCF (.71), and Specific/No SCF (.59). Descriptive statistics, the summary ANCOVA table, as well as daily percent safe scores for the feedback conditions are provided in Appendix C.

BB safety education/training. All employees received one hour of BB safety education/training, with approximately 25 participants per session. All training occurred on one day. The author delivered all BB safety education/training, having had three years of prior training experience with such organizations as Exxon Chemical, Philip Morris, Koch Refining, Lucent Technology and other Fortune 500 companies.

Participants learned about the principles and practical applications of BB safety, with an emphasis on behavioral observation and feedback. The training materials used are given in Appendix E. Participants were informed that behavioral observations would occur for another six weeks and that behavioral feedback per group will be provided each week in sealed envelopes. This feedback was given individually to each employee, and participants were repeatedly asked not to discuss feedback information with coworkers. In other words, they were told to keep the feedback experience personal and private. Also, participants were informed that observation data would not be shared with management and that only group data would be presented. Finally, participants were informed that this "study" was part of the larger plan to incorporate behavior-based safety on an ongoing basis plant-wide (i.e., participants involved in making observations, providing feedback etc.). In other words, there was no clear endpoint for the behavior-based safety intervention.

Behavioral observations. Behavioral observations were made for six consecutive weeks. This CBC was used during baseline and for the six-week intervention period (Appendix D). Eight previously trained (by the author) senior undergraduate research leaders who were blind to the purpose of the study made all behavioral observations. See Appendix F for the observation training protocol used for these research assistants. Observers followed a specific route (the same used during baseline) to make behavioral observations. When an employee was observed to be engaged in a task, the observers marked individual behaviors as either safe or at-risk, based on the operational definitions given on the back of the CBC. When a judgement about a specific behavior was not possible (e.g., unsure about hearing protection use because of long hair), a line was drawn through the safe and at-risk box for that specific observation indicating a "non-

Reliability of observations. For 27% of the 15,183 behavioral observations, two trained and experienced research assistants independently observed the participants. These observers communicated with each other during the observation procedures only to identify the person being observed. After identifying a target individual, each observer completed the CBC independently. A percent agreement score was calculated for both safe and at-risk behaviors for each behavioral category (Total number of Agreements/Total number of Agreements + Total Disagreements X 100).

Observation schedule. The observers performed daily observations, Monday through Friday, for eight weeks following BB education/training. Observations were made on both shifts and lasted two to five minutes per target individual. Each observation session lasted approximately 1-2 hours.

Feedback conditions. Feedback was presented graphically (bar graphs) in sealed envelopes addressed to each individual employee (per the appropriate feedback condition). Feedback was given at the end of the week for six weeks. Included on the feedback page above the feedback graphs were the specific target and non-target safety-related behaviors. Participants in the global feedback condition were given a single percent safe score for the week, but did not receive information about specific behaviors. Participants in the specific feedback condition received graphs for each target behavior, but did not receive an overall percent safe score across behaviors. Employee feedback graphs are provided in Appendix G.

Social comparison feedback (SCF). Participants in Groups A (n=23) and B (n=22) received SCF. Specifically, they received their area's percent safe score(s) for the week compared to the performance of the same area on the other shift. These percentages were either global or specific. Participants in Groups C (n=28) and D (n=24) did *not* receive SCF. They *only*

received their own group's percent safe scores (Appendix G).

Dependent Variables

Percent safe scores across all behaviors served as the dependent measure in the current study. The formula for calculating these percentages is:

$$\%\ Safe\ Score = \frac{Total\ Safe\ Observations}{Total\ Safe\ Observations + At\text{-}Risk\ Observations} \times 100\%$$

Each day, percent safe scores were calculated for each specific behavior. Also, an overall daily percent safe score across all behaviors was calculated. These calculations were made for all four feedback groups. Performance information at the individual level was not possible. So, days was used as subjects in this design. Further, because of great variation in the number of daily observations, it was decided that this information should be aggregated to reduce the influence of outliers (i.e., percent safe score based on only one or two observations in a day). Because aggregating at the 'week' level would have too greatly diminished power, the unit of analysis chosen was every three days. It was believed this would minimize the loss of power and still address the issue of outliers.

Analyses

A 2 Feedback Level (Specific, Global) X 2 Feedback Type (Social Comparison, No Social Comparison) ANCOVA was used to test all hypotheses. Baseline percent safe scores served as the covariate in the analysis. Because of the large variance in the number of observations made per day, the aggregate percent safe across every three days (using days as subjects) was used as the unit of analysis. Overall, results from the significance tests must be interpreted very cautiously given the quasi-experimental nature of the design (lack of randomization).

Follow-up chi square analyses were also used to test for significant differences between feedback groups at intervention. Chi-square was used given the dichotomous nature of the data (i.e., all-or-none classification of behaviors as safe or at-risk). Finally, visual inspection of both daily and weekly time series percentages was used to study trends and evaluate the clinical significance of the intervention effects. Days with less than 10 observations were dropped for the "daily" graphs.

RESULTS

Interobserver reliability

Reliability estimates were collected on 10 of 37 days balanced within phases. Inter-observer agreement percentages were calculated by dividing the total number of observations agreed upon by two data collectors for a given behavioral category (i.e., safe or at-risk) by the total number of agreements and disagreements, and multiplying by 100. The overall reliability estimates were calculated by averaging the agreement percentages for each day two observers collected data. The overall reliability of safe observations was: PPE (93%, N=1725), Lifting (80%, N=3564), Forktruck Driving (77%, N=3880), General Safety Behaviors (91%, N=975). The overall reliability of at-risk observations was PPE (88%, N=681), Lifting (83%, N=1502), Forktruck Driving (78%, N=2607), General Safety Behaviors (93%, N=313).

BB Safety Feedback

Based on more than 15,000 observations over the eight week period, BB safety feedback was effective in increasing percent safe scores over a baseline condition. Overall, mean percent safe scores across all feedback conditions rose from 64% at baseline to 73% at intervention. Descriptive statistics, the summary ANCOVA table, and daily percent safe scores for the feedback conditions are provided in Appendix C. Also, graphs of weekly percent safe scores for

the feedback conditions are provided in Appendix H. Finally, graphs of daily percent safe scores for the feedback conditions are provided in Appendix I.

Global Versus Specific Feedback

The first hypothesis stated that specific feedback would lead to higher percent safe scores across *all* behaviors than global feedback. Mean percent safe scores at intervention were only slightly higher in the specific (M=.74, SD=8.7) versus global (M=.72, SD=9.7) feedback conditions. Specific/SCF led to higher percent safe scores than Global/SCF (M=.79 and .77, respectively) and Specific/NoSCF led to higher percent safe scores than Global/noSCF (M=.70 and .66, respectively). Overall, the main effect for feedback level was not statistically significant (F=.17, p>.05) and Hypothesis 1 was not supported.

Social Comparison versus No Social Comparison Feedback

The second hypothesis stated that social comparison feedback would lead to higher percent safe scores than the no social comparison feedback conditions across all behaviors. Percent safe scores were substantially higher in the comparison (M=.78, SD=6.94) versus no comparison conditions (M=.68, SD=8.43). Global/SCF led to a higher mean percent safe score than Global/noSCF (M=.77 and .66, respectively). Similarly, Specific/SCF led to a higher mean percent safe score than Specific/noSCF (M=.79 and .70, respectively). Not surprisingly, the main effect for feedback type was statistically significant (F=10.8, p<.05) and Hypothesis 2 was supported.

Feedback Level by Feedback Type

The third hypothesis held that specific, social comparison feedback would lead to the highest percent safe score across *all* behaviors. Specific/SCF did, in fact, result in the highest percent safe score across feedback conditions (M=.79, SD=6.7), followed by Global/SCF

(M=.77, SD=7.41), Specific/noSCF (M=.70, SD=8.48) and Global/noSCF (M=.66, SD=8.24). Overall, the Feedback Level by Feedback Type interaction was not significant (F=.02, p>.05) and Hypothesis 3 could not be supported. A plot of the feedback level by type interaction is provided in Appendix J.

Exploratory Analyses

Beyond the use of ANCOVA, follow-up exploratory analyses were used to provide more information beyond the formal hypothesis testing. A series of chi-square analyses were used to test for significant differences between the four feedback conditions at intervention. The first investigation included the two feedback conditions with the highest percent safe score means at intervention. Specific/SCF (M=.79, SD=6.70) was not significantly higher ($X^2_{(1)}$=.46, p>.05) than Global/SCF (M=.77, SD=7.41). Next, Global/SCF (M=.77, SD=7.41) was significantly ($X^2_{(1)}$=14.3, p<.05) higher than Specific/NoSCF (M=.70, SD=8.48). The final investigation involved the two feedback conditions with the lowest mean percent safe scores at intervention. Global/NoSCF (M=.66, SD=8.24) was significantly lower ($X^2_{(1)}$=12.81, p<.05) than Specific/NoSCF (M=.70, SD=8.48).

Overall, Specific/SCF and Global/SCF were similarly effective (and optimal) in influencing percent safe scores. Both groups were significantly better than Specific/NoSCF in influencing percent safe scores. Finally, Global/NoSCF resulted in significantly lower percent safe scores than the other three feedback conditions. A plot of the final feedback results by phase is provided in Appendix K.

Target versus Non-Target Feedback

Because the feedback manipulation was not compromised with specific feedback, further chi-square analyses were used to determine if percent safe scores were higher with target versus

non-target behaviors. For Specific/SCF percent safe scores were not significantly higher ($X^2_{(1)}$=1.19, p>.05) for target versus non-target behaviors at intervention (M=.81 and .78, respectively), although improvements were demonstrated over baseline for both target and non-target behaviors (M=.70 and .72, respectively).

For Specific/NoSCF, mean percent safe scores at baseline were nearly identical for target and non-target behaviors (M=.60 and .59, respectively). However, mean percent safe scores at intervention were significantly ($X^2_{(1)}$=4.19, p<.05) higher for target versus non-target behaviors (M=.75 and .67, respectively). This provides some support that participants were more responsive to the behaviors they believed were targeted for improvement versus those behaviors they believed were not targeted.

DISCUSSION

Performance feedback research seldom includes experimental comparisons of the specific effects of the different feedback characteristics (Balcazar, Hopkins, & Suarez, 1985/86). This lack of research extends to the safety literature, which consistently demonstrates that behavior-based feedback improves safety performance without exploring the specific feedback characteristics driving these results. To this end, the objective of the current study was to add to the existing literature by increasing our understanding of the relative impact of global, specific, and social comparison feedback on subsequent safety performance.

Similar to past BB feedback research (Barwick & Scott, 1978; Geller, Eason, Phillips, & Pierson, 1980; Fellner & Sulzer-Azaroff, 1984; Komaki, 1978; Komaki, Heinzmann, & Lawson, 1980; Sulzer-Azaroff, 1978; Sulzer-Azaroff & de Santamaria, 1980; Zohar, Cohen & Azar, 1980), behavioral feedback in the current study led to clear improvements in subsequent safety

performance. Based on 15,174 observations over an eight-week period, overall percent safe scores increased from 64% to 73% following the introduction of BB feedback.

Social Comparison Feedback

The current results support the use of social comparison feedback to improve safety performance. Differences in percent safe scores between the SCF and NoSCF conditions at intervention are reflected in Appendix J. Overall, SCF led to a 10 percentage point increase in percent safe scores over the NoSCF conditions. Results indicated that Specific/SCF was significantly higher than Specific/NoSCF, and Global/SCF was significantly higher than Global/NoSCF. Simply put, SCF was highly effective in influencing percent safe scores for safety behaviors.

Global versus Specific Feedback

Social comparison feedback was clearly beneficial in improving safety performance in the current study. However, non-significant differences in mean percent safe scores were found between Specific/SCF and Global/SCF at intervention. So, these two approaches were similarly effective at influencing safety performance. On the other hand, Specific/NoSCF led to a significantly higher mean percent safe score than Global/NoSCF. This suggests specific feedback is superior to global feedback when SCF is *not* present. In interpreting these results, two important considerations must be addressed.

First, management at the original study site decided that SCF might promote divisiveness in their organizational culture and (for several reasons) could not agree to participate in the study. Although companies across the country use SCF with BB feedback, it's possible other organizations might also be concerned about using SCF. In such organizations where SCF is not used, the current results suggest that specific feedback may be preferable to global feedback.

This is consistent with behavior analysis principles. Specific BB feedback serves as an activator to direct employees to perform safe work practices across a number of different behaviors. This provides specific information by which to adjust future behavior, referred to as an instructional intervention (Geller, 1998). When examining the feedback charts in the current study, employees received information on nine specific behaviors versus one overall score (i.e., global feedback). Also, employees may have felt more accountable for their behavior, given that they were monitored across a number of very specific behaviors, potentially increasing their motivation and effort to improve. So, it's possible a combination of informational and motivational processes led to the improvements with specific BB feedback.

Although specific feedback may outperform global feedback in the absence of SCF, most organizations would likely support the use of SCF if it improves safety performance. In fact, several organizations the author has worked with regularly use SCF with BB feedback. This leads to a second important consideration. It takes an extremely long time to encode, calculate, aggregate (by week) and then post percent safe scores for nine specific behaviors. This is especially true when SCF is added and specific feedback is given to more than one group. It took the author five to six hours a week to prepare the charts for the specific feedback conditions. Conversely, computing one single overall score (i.e., global feedback), even with SCF, took only about 30 minutes a week to complete. The difference in response effort between the two feedback conditions week after week cannot be overstated.

Most safety professionals have limited time and resources to implement and maintain every available intervention designed to improve safety performance. In an effort to reduce injuries, many professionals choose BB feedback to supplement existing safety programs. The results of the current study suggest that Global/SCF is basically as effective as Specific/SCF in

optimizing safety performance, at a *fraction* of the time and effort required to provide it. For safety professionals deciding whether or not to use BB feedback (and how to present it), the current results support the use of Global/SCF over the other feedback conditions.

Global/SCF versus Global/NoSCF

Perhaps the most compelling results in the study involve the Global/NoSCF condition. Figure X demonstrates the introduction of global feedback (without SCF) led to no meaningful change over baseline. Simply put, global feedback by itself had almost no effect on subsequent safety performance. In contrast, substantial improvements from baseline to intervention were shown with the other three feedback conditions (Appendix K). Not surprisingly, percent safe scores in the Global/NoSCF condition at intervention were significantly lower than the other three feedback conditions.

Providing employees one global score does not seem particularly informative. Adding a second overall score (from another shift) adds no further information about the original group's performance. And yet, this led to optimal safety performance at intervention (i.e., Global/SCF). These results are explained by Geller's Flow of Behavior Change Model (Appendix L) which suggests employees who already understand safe task requirements but choose at-risk alternatives (i.e., consciously incompetent) need motivational interventions, more than instruction, to change their future behavior (Geller, 1999). The motivational role of SCF is consistent with Festinger's (1955) concept of the unidirectional drive upward. Providing comparison information impacts our collective desire to outperform similar others, as demonstrated in the current study with SCF and safety performance.

Limitations of Current Study

The greatest challenge in the study was finding the most appropriate statistical procedures to test hypotheses in this quasi-experimental design. Because participants were not randomly assigned to groups, and because differences (in mean percent safe scores) between groups were present at baseline, results from the between group comparisons must be interpreted with caution. Originally, individual feedback was to be delivered to employees and a coding scheme had been developed to track individual performance over time. Of course, participants were to be randomly and equally assigned to one of the four feedback conditions, regardless of area or shift. Unfortunately, no sites (including the original site which was a foundry) agreed to this type of feedback implementation.

A second limitation in the current study was the lack of distinction between target and non-target behaviors in the global feedback conditions. The rationale for including non-target behaviors on the feedback charts stems from Stokes and Baer's (1977) discussion of "training loosely" and the assessment of response generalization. In "training loosely" participants are made aware of all possible criteria (behaviors) for a given outcome number, but are not told which behaviors drive the results. Improved performance is predicted in the outcome number because participants are more attentive to all possible criteria (behaviors) that may cause the results. Target behaviors in the global feedback condition should have been clearly indicated (i.e., italicized) as the criteria for determining the overall percent safe score.

Also, difficulties securing this alternative site led to time constraints regarding the number of available weeks to complete the study. Ideally, the baseline period would have been extended to allow for a more stable pattern to be established, and results from a withdrawal phase would have been provided. This would have also allowed for a multiple baseline design,

providing more control in the study to determine the differential effects of feedback on percent safe scores.

In addition, there was enormous variation in the number of observations made each day. Several low work-flow days and line shut downs resulted in extremely low observation numbers on some days. As a result, the observation data was aggregated (percentages for three days served as the unit of analysis) to eliminate the influence of percent safe score “ percent safe score of 100% based on one observation) on the results.

Further, ceiling effects at baseline with Specific/SCF may have limited the available “room to move” in terms of performance improvement. Comparisons between Specific/SCF and Global/SCF would have been stronger with equivalent baselines between groups. Still, initial improvements over baseline with Specific/SCF did occur and were seemingly followed by a return to baseline for the last two weeks of the intervention. Appendices H and I provide both weekly and daily graphs in which this trend is clearly demonstrated (see Appendices H and I).

Finally, the specific feedback graphs, especially with SCF, were simply too "busy." As a result, participants may have been overloaded with information. For instance, on the last day of feedback, participants in the Specific/SCF condition received information from six weeks worth of data for nine of their own team’s behaviors and nine of the comparison team’s behaviors, resulting in 108 available pieces of information (see Appendix G). This “overload” may account for the peculiar drop off in percent safe scores with Specific/SCF in the last two weeks of the study (Appendices H and I). The feedback presentation would have been improved if employees in the specific feedback conditions received nine number scores (instead of bar graphs) each week, or received a series of specific graphs with less information per graphs.

Alternative Explanations

It is important to consider alternative explanations for the current results. Because of differential baseline scores, it is difficult to determine conclusively that feedback led to different intervention scores, instead of inherent differences between workers in the given shifts or areas. Nevertheless, the safety director maintained that employees are not placed into certain areas or shifts based on differential skills, abilities etc. Also, the safety director reported that injury reports across groups and shifts were similar between areas and shifts. Still, definitive conclusions that feedback was the sole "active ingredient" driving the results is difficult because of the lack of randomization.

In addition, diffusion of treatment is a serious concern if employees had discussed their feedback with workers on different shifts or areas. The safety director responded on several occasions that the feedback was completely confidential. Surveys have been distributed to employees asking about confidentiality (and other characteristics of the feedback) but have not yet been returned (Appendix L). However, there is no logical reason to believe this information was shared across areas or shifts.

Conclusions

Despite a variety of shortcomings in the current study, it is clear that BB feedback was effective in improving safety performance. Overall, BB feedback increased percent safe scores from baseline to intervention. More specifically, Global/SCF provided the most promising results in terms of how to optimize BB feedback. Conversely, Global/NoSCF resulted in the least promising results for BB feedback presentation in organizational settings. Unfortunately, the most common type of BB feedback in applied settings is a single, plant-wide percent safe score.

So, the majority of organizations using BB feedback are probably not experiencing the full potential and benefits of this intervention.

Future Directions

Given the practical benefits of global/SCF, the current results offer an important springboard for future BB feedback research. This includes examining the contextual factors which may impact global, specific, and social comparison feedback. Others maintain that future feedback research should investigate other specific feedback characteristics such as mode of delivery (verbal, written), frequency of delivery, individual versus group presentations, and feedback contingencies to determine how to optimize organizational performance (Balcazar, Hopkins, & Suarez, 1985/86).

Regardless, it is important to maintain a *behavioral* focus when investigating optimal presentations of safety feedback. As demonstrated in the current study, behavior-based safety feedback is highly effective in improving safety performance. Geller (1996) points out, "The graphs hold people accountable for process numbers they can control on a daily basis- in contrast to outcome numbers like total recordable injury rate or workers' compensation costs. Improving these upstream numbers (percent safe behavior) will eventually reduce the outcome number (work injuries) (p. 208)."

From a practical standpoint, keeping employees out of danger is the ultimate mission of BB safety research. To this end, providing employees the optimal type of BB feedback is only possible through rigorous, scientific tests of the *relative* impact of various feedback characteristics on safety performance. It is hoped the current study meaningfully adds to the existing body of safety literature and provides important directions for future BB safety feedback research.

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Appendix A:
Review of BB Safety Feedback Articles

Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	**Findings**
Alavosius & Sulzer-Azaroff (1986)	6 social workers, 7 months	Global, response class; global, overall; specific (verbal)	36	Individual	Private	Written, verbal	Weekly (written), Daily (verbal)	None	N/A	Percent safe	Percent safe improved/ maintained (i.e., 100% safe pre and post) with 34 of 36 behaviors
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Austin et al. (1996)	7 roofers; 28 days	Global, overall	25	Group	Public	Graphs	Weekly	Time off for reaching 80% safe	None	Global percent safe; Actual labor cost savings	Percent safe increased from 51 to 90% safe (ground) and 55 to 95% safe (roofs)
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Chhokar & Wallin (1984)	58 metal fabrication workers, 42 weeks	Global, overall	35	Group	Public	Graphs	Weekly then Bi-monthly	Training, goal-setting (95% safe)	Specific	Percentage of workers performing 100% safe	Percent safe increased from 65% to 95%. No differences by feedback frequency

Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Cohen & Jensen (1984)	96 lift truck operators, 3 months	Specific	14	Group	Both	Graphs, verbal	Daily	Goal-setting of 80% safe	Specific	Percent at-risk	Percent at-risk dropped by 44% in Study 1 and 61% in Study 2.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Cooper & Newbold (1994)	28 light assembly workers, 11 weeks	Global, response class and overall	16	Group	Public	Graphs	Weekly	None	Specific	Percent safe	Overall percent safe increased from 8 to 78% safe. Lifting: 14 to 100%, Body positioning 7 to 83%, Tool use: 5 to 50%.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Cooper et al. (1994)	540 British construction workers, 11 weeks	Global, overall	Not provided	Group	Public	Graphs	Weekly	Goal setting with percent safe varied by department, ranging from 70-100% safe	Specific	Percent safe	Percent safe increased from 53% to 62%, 71%, 76%, and 70% for the next 4 months. Injury rates dropped 50%.

Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Fellner & Sulzer-Azaroff (1984)	500 paper mill workers, 6 months	Specific	24	Group	Public	Charts	Weekly	None	Specific	Percent safe	Significant improve-ments found in percent safe scores following feedback, leading to a 50% drop in injuries and significant cost/benefit savings.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Fellner & Sulzer-Azaroff (1986)	150 paper mill employees, 50 weeks	Specific	24	Group	Public	Charts	Weekly	Goal-setting	Specific	Percent safe	In following up the 1984 study, percent safe increases from feedback did not further increase with goal-setting.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Geller et al. (1980)	9 university kitchen workers, 30 days	Specific	7	Group	Private	Charts	Daily	None	Specific	Frequency of safe behaviors performed	Safe behavior occurrences increased significantly for one of two dependent safety measures

Article	*Population/ Duration of study*	*Level of feedback specificity*	*Number of behaviors*	*Individual versus group*	*Public versus private*	*Mode of delivery*	*Frequency of delivery*	*Additional independent variables*	*Feedback specificity during training*	*Safety performance metric*	*Findings*
Goltz et al. (1990)	20 micro-electronic workers, 76 days	Specific, Global, overall	Not provided	Group versus group plus individual	Private	Charts	Daily and weekly	None	Specific	Percent safe for a given behavior, when all workers perform the behavior safely (i.e., one at-risk observation is 100% at risk for that behavior)	Percent safe increased from 84% (baseline) to 91% (group feedback) to 96% (group plus individual feedback)
Article	*Population/ Duration of study*	*Level of feedback specificity*	*Number of behaviors*	*Individual versus group*	*Public versus private*	*Mode of delivery*	*Frequency of delivery*	*Additional independent variables*	*Feedback specificity during training*	*Safety performance metric*	*Findings*
Grant (1990)	370 transport training center workers, 6 weeks	Specific	1, safety belt use	Group	Public	Sign	Daily	Awareness campaign	Specific	Percent safe	Percent safe increased 65 to 82% for driver and 46 to 76% for passenger following feedback
Article	*Population/ Duration of study*	*Level of feedback specificity*	*Number of behaviors*	*Individual versus group*	*Public versus private*	*Mode of delivery*	*Frequency of delivery*	*Additional independent variables*	*Feedback specificity during training*	*Safety performance metric*	*Findings*
Hopkins et al. (1986)	Four plastics workers, 17 days	Specific, but not presented in terms of percent safe	9	Individual	Private	Verbal	Daily	None	Specific	Percent safe behaviors, exposure to chemicals	Percent safe increased for most behaviors, 36% drop in exposures

Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Komaki, Barwick, & Scott (1978)	162 food manufactur-ing workers, 25 weeks	Global, overall	Not provided	Group	Public	Chart	Bi-weekly (approx-imately)	Training, Goal-setting (90%)	Specific	Percent safe for a given behavior, when all workers perform the behavior safely	Percent safe increased from 70 to 96% and from 78 to 99% for 2 areas, with significant drops in injury rates.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Komaki, Collins, & Penn (1982)	200 poultry processing workers, 46 weeks	Global, overall	Not provided	Group	Public	Chart	3 times a week	Meeting emphasizing safety rules	Specific	Percent safe	Feedback led to an 11% increase in percent safe over baseline.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Komaki, Heinzmann, and Lawson (1980)	City vehicle maintenance workers, 45 weeks	Global, response class	4 behavioral categories	Group	Public	Graphs	Weekly, then 3 times a week	Training, goal-setting (75% and 90%)	Global, response class	Percent safe	Percent safe improved with feedback (but not training by itself), but only maintained when feedback was provided 3 times/week

Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Ludwig & Geller (1997)	Pizza delivery drivers, 15 weeks	Specific	1, complete stops	Group	Public	Graph	Approx-imately bi-weekly	Goal-setting	Specific	Percent safe	Percent safe increased significantlyNon-targeted behaviors improved with participative goal-setting.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Reber & Wallin (1984)	105 farm machinery workers, 56 weeks	Global, overall (by department not organiz-ation)	Not provided	Group	Public	Graphs	Weekly	Training, Goal-setting	Specific	Percentage of employees performing 100% safe	Percent safe increased from 56 to 93%,59 to 96%, and 69 to 98% for groups 1-3.. Injury rates dropped over 50%.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Reber, Wallin, & Chhokar (1990)	44 farm machinery workers, 55 weeks	Global, overall (by department not organiz-ation)	Not provided	Group	Public	Graphs	Weekly	Training, Goal-setting	Specific	Percentage of employees performing 100% safe	Percent safe increased from 55 to 93%, 58 to 97%, 81 to 97% for areas 1-3. Injury rates dropped for 2 of 3 areas.

Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Sulzer-Azaroff & de Santamaria (1980)	235 manufact-uring plant workers, 7 months	Specific	18 hazards, with correspond-ing behaviors	Group	Individual	Charts and oral feedback	Approx-imately bi-monthly	None	Specific	Frequency of hazards, similar to percent at-risk	Hazard frequency decreased following feedback from 30 to 13% for one area and 29 to 6% for a second area.
Article	***Population/ Duration of study***	***Level of feedback specificity***	***Number of behaviors***	***Individual versus group***	***Public versus private***	***Mode of delivery***	***Frequency of delivery***	***Additional independent variables***	***Feedback specificity during training***	***Safety performance metric***	***Findings***
Sulzer-Azaroff, Loafman, Merante, & Hlavacek (1990)	225 manufact-uring plant workers, 6 months	Specific	Not provided	Group	Public	Charts	Weekly	Goal-setting, incentives for 100% safe	Specific	Percent safe	Significant improve-ments in percent safe corresponde d with a drop in LTAs from 14 to 1 following the intervention and a $55,000 return on investment.

Appendix B:
Site-Specific Survey Information

COCA-COLA BOTTLING COMPANY CONSOLIDATED
SAFETY CULTURE SURVEY ANALYSIS

March, 1997

Report Contents

Executive Summary

Overview of the Survey

The Safety Culture Survey (SCS) was initially developed in 1990 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. It has been refined considerably and continuously improved as a result of its use with a number of companies and government agencies, including M & M Mars, Amoco, the U.S. Department of Energy, 3M, and Hercules. In its current version, the SCS incorporates three separate scales: the **Safety Perception Scale, the Actively Caring Scale, and the Person Factor Scale.** Each scale measures a unique component of employee health and safety.

The results of the SCS are useful in several ways. First, they can be used as a performance measure to assess the success of safety improvement efforts. Specifically, when implementing a behavior-focused safety improvement process, care and attention must be paid to employees' perceptions about safety and their opinions about the behavior-change processes. Otherwise, if behaviors change without subsequent attitude change, the change is likely to be relatively short term and limited in scope. Therefore, repeated administrations of the Safety Culture Survey can help determine if behavior-change interventions are occurring 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 Coke employees at a later time, comparisons across locations or positions within a single organization and between an organization and the norm (e.g., the average of other sites that have taken the survey) can suggest targets for improvement or areas where attention and support should be focused. Accordingly, this report compares data across eight location categories at Coke (see below). The report also compares data between Coke respondents and data from the norm. The norm scores are the average from 25 diverse industrial/manufacturing organizations that have completed the Safety Culture Survey since 1994 and includes approximately 8,000 respondents.

Administration of the Survey

There were 414 Safety Culture Surveys submitted for analysis. Of the 414 respondents, 5 people failed to complete 10 or more of the items. After eliminating incomplete surveys, 409 surveys were used in the remainder of this analysis. Below is the breakdown of Coke survey respondents.

Location	Number	Percentage
Bristol	56	13.7
Clifton Forge	16	3.9
Danville	31	7.6
Dublin	25	6.1
Martinsville	24	5.9
Norton	20	4.9
Roanoke	228	55.7
Vansant	9	2.2
Total	409	100.0

Overview of Findings

Overall, the survey findings suggest a culture supportive of safety improvement efforts. Employees report a slightly higher than average willingness to actively care for one another. Furthermore, all of the employee person factors (how they feel about themselves and their coworkers) are higher than average. In addition, Coke employees perceive more management support and peer support for safety than average, and an average level of personal responsibility for safety. A description of each scale and summary of the findings from each scale are given below. Further detail can be found in the body of this report.

Safety Perception Scale

The Safety Perception Scale (SPS) measures employees' opinions and attitudes about their current safety culture. The scale focuses on how employees perceive management support for safety, peer support for safety, and personal responsibility for safety.

Sample of Findings

• Coke (average score of 3.8) scored higher than the norm (average score of 3.6) regarding perceptions of management support for safety.

• There were some differences in perceptions of management support for safety across locations. The Dublin and Norton locations (average score of 3.9) perceived the most management support for safety, while the Bristol location (average score of 3.5) perceived the least.

• It is promising to see that only 25% of Coke employees thought that work productivity had a higher priority than work safety (norm = 40%).

• Most employees (86%) felt management was genuinely interested in reducing injuries. This percentage is above the norm (norm = 79%).

• Employees felt management places most of the blame on the injured employee (33%) less than the norm (44%). In fact, all eight locations scored below the norm on this item.

• Coke (average score 3.4) also scored above the norm (average score 3.3) regarding perceptions of peer support for safety, indicating that Coke employees feel coworkers support each other in safety efforts more than in most sites.

• There were clear differences across Coke locations regarding peer support for safety. Bristol reported the least positive perceptions regarding peer support for safety (average score 3.2), while Vansant reported the most (average score 3.6). It is noteworthy that only the Bristol location scored lower than the norm (3.3) regarding peer support for safety.

• It is promising to see that only 26% of Coke employees agreed with the statement “If I confront coworkers about their unsafe behaviors, they will react negatively and think I should mind my own business” (norm = 39%). However, there was great variability across locations regarding this question.

• Coke (4.0) scored right at the norm (4.0) regarding personal responsibility for safety**.** There were only slight differences across Coke locations.

• Most (91%) agreed that it is the responsibility of each employee to seek out opportunities to prevent injury (norm = 88%). However, only about half (53%) of Coke employees indicated they would report a minor injury on the job (norm = 59%). Given that 91% agreed it is the responsibility of each employee to seek out opportunities to prevent injury, employees either don't see that reporting minor injuries is an opportunity to help prevent future injuries, or they may be reluctant to report minor injuries and near misses for fear of reprimand or punishment.

• Few Coke employees (6%) said drug and alcohol use is a problem (norm = 20%). However, there were differences across locations regarding this question, with responses ranging from 0% to 11%. It is noteworthy, however, that all of these percentages are below the norm.

• 47% of Coke respondents indicated most employees in their group would not feel comfortable if their work practices were observed and recorded by a coworker (norm = 58%). However, 60% of those at the Norton location felt this way.

• 11% reported they had been punished for reporting a work injury. However, 31% report it is common for employees to be disciplined for having a work injury.

Actively Caring Scale

The Actively Caring (ACS) assesses employee willingness to go beyond the call of duty for the health and safety of others. This scale measures whether employees are willing, feel they should, and are currently actively caring in various ways.

Sample of Findings

• Overall, Coke (3.8) scored right at the norm (3.8) on the ACS.

There was little variability across Coke locations. However, the Danville and Vansant locations reported the most actively caring.

• Employees recognize it is important to AC and they are willing to AC, but for some reason they are not doing so as often as they feel they should. One possible barrier or explanation is they do not know how to give praise or corrective feedback and need to be trained. Another possible explanation is the system does not allow giving praise (e.g., employees work alone). Finally, the experience of peer to peer feedback being rejected may discourage those who are willing and feel they should provide feedback. The TSC training was a first attempt at addressing some of these issues by not only focusing on how to give feedback but also why it is important.

Person Factor Scale

When individuals feel good about themselves, their work teams, and the organization as a whole, they are more likely to go out of their way to assist others. This is the case in general, and in safety-related matters as well. Therefore, person factors (expectancies or mood states) such as self-esteem, belonging, personal control, optimism, self-effectiveness, and reactance can have a significant impact on people's willingness to become actively involved in safety improvement efforts. The Person Factor Scale (PFS) measures the above six person factors which are strongly related to one's propensity to actively care for the safety of others.

Findings

• It is promising to see that Coke scored above the norm for all of the AC person factors.

• There were visible differences across the Coke locations on most of the person factors. However, these differences were not consistent across factors or locations.

• The correlation between person factors and likelihood of actively caring was .74, which is very good when trying to predict human behavior. Therefore, Coke employees with higher perceptions of group belonging, self-esteem, optimism, personal control, and self-effectiveness reported a greater likelihood of actively caring.

• Because of the relationship between the AC person factors and one's propensity to actively care for the safety of others, and the overall high person factor scores at Coke, Coke seems to have a greater potential to achieve a Total Safety Culture than most organizations.

Interpretation of the Survey Results

Introduction

The Safety Culture Survey incorporates three separate scales, each measuring a unique component of employee health and safety. The ***Safety Perception Scale*** *(SPS)* addresses a variety of safety issues, including perceived management support for safety, peer support for safety, and personal responsibility for safety. The ***Actively Caring Scale*** *(ACS)* measures whether employees are a) willing, b) feel they should, and c) are currently actively caring in various ways. The ***Person Factor Scale (PFS)*** measures the "person factors" (self-esteem, belonging, self-effectiveness, personal control, optimism, and psychological reactance) related to one's likelihood of actively caring for the safety of others.

Many of the Safety Culture Survey questions and scale results are depicted as graphs using the average response score. The original scale was a five-point Likert scale ranging from Highly Disagree (1), Disagree (2), Not Sure (3), Agree (4), to Highly Agree (5). Even though respondents answered the questions using this five-point scale, the responses were similar enough that they could best be illustrated by showing the top three responses or the bottom three responses in the graphs. Further explanation is given before each scale.

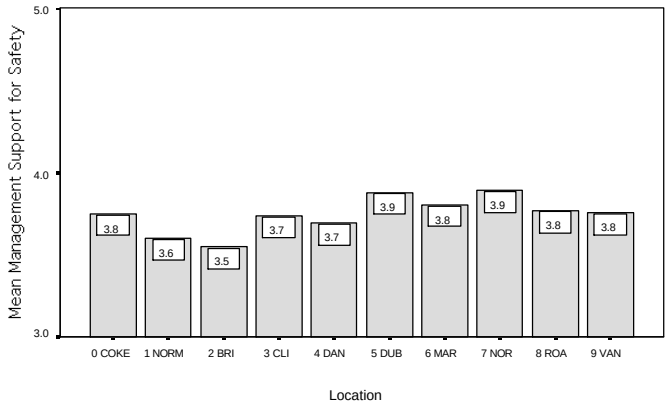
Although the most meaningful interpretation of the SCS results will come from a comparison between the responses from the current results with results taken from Coke employees at a later time, comparisons across locations or positions within a single organization and between an organization and the norm (e.g., the average of other sites that have taken the survey) can suggest targets for improvement or areas where attention and support should be focused. Accordingly, this report compares Coke to the norm, as well as across eight location categories.

Although the differences between Coke employees and the norm might seem very small, differences of only .1 are statistically significant at the .05 level. This means that if the Coke score was 3.0 on a Safety Culture Survey question or scale and the norm score was 3.1, the chance of such a difference occurring randomly would only happen 5 times out of 100. Because the difference needed to be considered significant is related to the number of people in the sample (among other things), differences of .1 are large enough to be considered significant only when comparing Coke scores to the norm. When comparing scores among the different Coke locations (e.g., Dublin vs. Norton) differences of at least .3 are usually enough for the differences to be considered significant.

Safety Perception Scale

The Safety Perception Scale (SPS) assesses employees' current perceptions and opinions regarding a variety of safety issues. This scale is composed primarily of questions relating to three factors: management support for safety, peer (e.g., coworker) support for safety, and personal responsibility for safety. None of the average responses for these factors were below the "Not Sure" category. Therefore, graphs on the next page only include the top three anchors (categories) of Not Sure (3), Agree (4), and Highly Agree (5).

The graphs on the next pages illustrate the responses for the three SPS factors at Coke and the norm. Higher scores (depicted by higher bars on the graphs) coincide with more positive perceptions and opinions regarding safety.



Management Support for Safety

Management support for safety

Coke (average score of 3.8) scored higher than the norm (average score of 3.6) regarding perceptions of management support for safety. There were some differences, though, in perceptions of management support for safety across locations. The Dublin and Norton locations (average score of 3.9) perceived the most management support for safety, while the Bristol location (average score of 3.5) perceived the least.

The percentage of those who agreed, disagreed, or were not sure regarding each item from the management support for safety factor are listed in Table A for Coke on average as well as for the norm. This information is listed for each Coke location in Appendix 1.

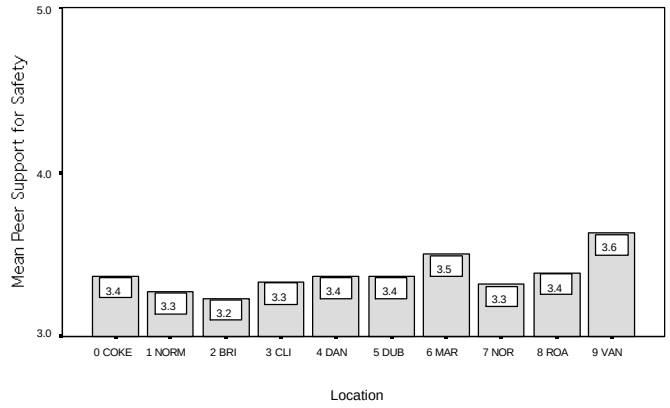
It is promising to see that only 25% of Coke employees thought that work productivity had a higher priority than work safety (norm = 40%). Also, most employees (86%) felt management was genuinely interested in reducing injuries. This percentage is above the norm (norm = 79%). In addition, employees felt management places most of the blame on the injured employee (33%) less than the norm (44%). In fact, all eight locations scored below the norm on this item.

Peer support for safety

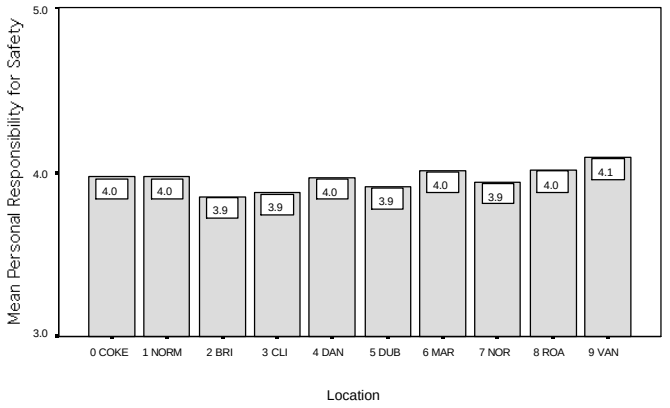
Coke (average score 3.4) also scored above the norm (average score 3.3) regarding perceptions of peer support for safety, indicating that Coke employees feel coworkers support each other in safety efforts more than in most sites. However, there were clear differences across Coke locations regarding peer support for safety. Bristol reported the least positive perceptions regarding peer support for safety (average score 3.2), while Vansant reported the most (average score 3.6). It is noteworthy that only the Bristol location scored lower than the norm (3.3) regarding peer support for safety.

The percentage of those who agreed, disagreed, or were not sure regarding each item from the peer support for safety factor are listed in Table A for Coke on average as well as for the norm. This information is listed for each Coke location in Appendix 1.

Peer Support for Safety



Personal Responsibility for Safety



It is promising to see that only 26% of Coke employees agreed with the statement "If I confront coworkers about their unsafe behaviors, they will react negatively and think I should mind my own business" (norm = 39%). However, there was great variability across locations regarding this question.

Personal responsibility for safety

Coke (4.0) scored right at the norm (4.0) regarding personal responsibility for safety**.** There were only slight differences across Coke locations.

The percentage of those who agreed, disagreed, or were not sure regarding each item from the personal responsibility for safety factor are listed in Table A for Coke on average as well as for the norm. This information is listed for each Coke location in Appendix 1.

Regarding specific questions from the personal responsibility for safety factor, most (91%) agreed that it is the responsibility of each employee to seek out opportunities to prevent injury (norm = 88%). However, only about half (53%) of Coke employees indicated they would report a minor injury on the job (norm = 59%). Given that 91% agreed it is the responsibility of each employee to seek out opportunities to prevent injury, employees either don't see that reporting minor injuries is an opportunity to help prevent future injuries, or they may be reluctant to report minor injuries and near misses for fear of reprimand or punishment.

After TSC training, Coke should be aware that the **reported** rate of **minor** injuries (e.g., anything which could be hidden) sometimes increases. This can be a normal reaction to a more open and supportive safety culture, where employees feel more comfortable talking about and reporting the injuries they would have once tried to hide. Please remember that this does not usually reflect increases in actual injuries, but rather the reporting of injuries. Once employees feel comfortable talking about their injuries and near misses, and supportive interventions are developed in response, these injuries should decline.

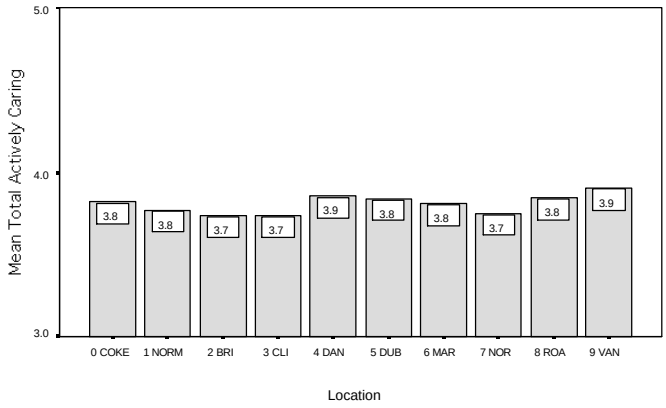
Miscellaneous safety perception questions

The miscellaneous questions in the Safety Perception Scale are those questions which did not group together (statistically) with either management support, peer support, or personal responsibility for safety, but were still of interest. For example, few Coke employees (6%) said drug and alcohol use is a problem (norm = 20%). However, there were differences across locations regarding this question, with responses ranging from 0% to 11%. It is noteworthy, however, that all of these percentages are below the norm. Also, 47% of Coke respondents indicated most employees in their group would not feel comfortable if

their work practices were observed and recorded by a coworker (norm = 58%). However, 60% of those at the Norton location felt this way.

It is noteworthy that 11% of employees reported they had been punished for reporting a work injury. However, 31% reported that it is common for employees to be disciplined for having a work injury. These values are similar to those of the norm, where 14% reported they had been punished for reporting a work injury, but 29% reported it was common for employees to be disciplined for having a work injury.

Actively Caring Scale (ACS)



Actively Caring Scale

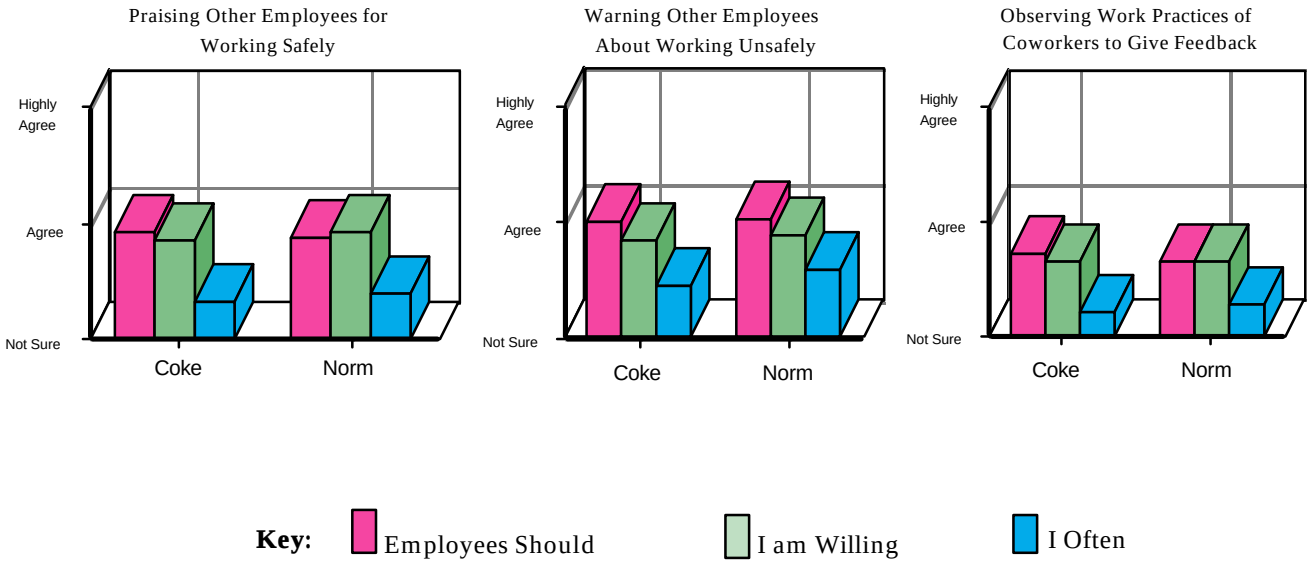
In a Total Safety Culture, actively caring is defined as employees' willingness to look out for the safety of others as well as themselves. Actively caring behaviors are those which will directly or indirectly impact the safety of others, and can be behavior-focused, person-focused, or environment-focused. The actively caring scale (ACS) assesses intentions and attitudes toward AC behaviors for fellow employees and the environment. For each AC behavior addressed (e.g., praising other employees for working safely), three separate questions were asked. Respondents were asked 1) if they felt employees should perform the specific behavior (e.g., "Employees should praise each other for working safely"), 2) if they are willing to perform the behavior (e.g., "I am willing to praise other employees for working safely"), and 3) if they often do perform the behavior (e.g., "I often praise coworkers when I see them working safely"). When employees feel they should AC and are willing to AC more than they currently do, a potential for relatively quick improvement in safety behaviors following appropriate training exists. Furthermore, when employees are willing to AC more than they feel they should or actually do, they will "stretch" or go beyond the call of duty for safety, but might need additional support and direction for doing so. The summary graph above shows little variability across Coke locations. However, the Danville and Vansant locations reported the most actively caring. Overall, Coke (3.8) scored right at the norm (3.8) on the ACS.

Table B lists the base questions from the AC sub-scale along with a graphical representation of the average responses for both Coke and the norm. The questions are separated into environment-, person-, and behavior-focused items.

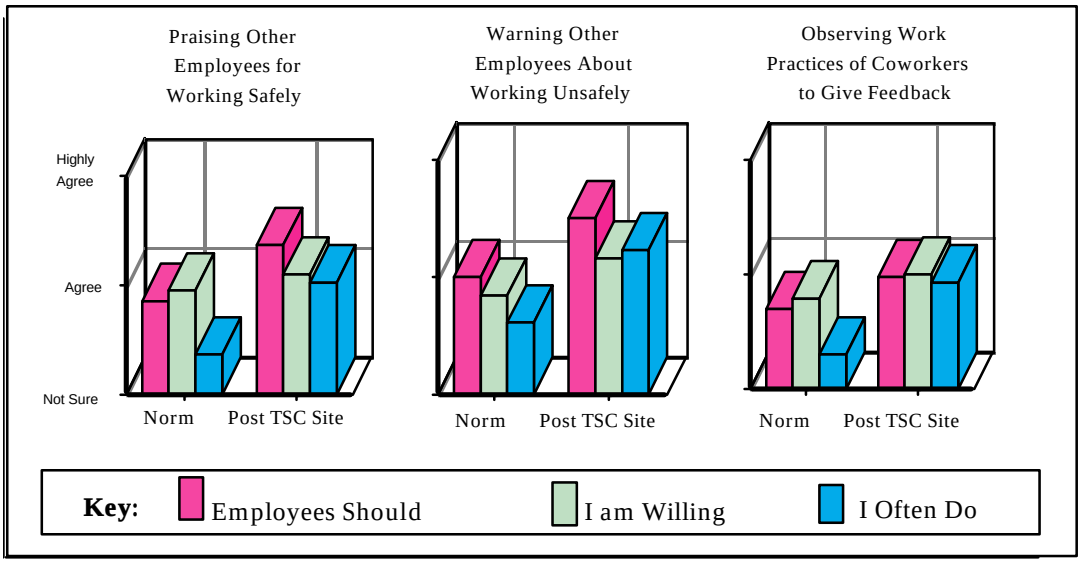
Because employees for the most part agree they should and are willing to actively care for their coworkers and for the environment, effort should focus on getting the employees involved in such improvement activities. We have found that employees are receptive to safety training where the techniques of one-on-one behavioral feedback are taught. Role-play exercises to increase the comfort level of giving and receiving feedback (such as those done during TSC training) have also been very effective. However, training is not enough. Effort must be maintained after the training to provide the

structure for employee involvement and to continually encourage and recognize individuals who stay actively involved.

Below are three select graphs from Table B. These graphs, representing responses to "praising other employees for working safely", "warning other employees about working unsafely", and observing work practices of coworkers to give feedback" indicate employees recognize it is important to AC and they are willing to actively care, but for some reason they are not doing so as often as they feel they should. One possible barrier or explanation is they do not know how to give praise or corrective feedback and need to be trained. Another possible explanation is the system does not allow giving praise (e.g., employees work alone). Finally, the experience of peer to peer feedback being rejected may discourage those who are willing and feel they should provide feedback. The TSC training is a first attempt at addressing some of these issues by not only focusing on how to give feedback but also why it is important.



It should be stated that the norm represents data from companies before TSC training. Therefore, the similarities between Coke and the norm are not surprising. However, positive changes in employees' level of actively caring is expected after TSC training. On the next page are three graphs depicting the same questions as those above. However, these graphs represent the norm compared to a site that has taken the SCS two years after TSC training. Not only are these employees more willing and feel they should actively care more than the norm, but more importantly, they report more actively caring behaviors. Furthermore, even though employees still report they are willing and feel they should actively care more than they often do, this difference is much less pronounced than the pre-TSC training norm. Table C includes all the sub-scale questions ("I should", "I am willing", "I often do") and separates the questions into environment-, person-, and behavior-focused items.



Person Factor Scale

As in the Safety Perception Scale, the average responses of the Person Factor Scale were all above the "Not Sure" category. Therefore, graphs only include the top three anchors (categories) of Not Sure (3), Agree (4), and Highly Agree (5). The only exception to this is Psychological Reactance, where the desirable response is low. This scale includes the bottom three anchors of Highly Disagree (1), Disagree (2), and Not Sure (3).

When individuals feel good about themselves, their work teams, and the organization as a whole, they are more likely to go out of their way to assist others. This is the case in general, and in safety-related matters as well. Therefore, person factors (expectancies or mood states) such as self-esteem, belonging, personal control can have a significant impact on people's willingness to become actively involved in safety improvement efforts. The Person Factor Scale measures six person factors most strongly related to the likelihood of actively caring for the safety of others.

The ACS includes six sub-scales:

Self Esteem. Self-esteem is the evaluation an individual makes and usually maintains about oneself. This evaluation indicates the extent to which the respondent feels capable, significant, successful, and worthy. When an individual does not feel valuable, they are not likely to intervene on behalf of a co-worker.

Optimism . Optimism is the learned expectation that things will go well and the anticipation of positive outcomes from one's actions (e.g., "Things usually turn out for the best").

Self-effectiveness. Self-effectiveness relates to ones judgments of personal mastery and success. Those high in self--effectiveness may be more likely to attempt new behaviors, exert more effort, and persist in the face of adversity.

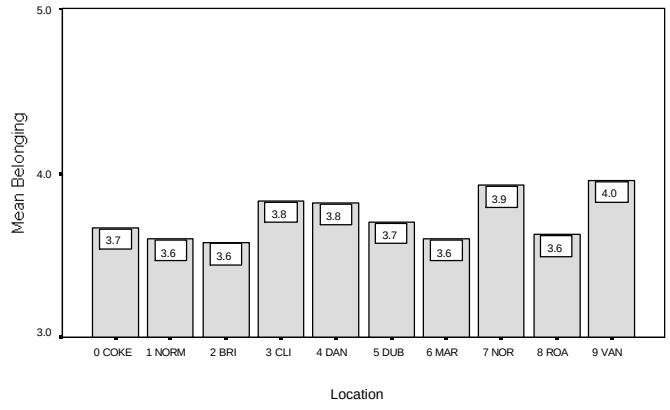
Personal Control. Personal control refers to a general expectancy regarding the location of forces controlling a person's life – internal or external. Those with an *internal locus of control* feel they essentially have direct personal control over the things that happen to them, through their knowledge, skills, and abilities. In contrast, persons with an *external locus of control* believe things like chance, luck or fate play important roles in their lives – past, present, and future.

Belongingness. Group belongingness or cohesion refers to an individual's perception of solidarity or closeness with a workgroup. Five main consequences result from group cohesion: 1) high quantity and quality of communication, 2) high member loyalty and satisfaction, 3) enforcement of group norms, 4) increased directing and focusing of group goals, and 5) a strong group culture, including special behavioral routines.

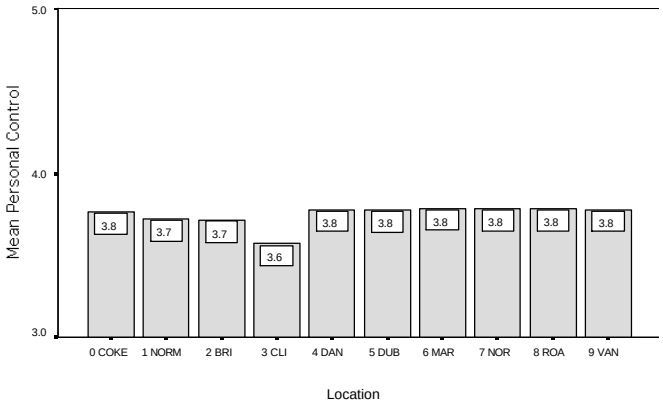
Psychological Reactance. Individuals are predisposed in varying degrees to preserve their personal freedom or react aggressively to a threat to personal freedom. When one's perceived freedom is lost or threatened (e.g., by an external controlling agent), one will experience an unpleasant state (reactance) resulting in a desire to recover the lost or threatened. 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.

On the following page, the six person factors are graphed for each Coke location. The higher the bars on the graphs, the more employees agreed with questions relating to each factor. It is promising to see that Coke scored above the norm for all of the AC person factors. There were visible differences across the Coke locations on most of the person factors. However, these differences were not consistent across factors or locations.

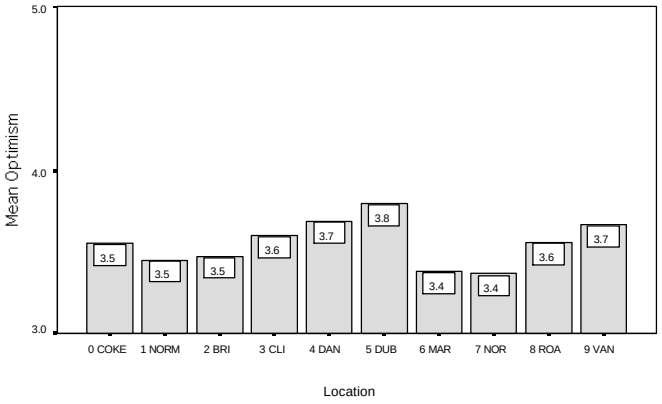
Belonging



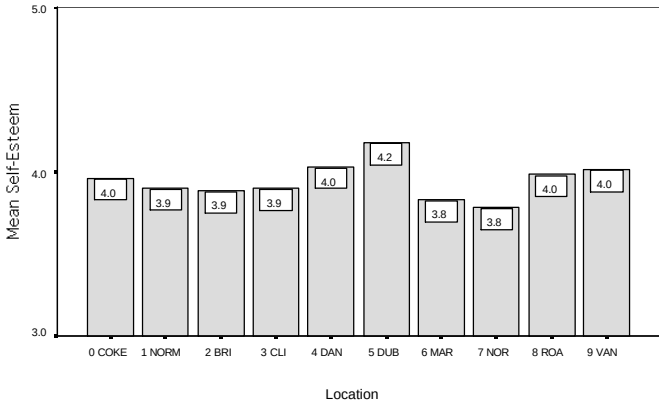
Personal Control



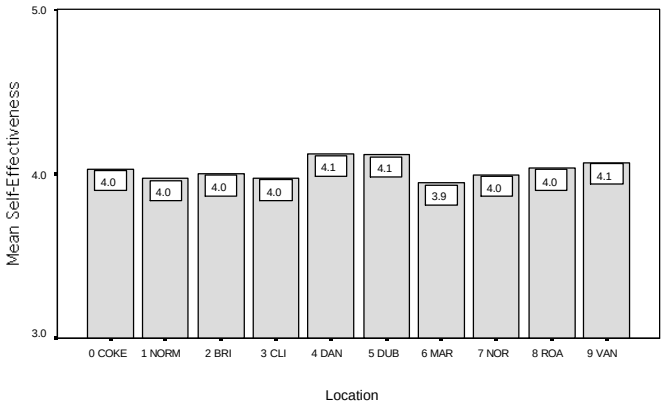
Optimism



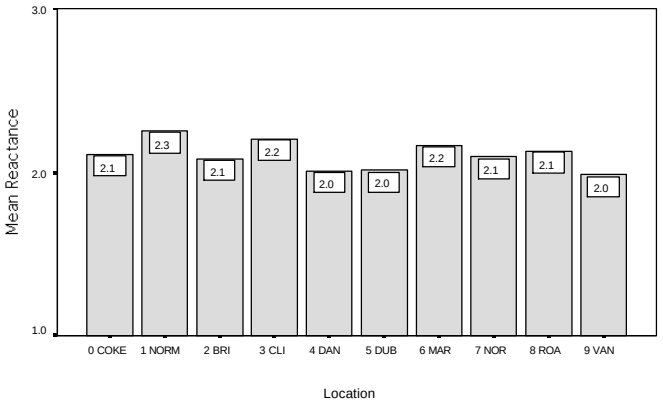
Self-Esteem



Self-Effectiveness



Reactance



Person Factors and Actively Caring at Coke

Theory and research suggests individuals with high Person Factor Scale (PFS) scores are more likely to get involved and actively care for safety. However, it is important to see if our AC model actually explains intentions and attitudes among Coke employees. The figure on the next page depicts a correlation between the likelihood of actively caring (e.g., the combined questions from the ACS) on the y axis (left side) and an person factor score (obtained by combining the average scores from the seven person 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 acceptable. The correlation between person factors and likelihood of actively caring was .74, which is very good when trying to predict human behavior. Therefore, the figure shows that Coke employees with higher perceptions of group belonging, self-esteem, optimism, personal control, and self-effectiveness reported a greater likelihood of actively caring. This information is useful because now we can be more confident that attempts to increase the person factors as part of the TSC process at Coke will lead to increased individual and group involvement in safety efforts, and eventually to a safer workplace.

Relationship Between Person Factors and Likelihood of Actively Caring

The relationship between these person factors and workplace safety may not be immediately apparent to most. Therefore, training is generally required in order for individuals to understand and appreciate this relationship, and be willing to put forth the extra effort required (even though the effort is often small) to implement strategies to increase these person factors in others. The TSC training is generally successful in convincingly illustrating this relationship.

Table A:
Safety Perception Scale Items

Arranged by factors, Table A shows the average responses as well as the percentage of each group who agreed or disagreed with each item. Note: Recall the survey used a five-point response scale (i.e., 5=Highly Agree, 4=Agree, 3=Not Sure, 2=Disagree, and 1=Highly Disagree). These five response categories have been collapsed into two (i.e., 5 and 4 =Agree and 1 and 2=Disagree). The percentage "Not Sure" can be calculated by subtracting the smaller number (Agree or Disagree) from the larger number.

		Coke				Norm			
	Management Support for Safety	**Ave-rage**	**Agree**	**Dis-Agree**	**Not Sure**	**Ave-rage**	**Agree**	**Dis-Agree**	**Not Sure**
spm004	When told about safety hazards, supervisors are appreciative and try to correct them quickly.	3.75	75%	13%	12%	3.55	64%	20%	16%
spm005	My immediate supervisor is well informed about relevant safety issues.	3.85	74%	10%	16%	3.82	72%	11%	16%
spm007	The management at my plant is willing to invest money and effort to improve our safety performance.	4.14	88%	5%	7%	3.69	66%	15%	19%
spm012	At my plant, work productivity and quality usually have a higher priority than work safety.	2.77	25%	46%	29%	3.04	40%	40%	20%
spm013	The managers at my plant really care about safety and try to reduce risk levels as much as possible.	3.94	82%	6%	12%	3.73	69%	13%	18%
spm014	Management places most of the blame for an accident on the injured employee.	3.06	33%	33%	34%	3.24	44%	30%	26%
spm023	Working safely is the Number One priority in my plant.	3.67	62%	14%	24%	3.67	63%	18%	19%
spm025	I have received adequate job safety training.	3.87	79%	9%	13%	3.86	77%	12%	12%
spm027	Information needed to work safely is made available to all employees.	3.94	83%	6%	11%	3.89	77%	9%	14%
spm029	Management here seems genuinely interested in reducing injuries.	4.11	86%	5%	8%	3.97	79%	9%	13%
SCORE	**Management Support for Safety Score**	3.75	68%	3%	29%	3.60	60%	5%	35%
	Peer Support for Safety								
spp001	When employees in my group are cautioned about working unsafely, they begin working more safely.	3.71	75%	9%	16%	3.61	68%	15%	18%
spp002	Employees do not like it when coworkers do not follow safety policy, even when no harm is done.	3.52	61%	14%	25%	3.51	60%	18%	22%
spp006	If I approach my coworkers about their unsafe behaviors, they will react negatively and think I should mind my own business.	2.84	26%	44%	30%	3.02	39%	39%	22%
spp010	Employees in my work group give each other verbal praise for working safely.	2.92	28%	35%	37%	2.84	28%	39%	33%
spp019	Employees seen behaving unsafely in my department are usually given corrective feedback by their coworkers.	3.36	49%	17%	34%	3.21	44%	25%	31%
spp028	Employees in my work group participate in defining safe work practices.	3.56	60%	12%	29%	3.48	58%	17%	26%
SCORE	**Peer Support for Safety Score**	3.37	36%	4%	59%	3.27	30%	8%	62%

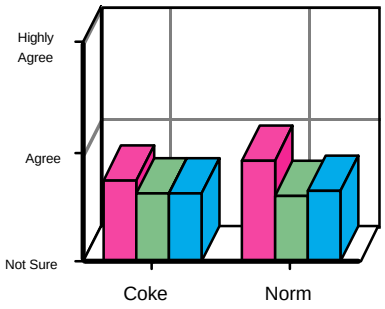
Table A: Continued
Safety Perception Scale Items

		Coke				Norm			
		Ave-rage	**Agree**	**Dis-Agree**	**Not Sure**	**Ave-rage**	**Agree**	**Dis-Agree**	**Not Sure**
	Personal Responsibility for Safety								
spr009	It is the responsibility of each employee to seek out opportunities to prevent injury.	4.21	91%	5%	4%	4.22	88%	6%	6%
spr016	I have more respect for workers who work safely than for workers who work unsafely.	3.86	73%	10%	17%	3.73	70%	18%	12%
spr024	When a safety regulation is issued, I try to follow it as best I can.	4.15	92%	2%	5%	4.17	91%	4%	5%
spr033	I know how to do my job safely.	4.28	93%	4%	3%	4.20	90%	5%	5%
spr035	If I received a minor injury on the job, I would report it.	3.36	53%	25%	22%	3.53	59%	22%	19%
SCORE	**Personal Resp. for Safety Score**	3.97	87%	2%	12%	3.97	84%	2%	13%
	Misc. Safety Perception Questions								
spx003	The risk level of my job concerns me quite a bit	3.35	53%	30%	16%	3.48	60%	28%	12%
spx015	Alcohol or drug abuse is a problem in my plant.	1.69	6%	87%	7%	2.45	20%	56%	25%
spx021	Compared to other plants, I think mine is rather risky.	2.02	5%	78%	18%	2.46	18%	57%	25%
spx030	Safety audits are conducted regularly in my department to check the use of personal protective equipment.	3.20	41%	24%	34%	3.29	48%	27%	26%
spx034	Most employees in my group would not feel comfortable if their work practices were observed and recorded by a coworker.	3.28	47%	26%	27%	3.52	58%	21%	21%
spx043	Good performance evaluations and promotions depend on individual contributions toward plant safety.	3.57	63%	15%	23%	3.31	50%	25%	25%
inv017	Near misses are consistently reported and investigated at our plant.	2.69	19%	43%	38%	3.21	46%	27%	27%
inv026	Many first aid cases in my plant go unreported.	2.41	12%	57%	31%	2.88	30%	37%	34%
inv113	I would feel free to discuss the causes of my injury with the investigation team.	3.84	79%	5%	16%	3.82	75%	10%	15%
inv121	I am encouraged to report near misses.	3.07	34%	25%	40%	3.22	46%	25%	30%

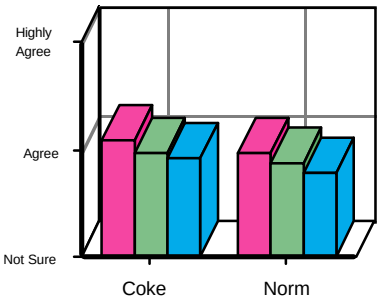
Table B:
AC Scale Graphs

Environment Focused Actively Caring

Picking Up After Others to Maintain Good Housekeeping

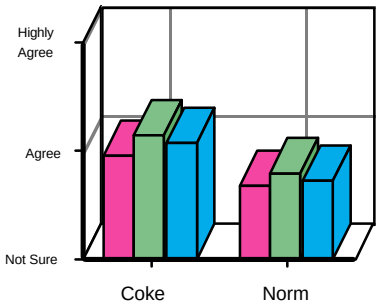


Taking Corrective Action for Unsafe Equipment

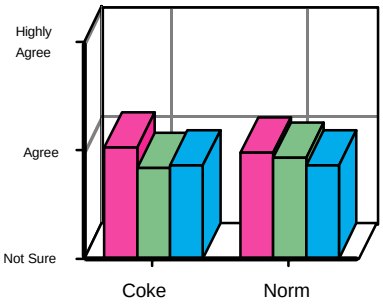


Person Focused Actively Caring

Helping Others With Tasks, Even if it Causes Inconvenience

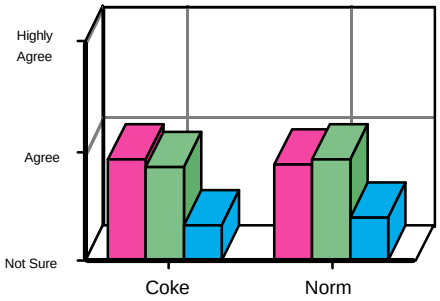


Helping Down Employees Feel Better

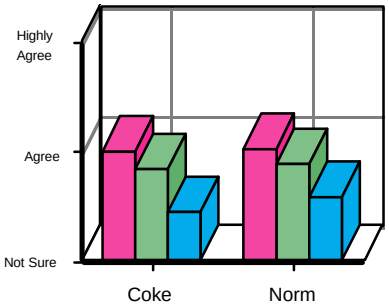


Behavior Focused Actively Caring

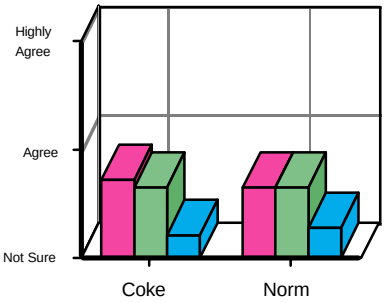
Praising Other Employees for Working Safely



Warning Other Employees About Working Unsafely



Observing Work Practices of Coworkers to Give Feedback



Key: Employees Should | I am Willing | I Often

Table C:
Actively Caring Scale Items

Arranged by focus areas, Table C shows the average responses as well as the percentage of each group who agreed or disagreed with each item. Note: The survey used a five-point response scale (i.e., 5=Highly Agree, 4=Agree, 3=Not Sure, 2=Disagree, and 1=Highly Disagree). These five response categories have been collapsed into two (i.e., 5 and 4 =Agree and 1 and 2=Disagree). The percentage "Not Sure" can be calculated by subtracting the smaller number (Agree or Disagree) from the larger number.

		Coke				Norm			
		Ave-rage	**Agree**	**Dis-Agree**	**Not Sure**	**Ave-rage**	**Agree**	**Dis-Agree**	**Not Sure**
	Behavior-Focused Actively Caring								
baa110	Employees should praise each other for working safely.	3.93	81%	3%	16%	3.88	77%	8%	16%
bab008	I am willing to praise other employees for working safely.	3.84	73%	6%	21%	3.91	77%	8%	15%
bac055	I have often praised a coworker after seeing him/her working safely.	3.32	43%	14%	43%	3.40	52%	20%	27%
bad124	Employees should caution their coworkers when they are observed working unsafely.	3.98	84%	3%	13%	4.01	84%	6%	10%
bae018	I am willing to caution my coworkers about working unsafely.	3.83	77%	6%	17%	3.88	78%	9%	12%
baf101	I often caution my coworkers when I see them working unsafely.	3.44	54%	13%	34%	3.57	64%	15%	21%
bag049	Employees should observe the work practices of their coworkers in order to provide them with safety-related feedback.	3.73	69%	5%	26%	3.66	67%	12%	21%
bah036	I am willing to observe the work practices of other employees in order to provide them with safety-related feedback.	3.65	65%	10%	25%	3.65	66%	13%	21%
bai115	I have observed the work practices of coworkers in order to provide them with safety-related feedback.	3.20	39%	20%	41%	3.27	47%	24%	30%
SCORE	**Behavior-Focused AC Score**	3.66	64%	2%	34%	3.57	56%	5%	39%
	Environment-Focused Actively Caring								
eaa056	Employees should pick up after one another to maintain good housekeeping.	3.74	70%	13%	17%	3.91	77%	13%	10%
eab011	I am willing to pick up after another employee in order to maintain good housekeeping	3.61	65%	16%	19%	3.59	66%	19%	15%
eac119	I pick up after other coworkers in order to maintain good housekeeping.	3.63	66%	13%	21%	3.64	68%	15%	17%
ead089	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).	4.08	89%	3%	9%	3.97	82%	7%	11%
eae031	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).	3.96	83%	5%	12%	3.86	76%	9%	14%
eaf042	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).	3.92	81%	6%	13%	3.77	72%	11%	18%
SCORE	**Environment-Focused AC Score**	3.83	71%	2%	26%	3.58	58%	10%	33%

Table C: (Cont.)
Actively Caring Scale Items

		Coke				Norm			
		Ave-rage	**Agree**	**Dis-Agree**	**Not Sure**	**Ave-rage**	**Agree**	**Dis-Agree**	**Not Sure**
	Person-Focused Actively Caring								
paa074	When an employee needs assistance with a task, coworkers should help, even if it is inconvenient.	3.95	85%	6%	9%	3.67	72%	16%	12%
pab022	When an employee needs assistance with a task, I am willing to help, even if it causes me inconvenience.	4.14	91%	4%	5%	3.78	76%	14%	10%
pac038	When an employee needs assistance with a task, I help, even if it causes me inconvenience.	4.07	89%	4%	7%	3.71	75%	15%	10%
pad046	When an employee gets down or depressed, coworkers should try to help him/her feel better.	4.03	82%	4%	13%	3.98	79%	7%	14%
pae125	When a coworker gets down or depressed, I am willing to try to make that person feel better.	3.83	77%	5%	19%	3.93	80%	6%	14%
paf093	When I see a coworker looking down or depressed, I often try to make that person feel better.	3.86	78%	4%	18%	3.86	76%	7%	16%
SCORE	**Person-Focused AC Score**	3.98	83%	2%	16%	3.82	72%	3%	25%

Table D:
Person Factor Scale Items

Arranged by the five factors, Table D shows the average responses as well as the percentage of each group who agreed or disagreed with each item. Note: The survey used a five-point response scale (i.e., 5=Highly Agree, 4=Agree, 3=Not Sure, 2=Disagree, and 1=Highly Disagree). These five response categories have been collapsed into two (i.e., 5 and 4 =Agree and 1 and 2=Disagree). The percentage "Not Sure" can be calculated by subtracting the smaller number (Agree or Disagree) from the larger number.

		Coke				Norm			
		Ave-rage	**Agree**	**Dis-Agree**	**Not Sure**	**Ave-rage**	**Agree**	**Dis-Agree**	**Not Sure**
	Belonging								
bel051	My coworkers do many helpful things for each other.	3.68	69%	11%	20%	3.51	63%	19%	18%
bel063	I distrust my coworkers.	2.13	8%	71%	21%	2.34	16%	63%	21%
bel069	I feel close to my coworkers.	3.50	56%	12%	32%	3.50	57%	16%	27%
bel072	I don't understand my coworkers.	2.45	10%	57%	33%	2.52	17%	55%	28%
bel075	I enjoy being with my coworkers.	3.70	70%	7%	24%	3.75	71%	9%	20%
bel080	I trust my coworkers.	3.54	59%	11%	30%	3.49	58%	15%	28%
bel082	I feel like I belong to my work group.	3.81	75%	6%	19%	3.74	71%	11%	18%
bel085	My coworkers are not very close at all.	2.45	13%	59%	27%	2.56	20%	55%	25%
bel087	My coworkers share much in common.	3.47	53%	9%	38%	3.30	46%	18%	36%
bel102	I dislike my coworkers.	1.99	4%	81%	14%	2.14	11%	73%	16%
SCORE	**Belonging Score**	3.67	64%	4%	32%	3.60	59%	5%	36%
	Personal Control								
pcn062	If a person tries hard enough, he or she can do anything.	4.11	85%	5%	10%	4.09	81%	9%	10%
pcn073	People who never get injured are just plain lucky.	2.23	11%	70%	19%	2.27	16%	69%	15%
pcn077	People's injuries result from their own carelessness.	3.10	32%	23%	45%	3.01	36%	34%	31%
pcn078	I am directly responsible for my own safety.	3.87	77%	9%	14%	4.00	80%	10%	10%
pcn084	Whenever someone is injured, it's usually due to something he/she has done or has not done.	3.43	51%	10%	39%	3.14	42%	27%	32%
pcn091	People can change what might happen tomorrow by what they do today.	3.82	77%	9%	15%	3.66	70%	15%	15%
pcn099	There is nothing a person can do to stop bad things from happening.	2.26	12%	71%	18%	2.35	18%	67%	15%
pcn105	It's better to be smart than lucky.	3.94	79%	5%	16%	3.83	73%	11%	16%
pcn109	If people follow safe life practices, they can avoid many unnecessary injuries.	4.02	87%	3%	10%	4.15	89%	5%	7%
pcn111	Whether people get injured is a matter of fate, chance, or luck.	2.23	6%	66%	28%	2.27	13%	66%	21%
pcn114	Most incidents that result in injuries are largely preventable.	3.83	77%	4%	19%	3.72	71%	12%	17%
SCORE	**Personal Control Average**	3.76	77%	1%	23%	3.72	70%	2%	29%

Table D: (Cont.)
Person Factor Scale Items

		Coke				Norm			
		Ave-rage	Agree	Dis-Agree	Not Sure	Ave-rage	Agree	Dis-Agree	Not Sure
	Self-Esteem								
see053	I feel I have a number of good qualities.	4.22	95%	3%	2%	4.18	89%	5%	6%
see058	I am inclined to feel I am a success.	3.81	73%	8%	20%	3.73	69%	12%	19%
see061	I am able to do things as well as most other people.	4.05	87%	5%	8%	4.13	88%	5%	7%
see064	At times, I think I am no good at all.	2.01	9%	78%	13%	2.15	16%	71%	13%
see081	On the whole, I am satisfied with myself.	4.00	85%	4%	11%	4.06	86%	6%	9%
see092	I feel I don't have much to be proud of.	1.83	6%	87%	8%	2.04	13%	79%	8%
see097	I certainly feel useless at times.	2.25	12%	68%	20%	2.28	18%	66%	16%
see112	I wish I could have more respect for myself.	2.28	10%	65%	25%	2.70	30%	52%	18%
SCORE	**Self-Esteem Score**	3.96	80%	1%	19%	3.91	76%	2%	23%
	Self-Effectiveness								
sef052	I give up on things before completing them.	1.91	5%	86%	8%	2.06	12%	78%	10%
sef060	One of my problems is that I cannot get down to work when I should.	1.97	6%	80%	14%	2.09	12%	76%	12%
sef068	When trying to learn something new, I soon give up if I am not initially successful.	2.00	7%	84%	9%	2.08	12%	78%	10%
sef079	When unexpected problems occur, I handle them well.	3.87	81%	4%	15%	3.79	74%	6%	20%
sef086	I feel secure about my ability to do things.	4.13	93%	2%	5%	4.11	89%	4%	7%
sef090	I do not seem capable of dealing with most problems that come up in life.	1.90	6%	86%	8%	2.13	15%	75%	10%
sef104	I avoid trying to learn new things when they look too difficult for me.	1.95	6%	88%	6%	2.17	15%	75%	10%
sef108	If I can't do a job the first time, I keep trying until I can.	4.01	88%	3%	10%	4.10	87%	4%	9%
sef118	Failure just makes me try harder.	4.01	86%	4%	10%	3.84	74%	8%	18%
sef120	When I set important goals for myself, I usually achieve them.	3.94	82%	3%	15%	3.94	80%	5%	15%
sef122	I do not give up easily.	4.11	91%	3%	6%	4.08	87%	6%	8%
SCORE	**Self-Effectiveness Score**	4.03	92%	1%	7%	3.97	85%	1%	14%
	Optimism								
opt057	I hardly ever expect things to go my way.	2.53	16%	54%	30%	2.43	20%	60%	21%
opt067	In uncertain or difficult times, I usually expect the best to happen.	3.20	37%	20%	43%	3.46	53%	18%	30%
opt070	I rarely count on good things happening to me.	2.36	13%	65%	23%	2.52	23%	58%	19%
opt095	If anything can go wrong for me, it probably will.	2.37	13%	66%	22%	2.49	19%	58%	23%
opt096	I always look on the bright side of things.	3.67	65%	8%	27%	3.75	68%	11%	21%
opt103	Things never work out the way I want them to.	2.20	7%	75%	19%	2.45	18%	62%	20%
opt106	I believe every cloud has a silver lining.	3.46	54%	13%	33%	3.11	40%	27%	34%
SCORE	**Optimism Score**	3.55	57%	3%	40%	3.45	45%	4%	51%

Table D:
(Cont.)
Person Factor Scale Items

		Coke				Norm			
		Ave-rage	**Agree**	**Dis-Agree**	**Not Sure**	**Ave-rage**	**Agree**	**Dis-Agree**	**Not Sure**
	Assertiveness								
ASR039	If the topic is important, I will continue talking with someone who disagrees with me.	3.62	65%	12%	24%	3.19	49%	28%	23%
ASR048	When criticized about my work, I am able to discuss it openly.	3.78	77%	7%	16%	3.83	76%	10%	14%
ASR059	I am able to resist the unfair demands of a supervisor.	2.93	26%	29%	45%	3.08	38%	29%	33%
ASR071	If the topic is important to me, I will express opinions that differ from the person I am talking to.	3.71	71%	12%	18%	3.41	57%	21%	22%
ASR083	When a meeting is needed, I will often be the one to request it.	2.90	22%	31%	47%	2.62	23%	48%	29%
ASR094	If an initial request for a meeting is turned down, I will request again at a later time	3.22	39%	18%	43%	3.33	49%	20%	32%
ASR107	I feel comfortable starting conversations with strangers.	3.55	61%	13%	26%	3.38	54%	23%	24%
ASR116	If I am interested, I will ask personal questions of others.	3.31	53%	22%	25%	3.17	47%	29%	24%
SCORE	**Assertiveness Score**	3.38	34%	3%	63%	3.34	31%	3%	65%
	Psychological Reactance								
rea032	When people tell me what to do, I want to do just the opposite.	1.75	5%	87%	8%	1.98	8%	79%	13%
rea037	Rules and regulations trigger a sense of resistance in me.	2.08	9%	75%	16%	2.53	22%	57%	22%
rea040	I enjoy contradicting others.	2.09	8%	75%	18%	2.02	10%	76%	15%
rea041	When I am told I can't do something, I react against it by thinking, "That's exactly what I'm going to do."	2.05	9%	75%	16%	2.12	12%	72%	16%
rea044	I don't like it when people give me advice.	2.00	3%	82%	14%	2.18	12%	72%	16%
rea047	It makes me angry when someone is presented to me as an example to follow.	2.72	19%	46%	36%	2.67	23%	48%	29%
rea050	I react negatively when someone tries to tell me what to do.	2.05	5%	80%	15%	2.24	11%	70%	19%
SCORE	**Reactance Score**	2.11	2%	81%	17%	2.25	4%	69%	27%

Appendix C:

Descriptive Statistics, Summary ANCOVA Tables, and Daily Percent Safe Scores

Table 1: Means and standard deviations for feedback types at baseline and intervention.

Level	Type	Intervention Mean (SD)	Baseline Mean (SD)
Specific	NoSCF	.70(.08)	.59(.04)
	SCF	.79(.07)	.71(.05)
	Total	.74(.09)	.65(.04)
Global	NoSCF	.66(.08)	.62(.06)
	SCF	.77(.07)	.67(.05)
	Total	.72(.10)	.64(.05)
Total	NoSCF	.68(.08)	.60(.05)
	SCF	.78(.07)	.69(.05)
	Total	.73(.09)	.65(.04)

Table 2: Summary of ANCOVA Table for the 2 (Feedback Level) X 2 (Feedback Type) Factorial Design

Source	df	MS	F	p
Corrected Model	4	2.91	4.90	.003
Intercept	1	8.87	14.93	.001
Covariate	1	9.44	1.60	.217
Feedback Level (Global, Specific)	1	1.16	1.95	.172
Feedback Type (SCF, NoSCF)	1	6.43	10.83	.002
Feedback Level * Type	1	1.27	.021	.885
Error	32	5.94		
Total	37			
Corrected Total	36			

Table 3: Daily Percent Safe Scores and Sample Size for Global/SCF

Day	Target	N	n	NonT	N	n
1	62%	105	9	75%	48	4
2	64%	25	4	73%	15	3
3	67%	84	2	70%	27	3
4	33%	6	8	100%	1	1
5						
6	88%	60	3	75%	12	2
7	62%	105	9	75%	48	4
8	66%	87	9	64%	42	4
9	52%	75	4	73%	40	2
10	33%	6	1	100%	1	1
11	78%	27	6	80%	15	2
12	60%	63	4	70%	20	1
13	79%	28	3	70%	20	1
14	84%	147	4	78%	32	1
15						
16	84%	38	2	100%	7	1
17	60%	45	8	69%	16	3
18	77%	126	7	76%	45	3
19	84%	38	3	100%	7	1
20	80%	55	9	71%	21	2
21	78%	59	5	74%	19	2
22	81%	197	8	62%	68	3
23	77%	13	1	77%	13	1
24	83%	124	7	85%	53	4
25	68%	22	6	73%	15	2
26	78%	18	6	90%	10	2
27	79%	47	6	68%	28	3
28	83%	23	2	89%	19	1
29						
30	79%	19	4	92%	12	1
31	79%	19	4	93%	15	2
32	77%	81	6	69%	29	3
33	56%	18	4	77%	13	2
34	81%	48	3	85%	13	2
35	100%	10	3	78%	18	2
36	100%	7	3	76%	17	2
37	89%	64	6	81%	21	3
38	56%	9	3	50%	8	2
39	54%	13	3	58%	12	2
40	86%	7	3	70%	20	2

Note: n represents the number of target behaviors (target = 1-9 and non-target = 1-4) from which percentages were drawn.

Table 4: Daily Percent Safe Scores and Sample Size for Global/noSCF

Day	Target	N	n	NonT	N	n
1	72%	141	7	53%	51	3
2	64%	76	7	71%	34	3
3	69%	109	7	50%	24	3
4	53%	38	6	45%	20	3
5						
6	100%	1	1			
7	72%	141	7	53%	51	3
8	68%	92	8	55%	33	3
9	48%	94	7	53%	40	3
10	53%	38	6	45%	20	3
11	52%	42	4	25%	20	2
12	65%	89	7	46%	35	3
13	57%	84	7	46%	35	3
14	91%	149	7	79%	28	2
15						
16	71%	84	7	36%	33	3
17	78%	63	8	26%	27	3
18	72%	175	7	66%	59	3
19	71%	84	7	36%	33	3
20	63%	79	4	66%	29	2
21	64%	115	7	33%	39	3
22	91%	223	6	64%	70	3
23	61%	93	6	70%	43	3
24	80%	157	7	78%	49	3
25	58%	86	7	34%	41	3
26	70%	86	7	53%	34	3
27	70%	86	7	53%	34	3
28	64%	44	7	52%	21	3
29						
30	58%	79	7	48%	33	3
31	58%	79	7	48%	33	3
32	70%	92	7	58%	40	3
33	57%	87	6	51%	39	3
34	60%	82	6	35%	31	2
35	77%	136	7	76%	71	4
36	76%	144	7	80%	46	3
37	73%	88	7	61%	38	3
38	58%	79	6	67%	36	3
39	58%	79	6	67%	36	3
40	76%	136	7	76%	71	4

Note: n represents the number of target behaviors (target = 1-9 and non-target = 1-4) from which percentages were drawn.

Table 5: Daily Percent Safe Scores and Sample Size for Specific/SCF

Day	Target	N	n	NonT	N	n
1	68%	92	8	72%	47	3
2	80%	10	3	80%	30	2
3	71%	101	7	69%	36	3
4	70%	112	7	69%	42	4
5						
6	73%	78	6	67%	21	3
7	86%	29	4	89%	19	2
8	100%	7	1	100%	5	1
9	64%	103	8	69%	48	3
10	70%	112	7	69%	42	4
11	87%	23	4	75%	20	2
12	70%	71	6	86%	21	4
13	78%	37	3	80%	10	1
14	86%	176	7	83%	54	4
15						
16	76%	90	6	84%	38	3
17	93%	14	4	82%	22	3
18	80%	175	7	85%	54	4
19	81%	26	6	94%	16	3
20						
21	82%	45	4	86%	14	2
22	85%	193	9	87%	53	4
23	70%	70	6	76%	17	3
24	84%	125	3	81%	37	1
25	83%	6	1	83%	6	1
26	93%	28	6	90%	10	3
27	74%	38	6	90%	20	3
28	74%	38	6	90%	20	3
29						
30	100%	10	1	80%	10	1
31	95%	19	3	100%	8	1
32	100%	2	1	100%	2	1
33	89%	19	7	100%	12	3
34						
35	100%	5	2	30%	30	1
36	76%	59	4	58%	33	2
37	100%	6	1	83%	6	1
38	46%	13	2	60%	5	1
39	77%	22	4	95%	38	3
40	89%	9	2	31%	29	2

Note: n represents the number of target behaviors (target = 1-9 and non-target = 1-4) from which percentages were drawn.

Table 6: Daily Percent Safe Scores and Sample Size for Specific/noSCF

Day	Target	N	n	NonT	N	n
1	70%	153	7	53%	58	3
2	49%	96	4	69%	58	3
3	63%	128	7	52%	31	3
4	59%	140	7	44%	41	3
5						
6	74%	27	5	50%	14	2
7	69%	91	8	74%	35	3
8	61%	31	4	53%	17	2
9	46%	170	7	74%	50	3
10	59%	140	7	44%	41	3
11	51%	69	4	28%	32	2
12	56%	41	4	33%	9	2
13	67%	27	5	57%	14	2
14	85%	146	8	81%	47	3
15						
16	66%	109	7	76%	68	3
17	72%	125	8	81%	84	4
18	78%	134	8	79%	80	4
19	54%	50	7	48%	23	4
20						
21	94%	78	6	71%	7	2
22	82%	175	7	68%	53	3
23	69%	81	6	55%	38	3
24	84%	92	4	88%	33	1
25	71%	77	4	45%	31	2
26	80%	69	7	57%	30	3
27	74%	91	6	54%	48	4
28	74%	91	6	54%	48	4
29						
30	100%	59	4	58%	52	3
31	76%	106	4	80%	46	2
32	72%	86	9	79%	42	4
33	75%	52	8	64%	22	3
34						
35	65%	100	6	68%	74	4
36	70%	10	2	50%	4	1
37	74%	70	4	59%	32	2
38	76%	129	7	53%	90	4
39	78%	89	7	73%	33	3
40	66%	100	6	71%	73	4

Note: n represents the number of target behaviors (target = 1-9 and non-target = 1-4) from which percentages.were.drawn.

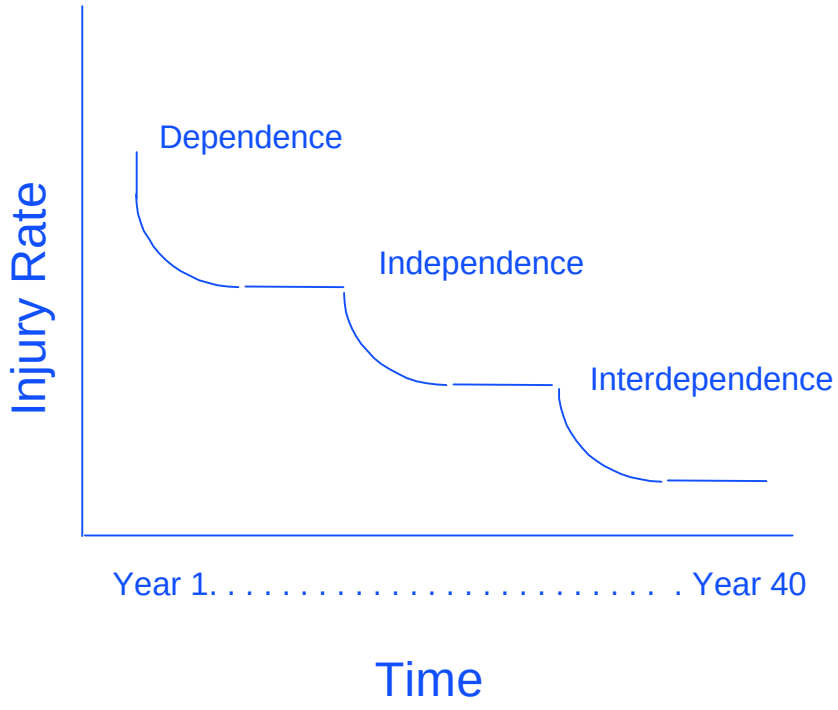
Appendix D:
Site-Specific Critical Behavior Checklist (CBC)

Primary Observer	Reliability Observer	Date	Shift	Location/Site	Page of

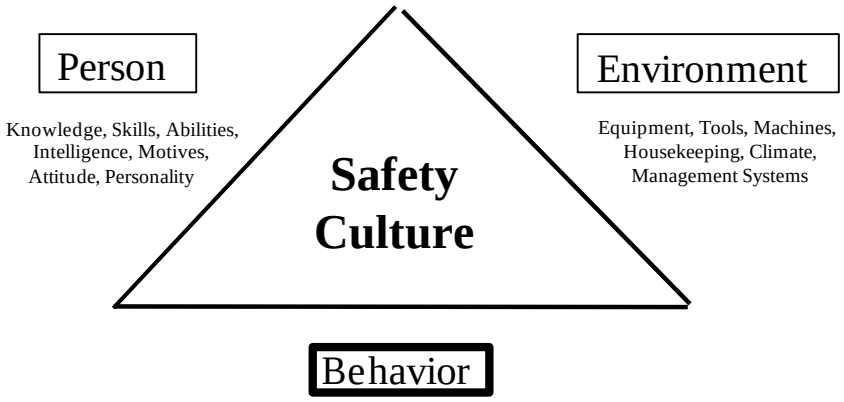
	PPE				Lifting				Fork Lift Driving				Cutting		General Safety			Repairs		
	Eyes	Ear Plugs	filler	Mainten.	Use Legs	Back Str8	Twist	Hold Close	Visual Scan	Back-wards	Honk	Slow	Cut Away	Use Gloves	Stack	Stairs	Con-veyor	Shut Down	Lock-Out	Mainten.
1	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
2	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
3	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
4	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
5	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
6	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
7	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
8	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
9	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
10	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
11	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
12	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
13	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
14	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
15	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
16	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
17	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
18	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
19	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
20	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
21	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
22	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
23	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
24	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
25	S A	S A			S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
Data Reliability																				
Tot																				
Agr																				
%																				
Comments																				
Data Summary																				
#S																				
Tot																				
%																				

Appendix E:
Training Materials

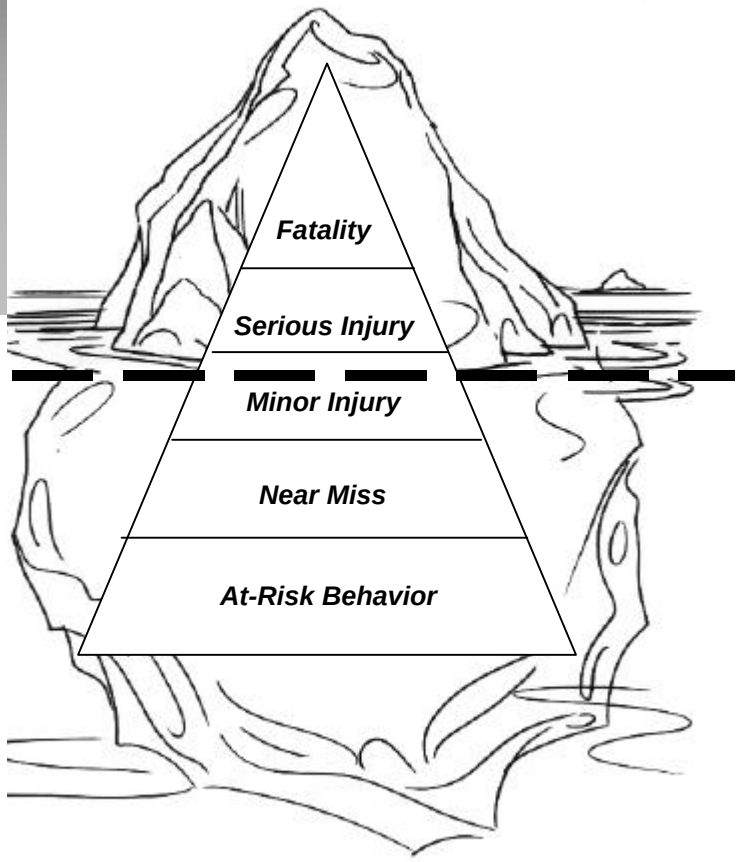
A Total Safety Culture Requires A Shift From Dependence to Interdependence.



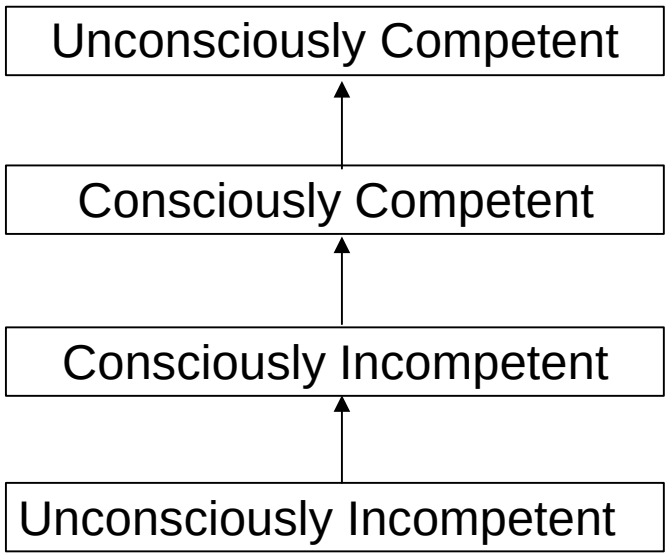
A Total Safety Culture Requires Continual Attention to Three Areas.



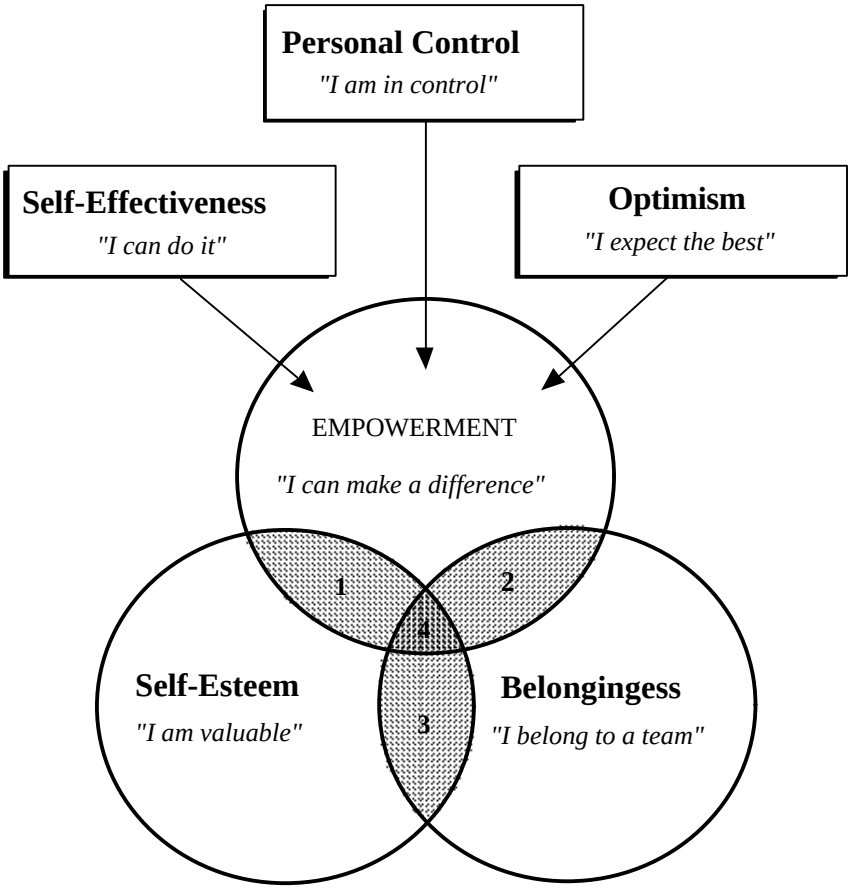
By Focusing on Behaviors, We Identify Areas for Improvement Before Injuries Occur.



At-Risk Behaviors Are Not Necessarily the Result of Deliberate Acts.

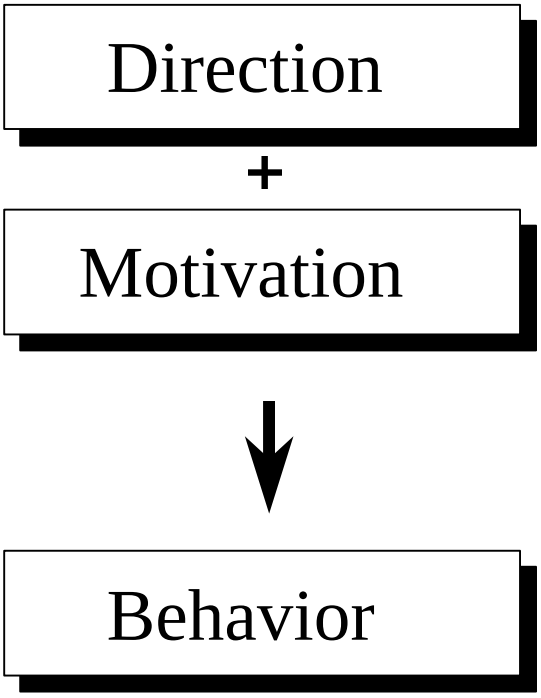


Person Factors Influence Our Willingness and Ability to Actively Care™.



1. I can make valuable differences.
2. We can make a difference.
3. I am a valuable team member.
4. We can make valuable differences.

Direction Is Not Sufficient To Change Behavior.



Beneficial Behavior Change Requires an Understanding of the ABC Model.

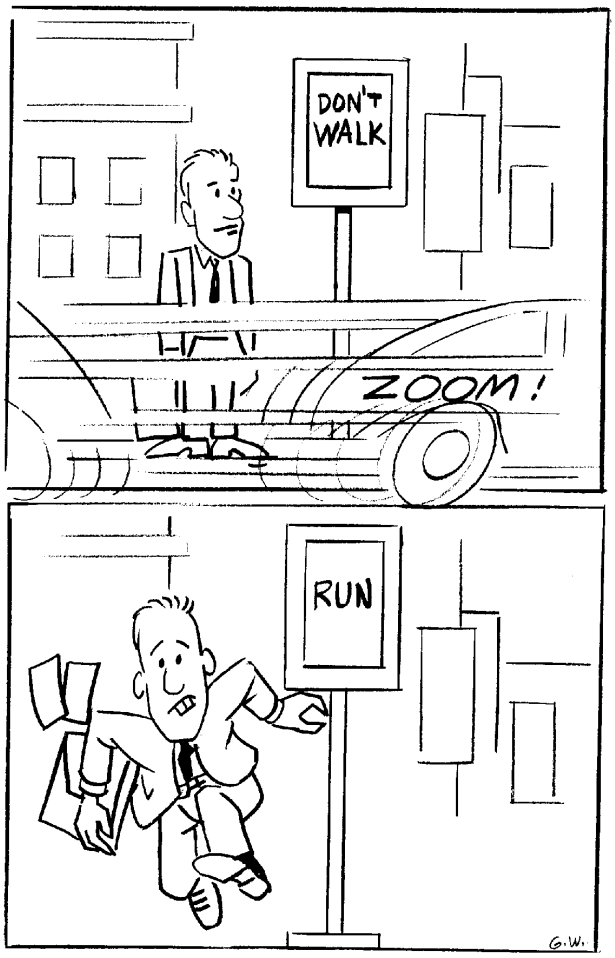
Activator ⇨ Behavior ⇨ Consequence

Activators:
- Safety Meetings
- Goal setting
- Rules and Regulations
- Pledge signing
- Policies and Procedures
- Incentives/Disincentives
- Directive Feedback
- Signs
- Training
- Modeling

Behaviors:
- Driving the speed limit
- Putting on PPE
- Locking out power
- Using equipment guards
- Giving a safety talk
- Cleaning up spills
- Coaching others about safe work practices

Consequences:
- Self-approval
- Reprimand
- Peer approval
- Penalty
- Feedback
- Injury
- Prize or trinket
- Inconvenience
- Thank-you
- Time savings

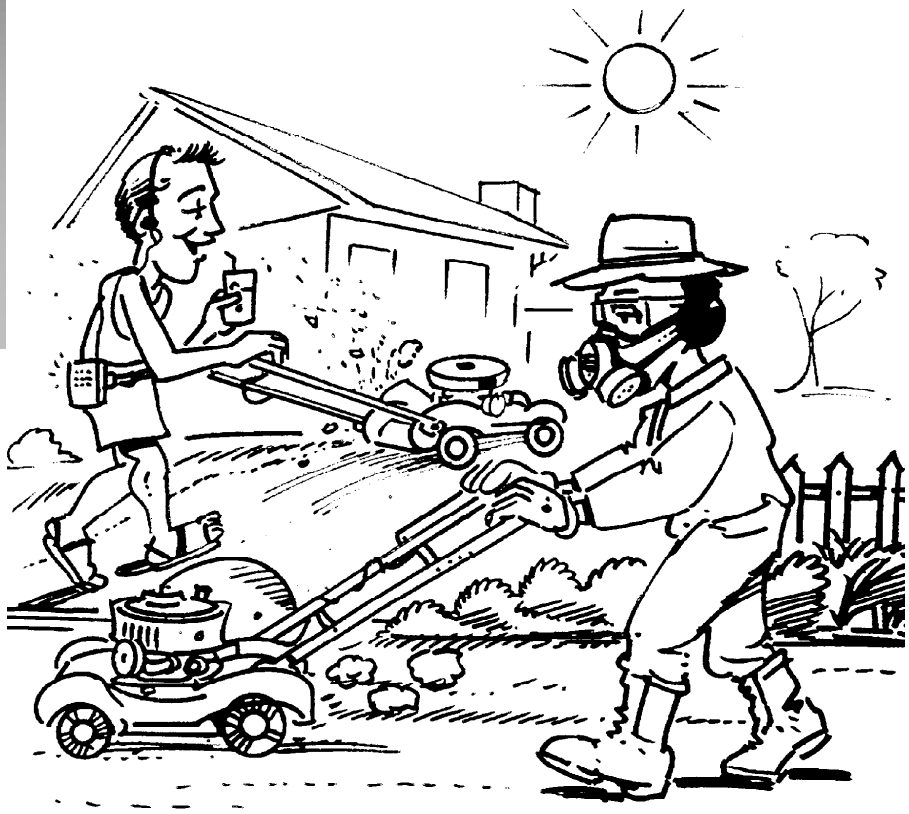
Compliance With Some Activators Is Supported by Natural Consequences.



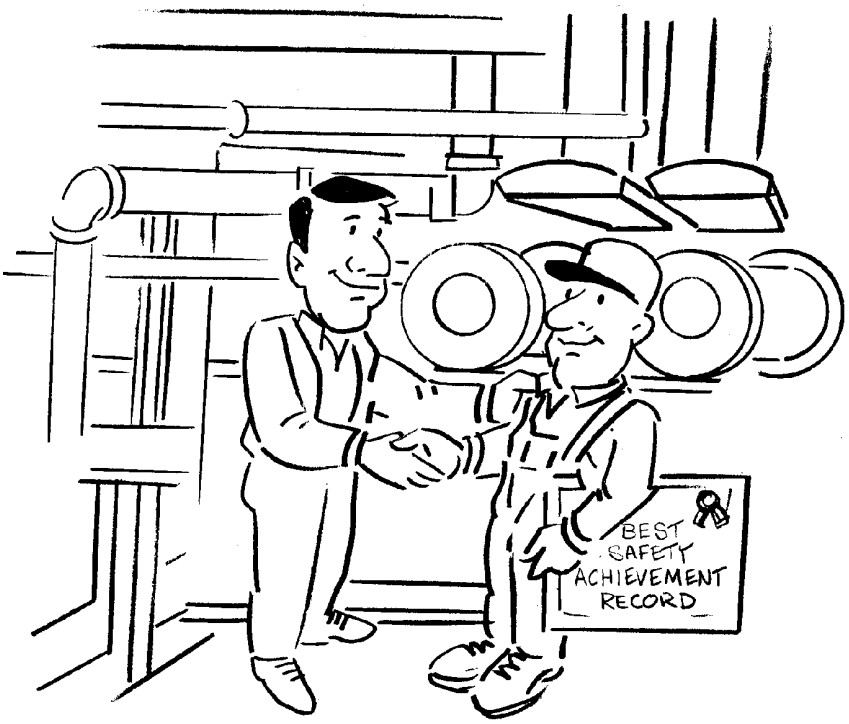
Compliance with Some Activators Is Not Supported With Consequences.

Some Tasks Have Natural Rewarding Consequences.

Some Tasks Don't Have Natural Rewarding Consequences.



Extra Consequences Are Needed for Some Tasks.



Safety is a Continuous Fight with Human Nature

- At-risk behaviors are often more comfortable, convenient, and time-efficient than safe behaviors.
- At-risk behaviors rarely result in the sort of consequences (e.g., an injury) sufficient to discourage their occurrence.
- Initial safety awareness and carefulness is often transient because of a natural learning process (i.e., drift).

Appendix F:
Data Collection Protocol

Coca-Cola Bottling Company Consolidated
Roanoke, Virginia

Data Collection Protocol

All visitors to Coca-Cola must:

1. Check in with Anthony Norwood, Kirk McConnor, or the receptionist at the front desk prior to beginning observations.
2. Complete a "hold harmless" waiver and have it signed by either Tony or Debbie.
3. Wear approved safety glasses with side shields while in the bottling area.
4. Be dressed in suitable attire (that means no open-toed shoes or tennis shoes, no shorts or skirts, no tank-tops or bare midriffs-- no bellybuttons, no cleavage).

In addition to these guidelines, please remember that we are visitors and are representing Dr. Geller, CABS, and Virginia Tech while at the plant. We are ambassadors for applied psychology — please act professionally and responsibly at all times.

Observation Procedure:

Using the Data Sheet
From the top:

1. **Primary** The primary observer's name (or initials).
2. **Reliability** The reliability observer's name (or initials).

Please check the box for your data sheet so that we will know if the data is primary or reliability.

3. **Date** Today's date (YYMMDD).
4. **Shift** The current production shift

(1=7:30am-3:30pm; 2=3:30pm-10:30pm)

5. **Page** The number of the current page.
6. **Location/Site** The location of the data collection.

In this case, the only location we have is Roanoke, Virginia

7. **PPE** **Personal Protective Equipment**. Circle "S" if the employee being observed is wearing proper protective gear, or circle "A" if the behavior observed is at-risk.. Put a check mark in the "filler" Mainten." column(s) if it applies to the observation.

Personal Protective Equipment is required by Coca-Cola for all employees at all times. Eye glasses, ear plugs, and hair nets are the most common types of PPE (see below) although hair nets are not being observed.

Eye Glasses: approved safety-glasses **with side shields** are the correct equipment for employees to wear. Prescription glasses are acceptable, provided they are equipped with side shields. Any glasses not equipped with side shields are not approved, and should count as at-risk ("A").

Ear Plugs: any foam, rubber, or ear-muff type ear protection is approved PPE. Please take your time when observing for ear plugs, as some are difficult to see and may be covered by a hat or hair net. The most common colors are green yellow, dark blue, and orange, with green, blue or orange lanyards.

If you cannot see that they <u>do not</u> have ear plugs, do not mark at-risk. Simply do not count them in the tally.

8. **LIFTING** For the sake of this protocol, lifting is that which is done by an employee, not a forklift or hand truck. A "safe lift" has many key parts, all of which in combination reduce the risk for serious injury to the employee. Each of the following categories is a component important to the safe lifting of any object an employee is trying to move.

Each row represents a single observation or opportunity for observation. Mark "S" for safe behavior, and "A" if the behavior is at-risk.

It is important not to make guesses regarding the safe or at-risk behaviors. If you miss an item, it's okay — just move on.

Use Legs: A correct lift begins with the legs. To avoid injury to the lower back, the legs should be bent at the knees, extending to a straight position at the top of the lift. If the load is above waist at all times – draw a line through "use legs"

Back Straight: Using the legs to lift is only effective if the back is kept straight. Bending at the waist and not at the lower back can

help prevent serious injury. Keeping the shoulders in line with the knees constitutes a safe use of the back.

Twist: Twisting the back at the waist can also be a major cause of injury or strain to the back. For safety, an object should be lifted or carried while the shoulders are squared with the hips (i.e. not causing a twisting motion in the back). If there is any twisting motion in the back, then the behavior should be coded as at-risk.

Hold Close: To avoid injury to the upper back, shoulders, or arms, objects should be lifted and carried as close to the **center** of the body as possible (within 3”). This also improves balance because the weight is closer to a person’s center of gravity.

9. **FORKLIFTS** Forklifts operating on the production floor need to follow certain guidelines regarding their safe driving. Mark "S" for safe behavior, and "A" if the behavior is at-risk.

Each row represents a single observation or opportunity for observation.

To observe forklift behaviors reliably, choose an intersection in the plant warehouse that will be the primary observation environment. The primary observer should designate the intersection and begin timing the observations.

Observe an intersection and collect data on all forklifts passing through that intersection for ten (10) minutes. If you get a low frequency of observations, choose another intersection or stay longer than ten minutes.

The primary observer should designate a forklift to observe (don't use designations like "the one driving backwards," or "the one that just honked"), and both the primary and reliability observers should record all relevant data.

Be sure that both observers are on the same observation number!

Visual Scan: While the fork truck is passing through the intersection, the driver should look left and right for any cross traffic. Often, this occurs very quickly, so it may be hard to record. If you see the driver turn his or her head to look to the sides, including looking at mirrors at intersections, record the behavior as safe. If no head motion is visible, it should be considered at-risk.

Drive Backward: Due to the design of the forklifts and the speeds at which they travel in the Coca Cola plant, it is considered by management to be at-risk to drive a forklift in the forward direction when carrying a load. <u>Only record an observation for "backwards" when the forklift has a load</u>. Otherwise, mark through it, and do not count the observation in the tally. You can, however, make observations for the other forklift behaviors (i.e. visual scan, honk, and slow) when a load is not being transported.

Honk at Crossings: Before entering an intersection, the forklift operators are supposed to sound the vehicle's horn to warn pedestrians and other drivers. Any time a forklift enters an intersection and does not sound its horn is at-risk.

Slow at Crossing: Drivers are supposed to pass through intersections at a slower pace than they use for traveling down the aisles. If the forklift is moving faster than a person can *quickly* walk (this is relatively subjective, but almost all adults can walk about 3-4 mph), that behavior should be coded as at-risk.

10. **GENERAL SAFETY**

These items are general safety issues that are prevalent throughout the plant. Record these behaviors in their appropriate spaces.

Stacking Pallets: For wooden pallets, there should be no more than 12" of overhang along the entire height of the stack to be considered safe. For stacked boxes, there should be no more than 6" of overhang. You may record an observation for either a whole stack of pallets, or for each individual pallet which is stacked.

Handrail/Stairs: Safe use of handrails on stairwells is defined for our purposes as contact between the person and the handrail at any point along the length of the handrail. If, however, the employee is using the handrail, but is "skipping" stairs (i.e., taking them two or three at a time), then the behavior should be recorded as at-risk.

Conveyor Safety: To reach some areas on the production lines employees pass under the conveyor belts that are moving the bottles and cans through the production line. If any part of an employee's clothing or their body (i.e., their head or hands) comes into contact with the conveyor belt or its metal housing, the behavior should be coded as at-risk.

11. **REPAIRS**

ese three columns are to be used when recording a single observation.

enance" column is to be checked when the person being observed is a

Coca-Cola maintenance worker.

Shut Down: If any work is being done on machinery, the least an individual can do is shut down the power to eliminate the risk of getting clothing or a body part caught in the moving parts. If an employee touches near moving parts of a machine, it is considered at-risk. *Note: This is only part of the Lock-Out process, we just want to know how much of the process the employees are actually completing.

Lock-Out/Tag-Out: Machinery must be shut down and locked-out before any sort of maintenance is performed. The employee is to shut the machine down by pushing a button or turning a lever, and then insert a lock or tag through it (the button or lever) so that the machine cannot be restarted. LOOK FOR LOCKS AND PLASTIC TAGS! If you observe this, mark it as "S". Otherwise, if work or a "quick fix" is being done without properly locking the machine out, mark this behavior as "A".

12. **COMMENTS NOTES/MISC** The comments and notes sections are provided for additional information that may be useful to look at (i.e., if an injury is witnessed, if there are environmental problems such as spills and messes, if employees have suggestions).

TOTALS:

The primary observer is responsible for calculating the reliability totals and the summary totals for the observation session.

For the reliability totals, record the total number of concurrent observations (i.e., both the primary and reliability observers recorded behaviors on the same observation number) for each

$$\%agreement = \frac{Agr}{Tot}$$

cell in the row marked "Tot." Record the total number of observations that the primary and reliability observers agreed upon (i.e., both primary and reliability observers recorded an "S") in Agr." Calculate the % agreement between both observers using the following formula:

Record this value in the row marked "%".

***It is the responsibility of the primary observer to discuss % agreement outcomes with the reliability observer after each data collection session.**

For the Data Summary, record the total number of safe observations for that behavior category for all observations made (all primary data sheets from that session) in the row marked "#S." Then record the total number of observations (safe and at-risk) made for that behavior (from all primary sheets) in the row marked "Tot."

Note: These values have nothing to do with reliability. Record these values from the PRIMARY OBSERVER'S DATA ONLY.

Then calculate the % safe for the behavior for the entire session using the following formula:

$$\%safe = \frac{\#S}{Tot}$$

Record this value in the row marked "%".

After calculating the reliability and summary sections on the data sheet, the primary observer is responsible for entering this information into the **reliability and summary logs**. These are located in the maroon binder marked "Project Logbook", which is on the shelf above the computers Maggie and Lisa. These are fairly self-explanatory, but if you have any questions, please ask a fellow lab-mate. **Note**: When an observer has collected more than one page of data, please use the **sums** of all of the sheets when entering the data into the logs and data base.

Also (yes, there's more ☺), there is a **second page to the summary logs** which includes % Safe Lifts, and % Safe Forklift Driving. In these sections, please count the number of observations in which each behavior has been coded as safe. For example, a safe forklift observation would have "safe" for visual scan, backwards, honk, and slow. If a behavior is not observed (i.e. a line has been drawn through one of the behaviors), then it is still considered safe if the other behaviors in that observation have been coded as safe. Then count the total number of observations and write this number in the "total" column.

An example of summary calculations is provided on the following page.

Data Entry: There are two types of data entry for this project. One type is summary data, which is to be entered into the "CBC" file. Also, data for each observation must be entered into the "Coke Database" file. Please receive training from someone before attempting to enter data.

Orange Slips: Please attach an orange tracking slip to the data sheet when you return from collecting data, and then place it in the "to be entered" drawer.

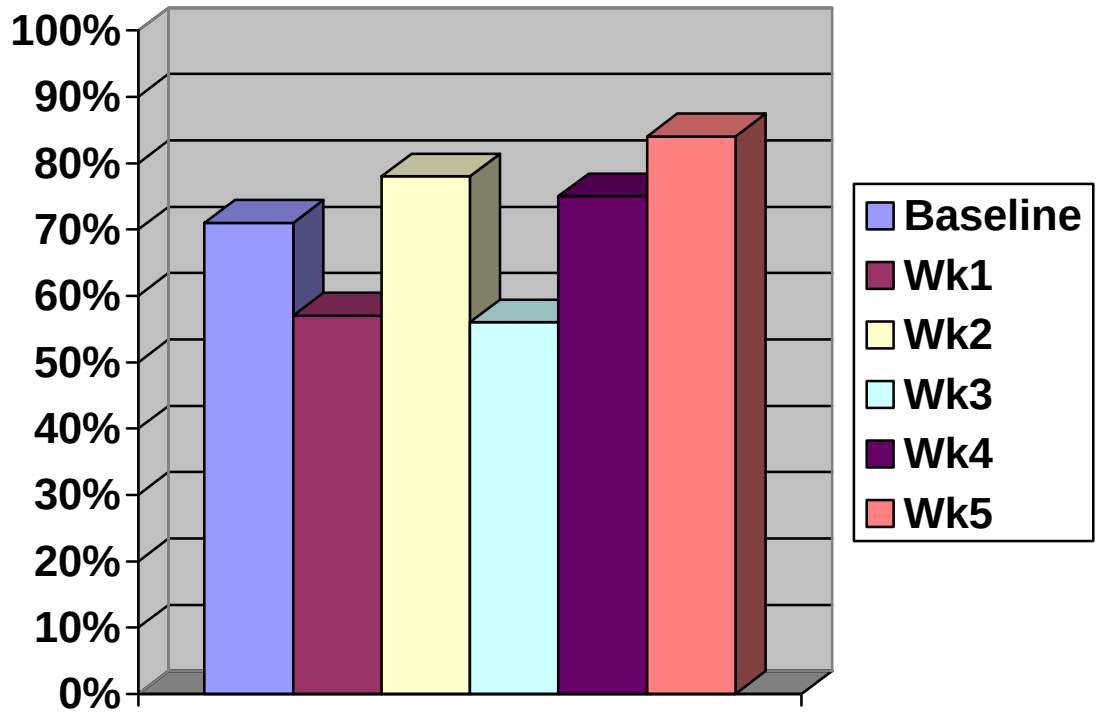
Thank you!

Appendix G:
Final Feedback Graphs for Employees

The percent safe scores for **Line 4, Shift 1** are calculated from a subset of these behaviors.

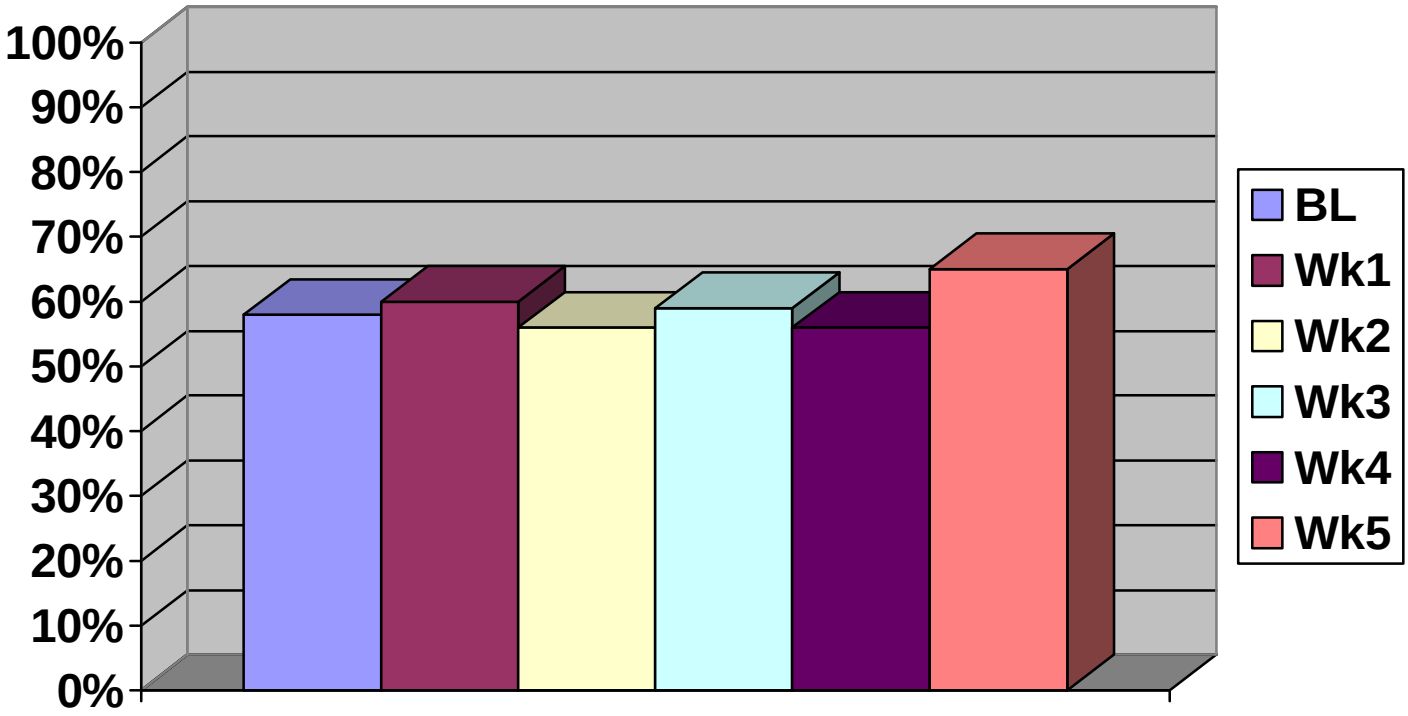
PPE
Wearing Safety Glasses
Wearing Ear Protection
Lifting
Bend Knees
Back Straight
Don't Twist
Hold Load Close

Forktruck Driving
Visual Focus
Backward with Load
Slow at Intersection
Honk at Intersection
General Safety
Stacking
Stairs
Conveyors



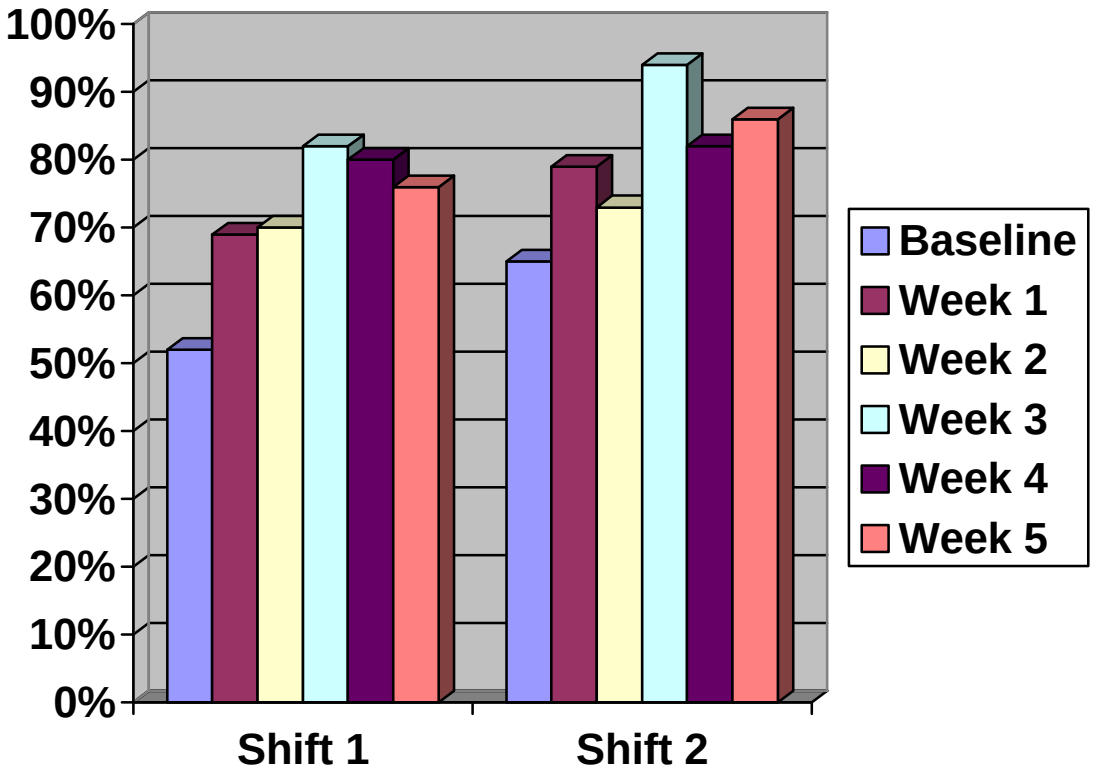
The percent safe scores for **Warehouse, Shift 1** are calculated from a subset of these behaviors.

PPE	Forktruck Driving
Wearing Safety Glasses	Visual Focus
Wearing Ear Protection	Backward with Load
Lifting	Slow at Intersection
Bend Knees	Honk at Intersection
Back Straight	General Safety
Don't Twist	Stacking
Hold Load Close	Stairs
	Conveyors



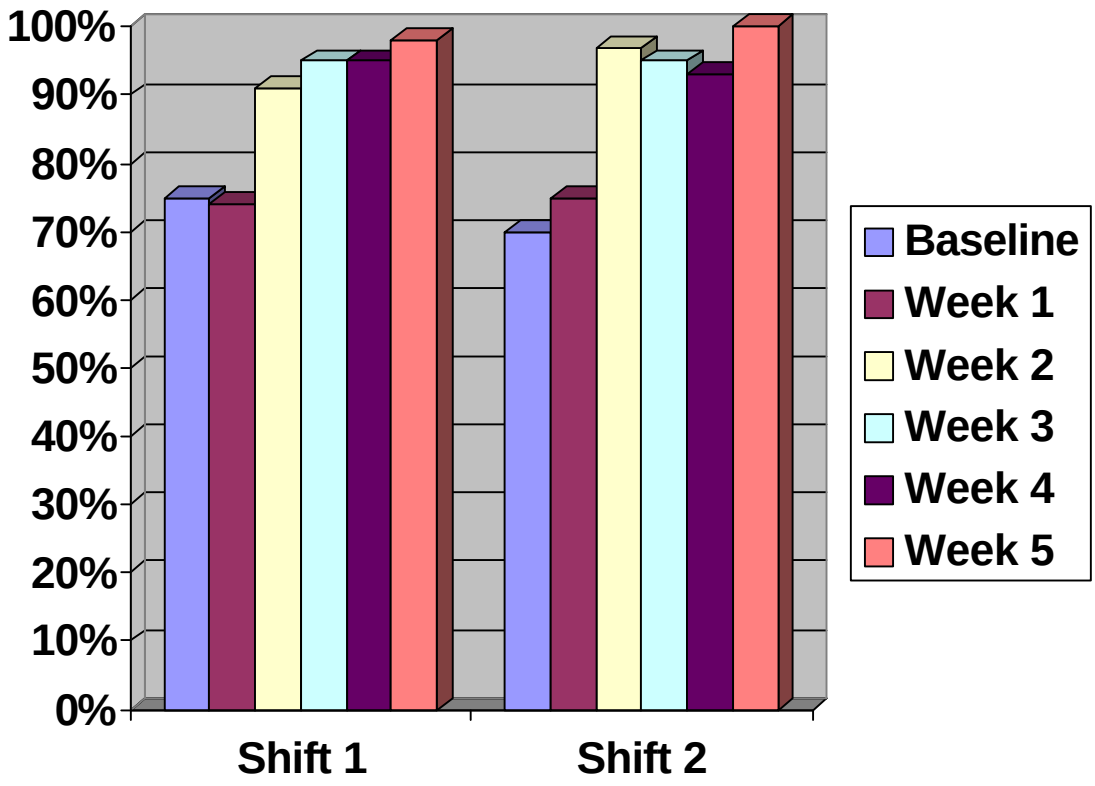
The percent safe scores for Lines 1 & 2 are calculated from a subset of these behaviors.

PPE	Forktruck Driving
Wearing Safety Glasses	Visual Focus
Wearing Ear Protection	Backward with Load
Lifting	Slow at Intersection
Bend Knees	Honk at Intersection
Back Straight	General Safety
Don't Twist	Stacking
Hold Load Close	Stairs
	Conveyors



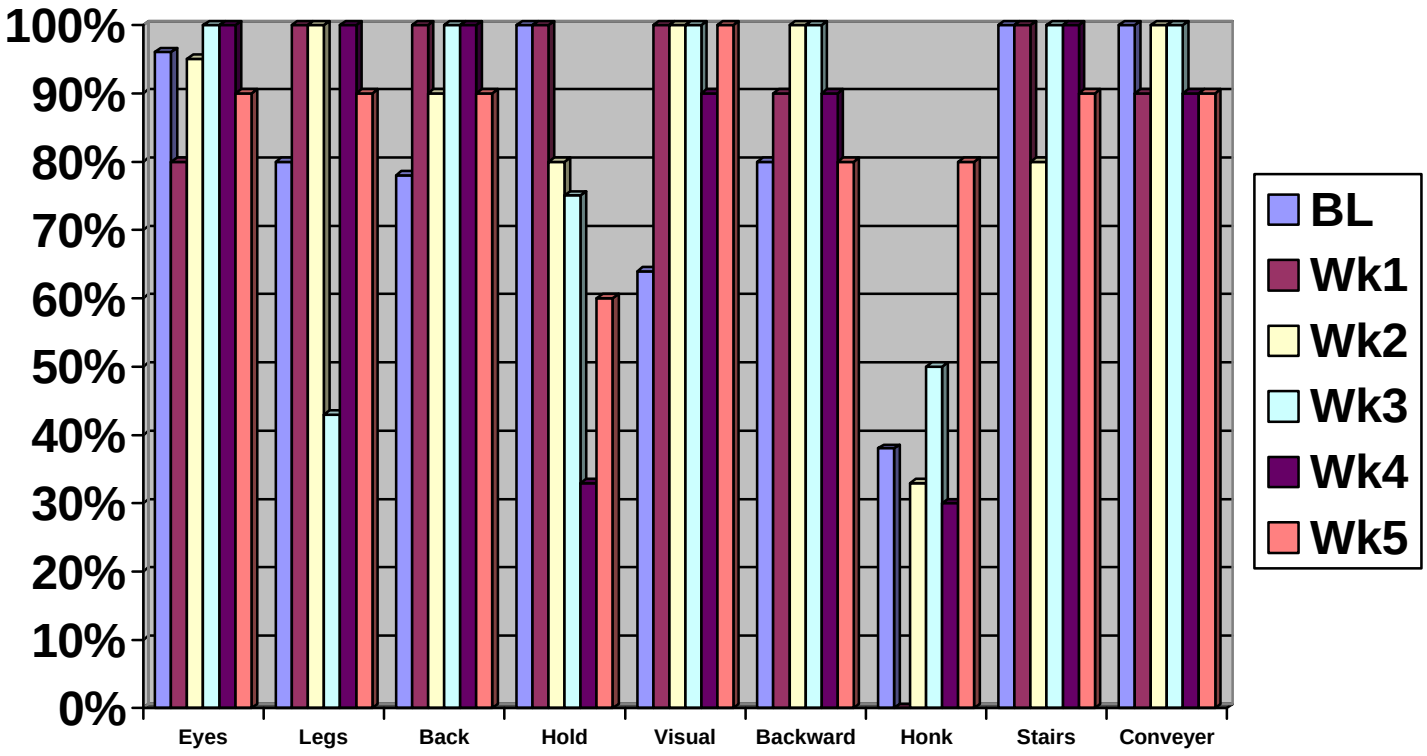
The percent safe scores for Line 3 are calculated from a subset of these behaviors.

PPE	Forktruck Driving
Wearing Safety Glasses	Visual Focus
Wearing Ear Protection	Backward with Load
Lifting	Slow at Intersection
Bend Knees	Honk at Intersection
Back Straight	General Safety
Don't Twist	Stacking
Hold Load Close	Stairs
	Conveyors



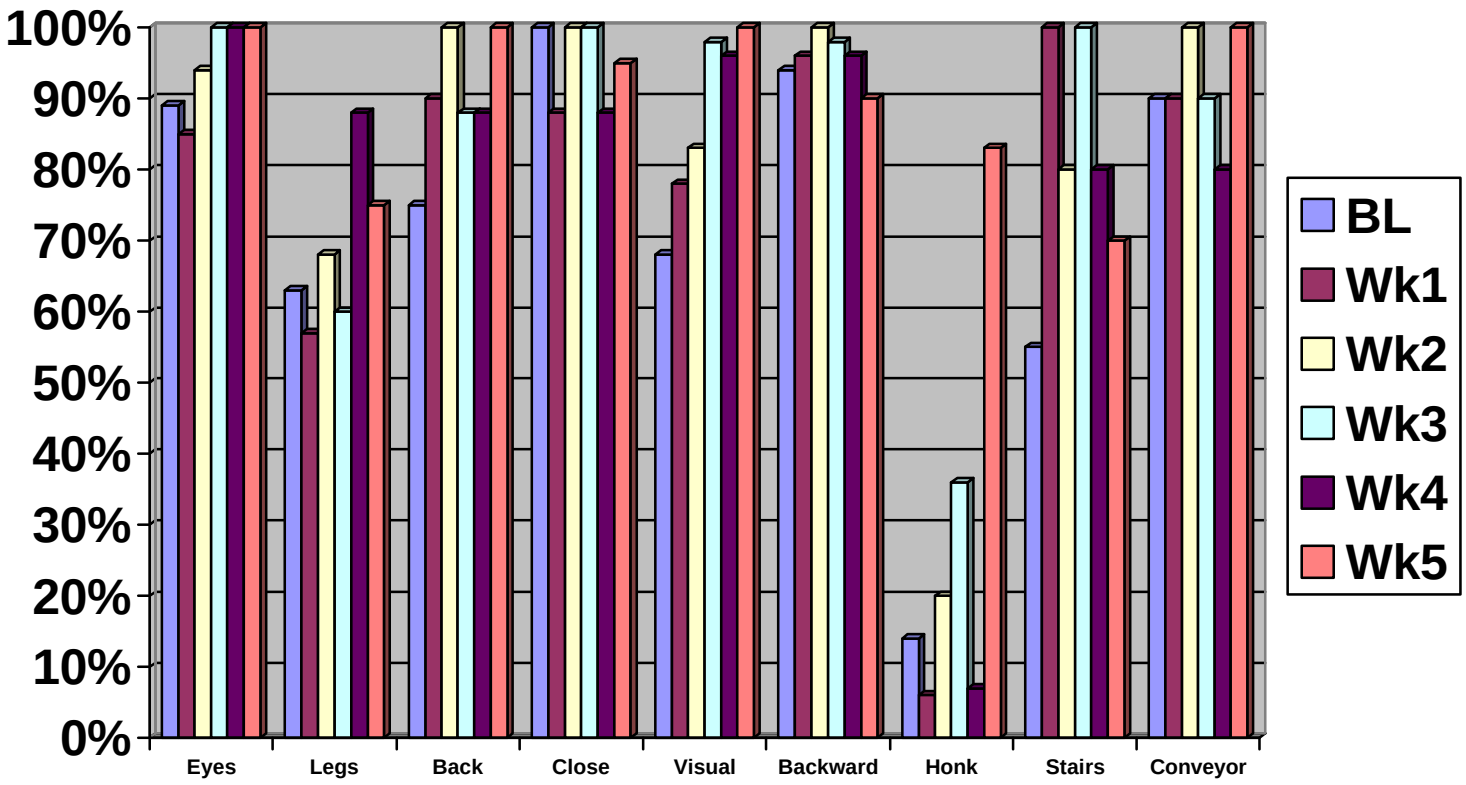
The percent safe scores for Line 4, Shift 2 are calculated from a subset of these behaviors.

PPE	Forktruck Driving
Wearing Safety Glasses	Visual Focus
Wearing Ear Protection	Backward with Load
Lifting	Slow at Intersection
Bend Knees	Honk at Intersection
Back Straight	General Safety
Don't Twist	Stacking
Hold Load Close	Stairs
	Conveyors



The percent safe scores for Warehouse, Shift 2 are calculated from a subset of these behaviors.

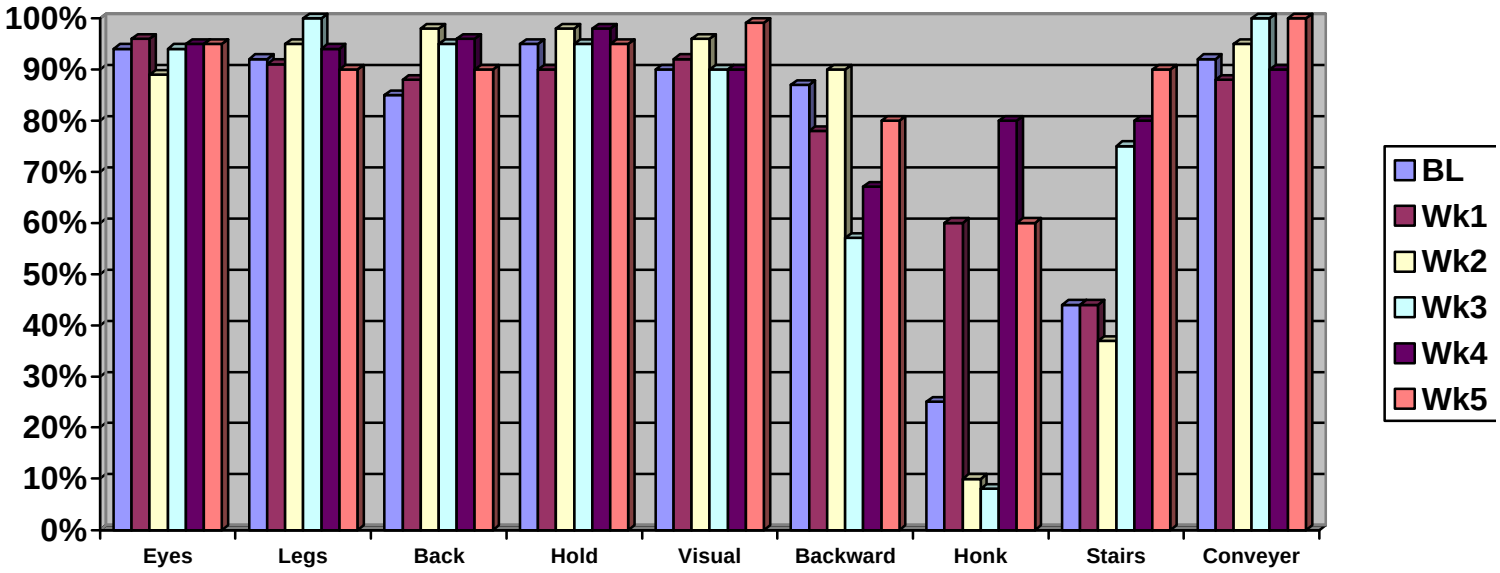
PPE	Forktruck Driving
Wearing Safety Glasses	Visual Focus
Wearing Ear Protection	Backward with Load
Lifting	Slow at Intersection
Bend Knees	Honk at Intersection
Back Straight	General Safety
Don't Twist	Stacking
Hold Load Close	Stairs
	Conveyors



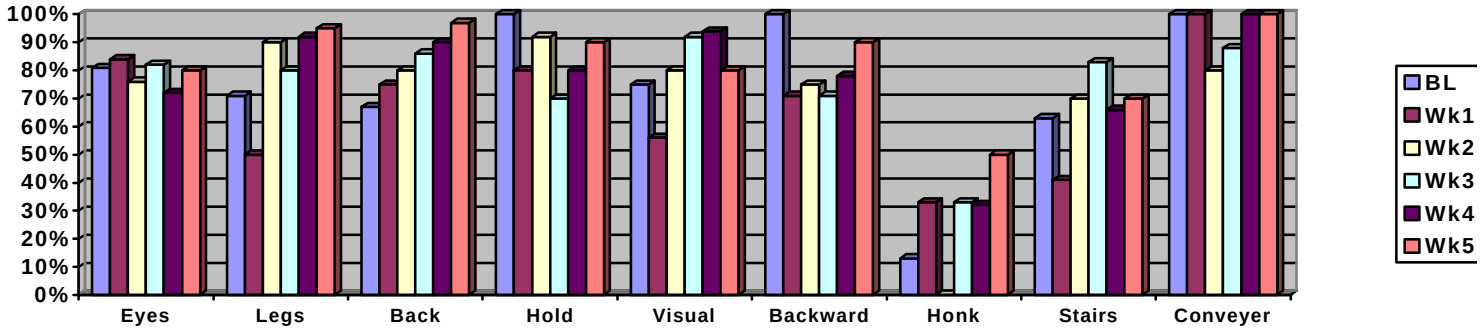
The percent safe scores for Lines 1 & 2 are calculated from a subset of these behaviors.

PPE	Forktruck Driving
Wearing Safety Glasses	Visual Focus
Wearing Ear Protection	Backward with Load
Lifting	Slow at Intersection
Bend Knees	Honk at Intersection
Back Straight	General Safety
Don't Twist	Stacking
Hold Load Close	Stairs
	Conveyors

Shift 2



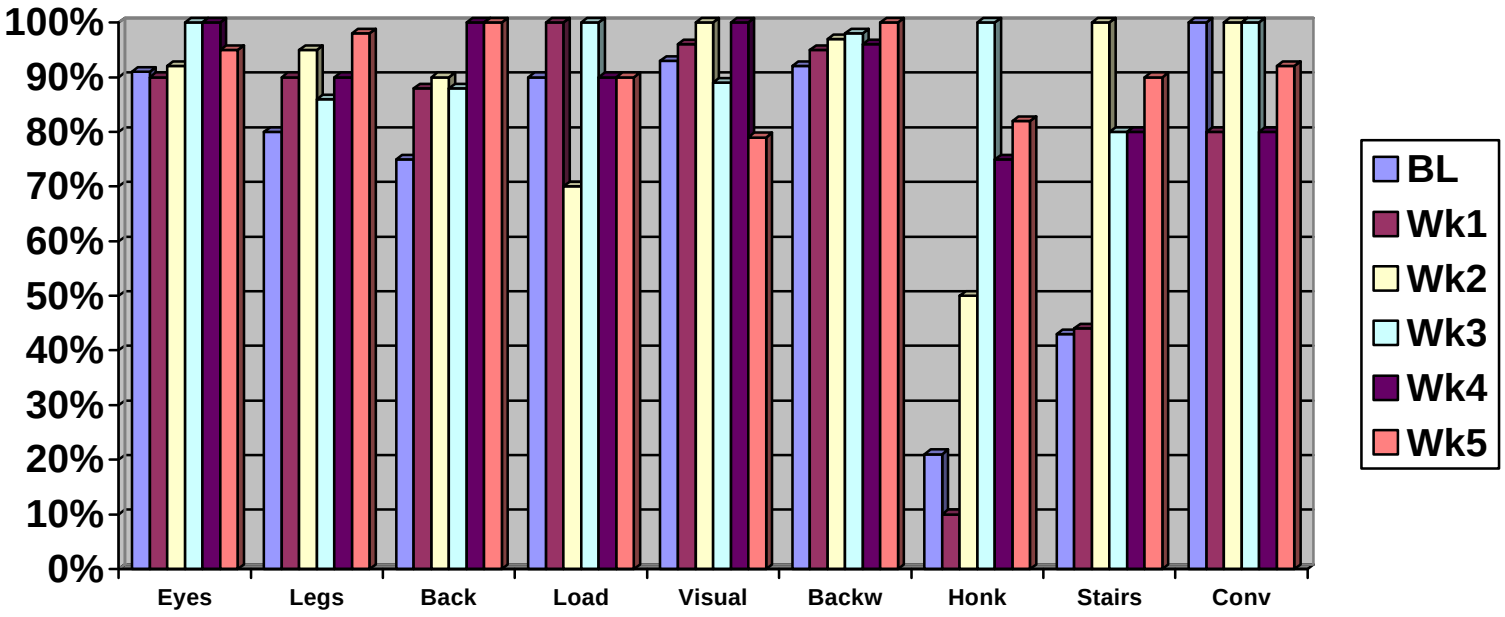
Shift 1



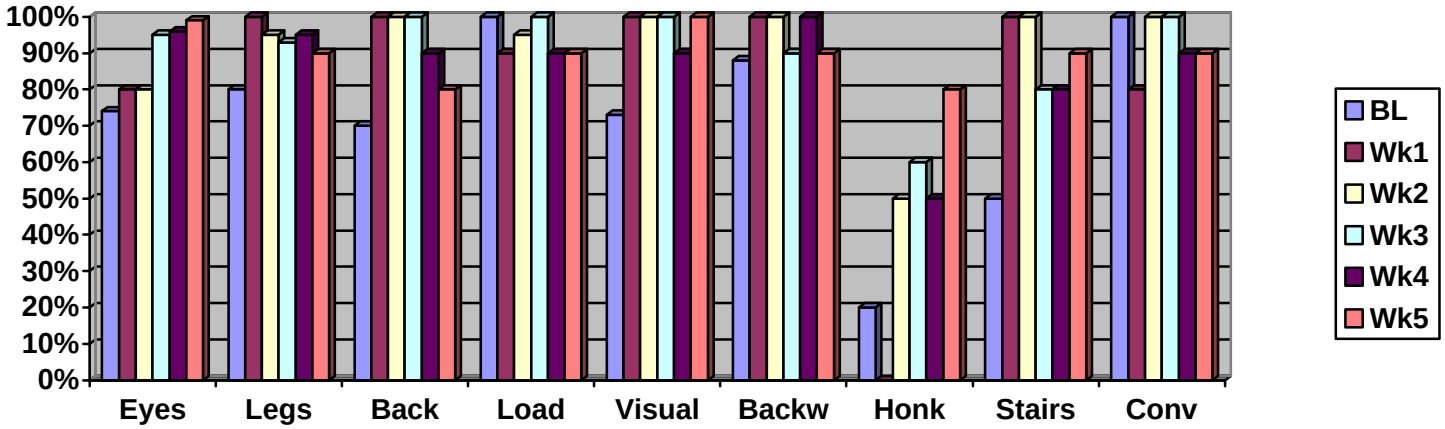
The percent safe scores for Line 3, Shift 2 are calculated from a subset of these behaviors.

PPE	Forktruck Driving
Wearing Safety Glasses	Visual Focus
Wearing Ear Protection	Backward with Load
Lifting	Slow at Intersection
Bend Knees	Honk at Intersection
Back Straight	General Safety
Don't Twist	Stacking
Hold Load Close	Stairs
	Conveyors

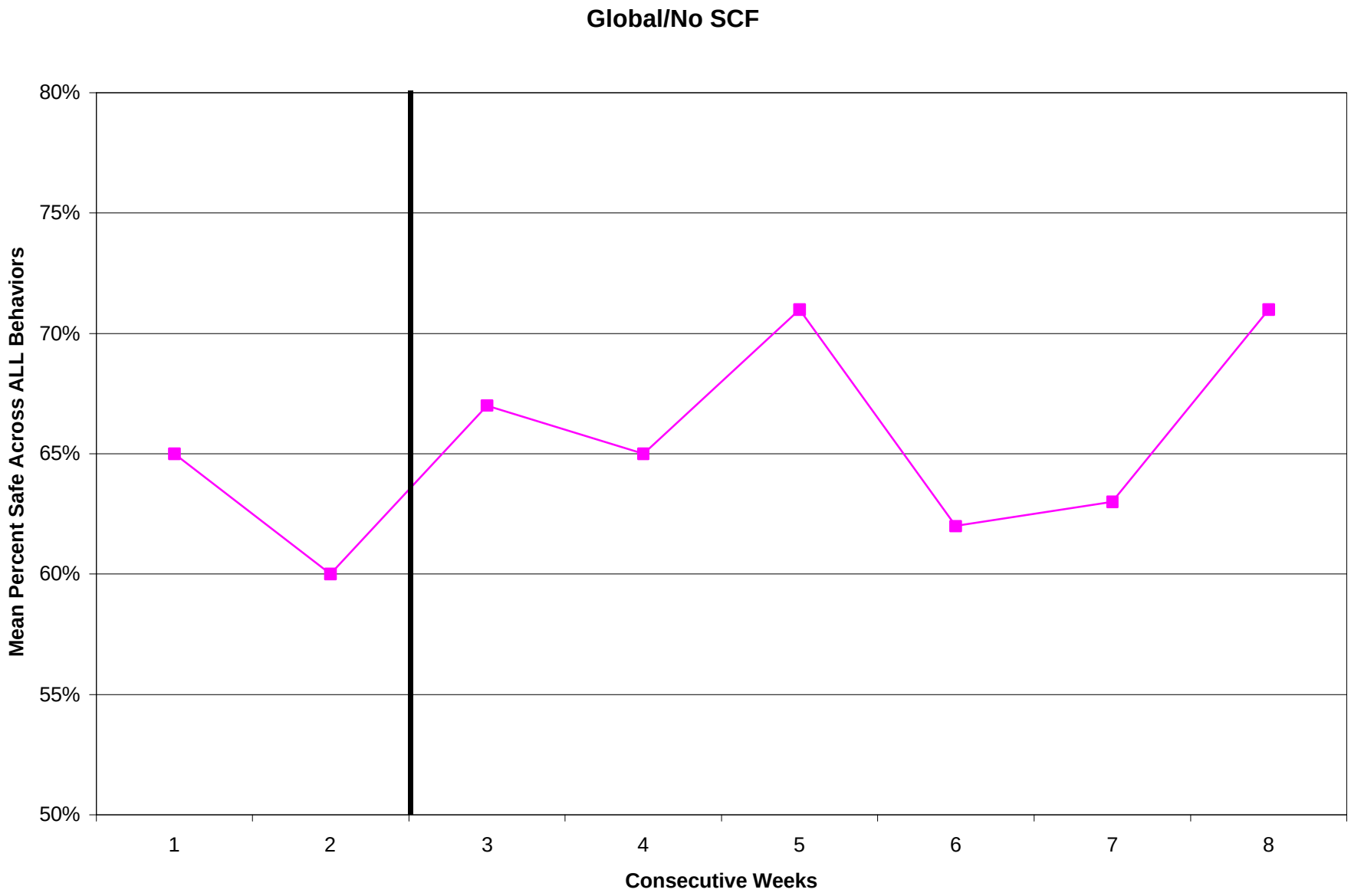
Shift 2

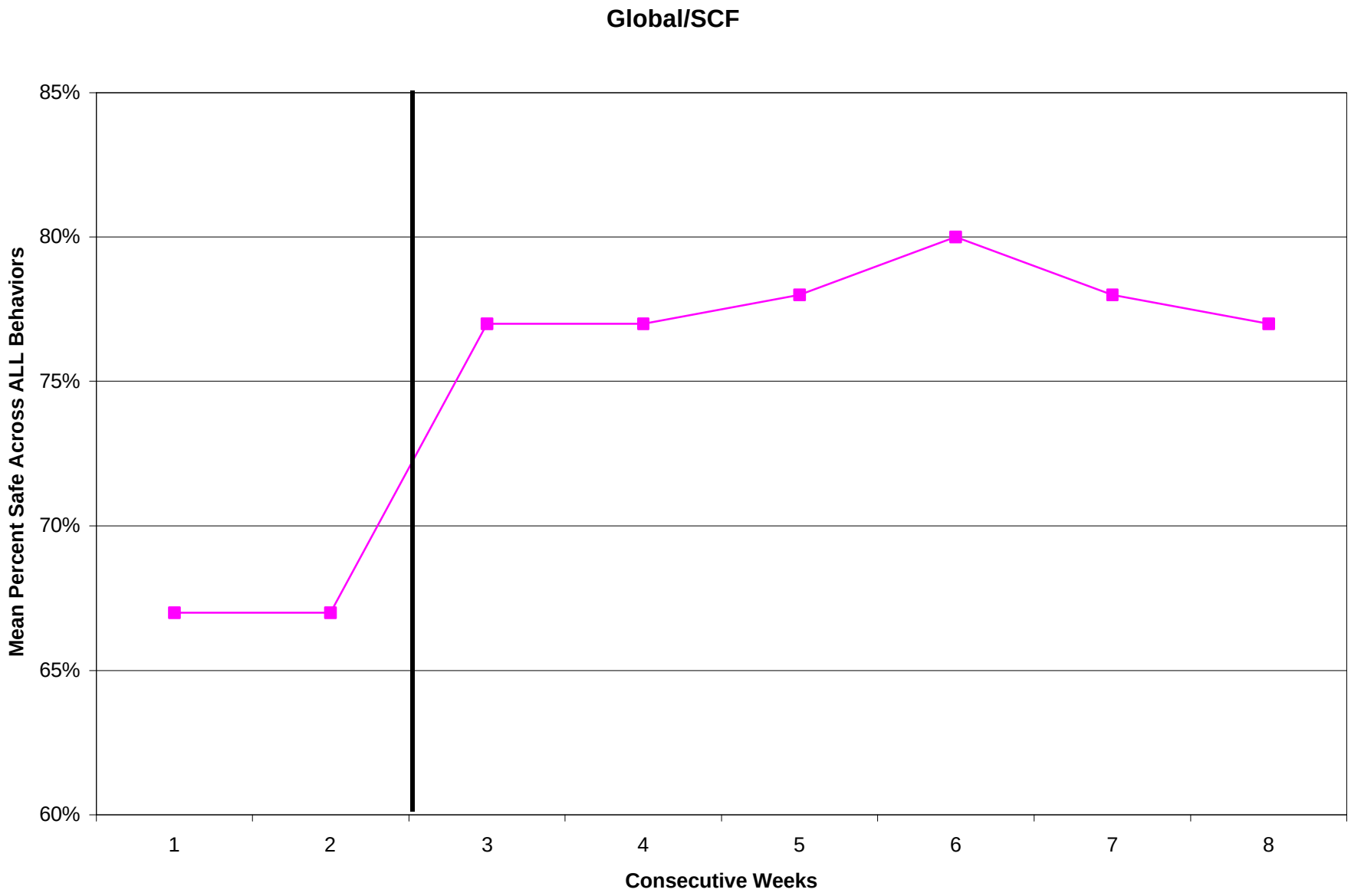


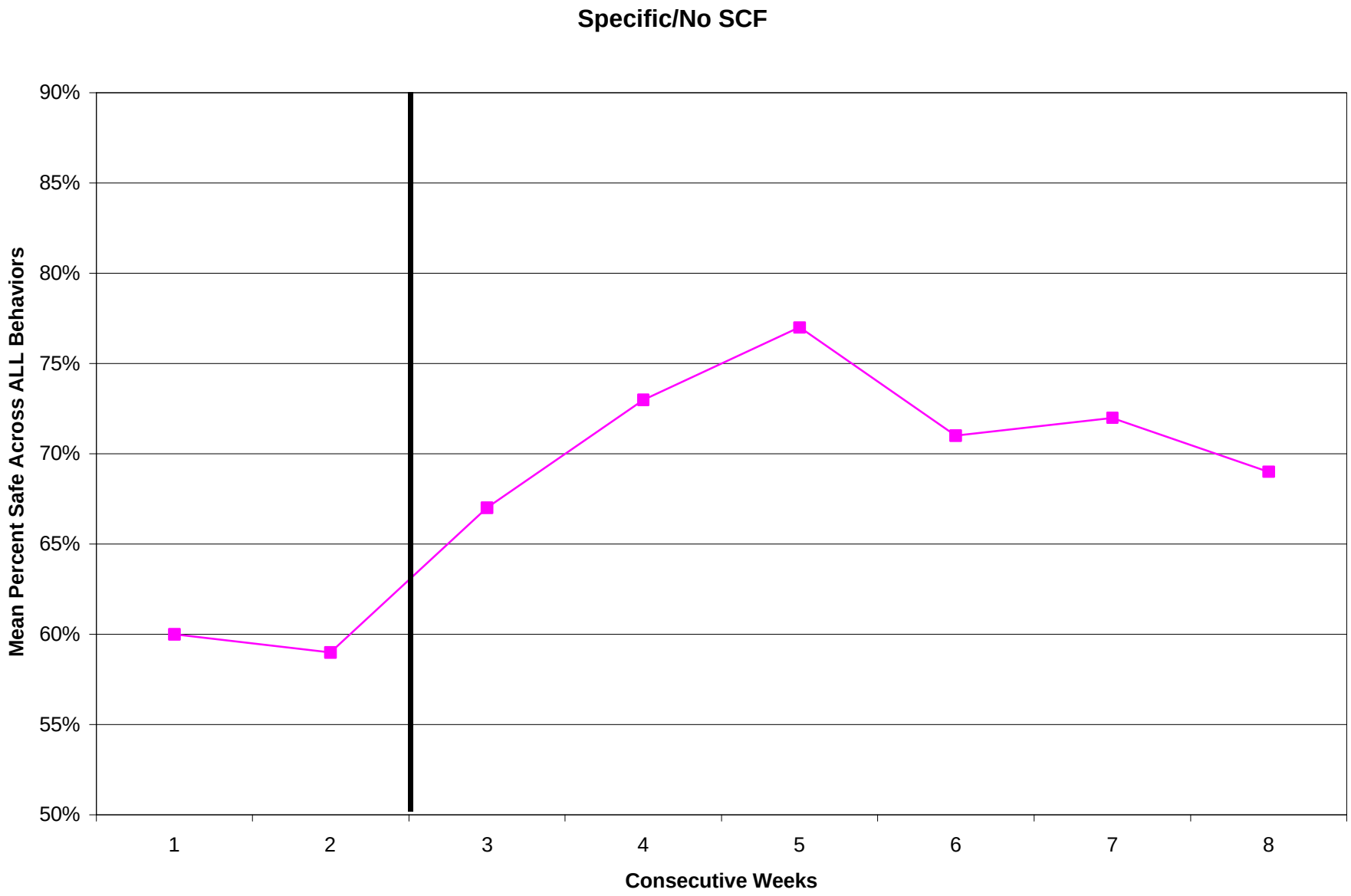
Shift 1

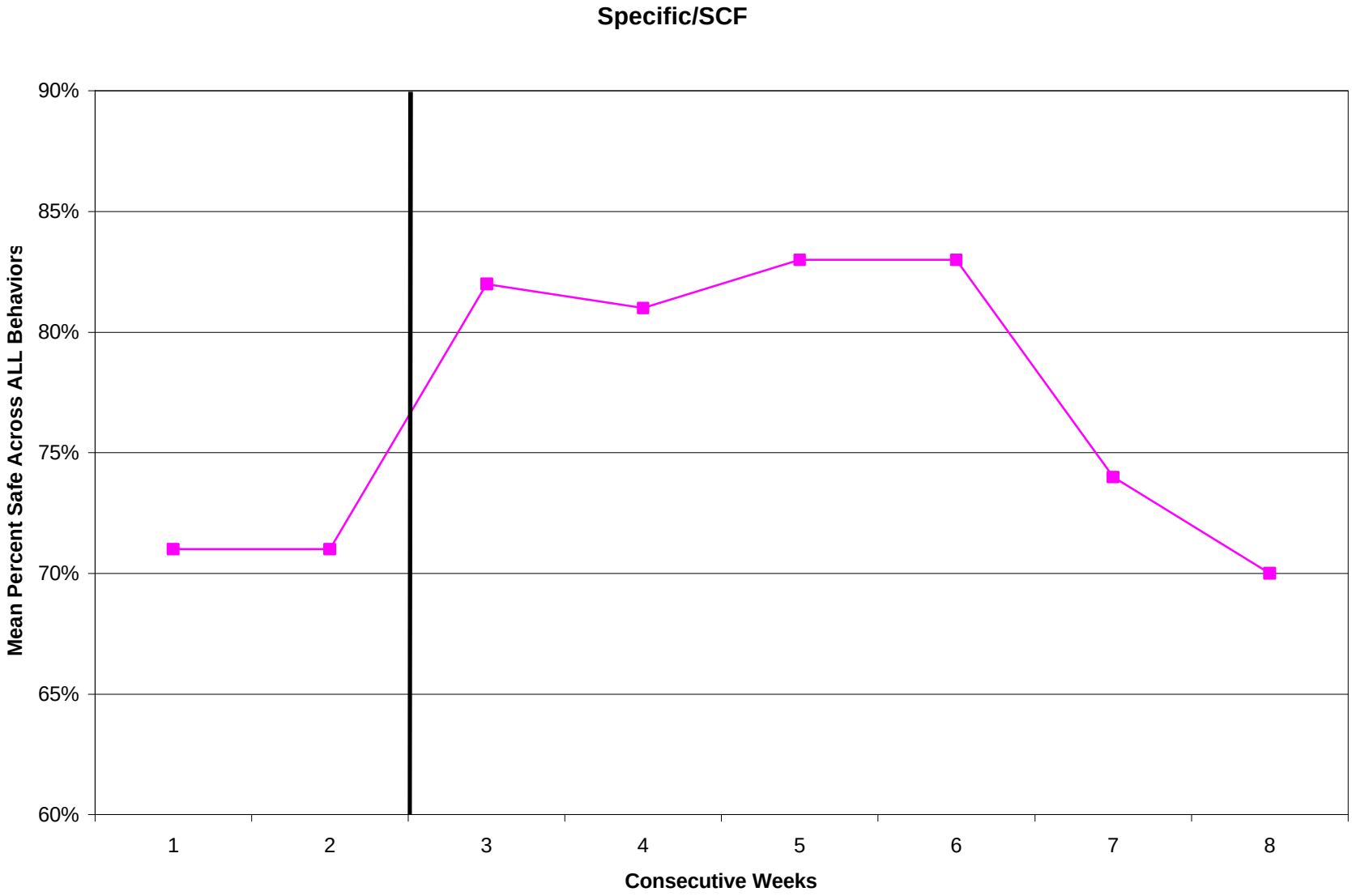


Appendix H:
Graph of Weekly Percent Safe Scores by Feedback Conditions

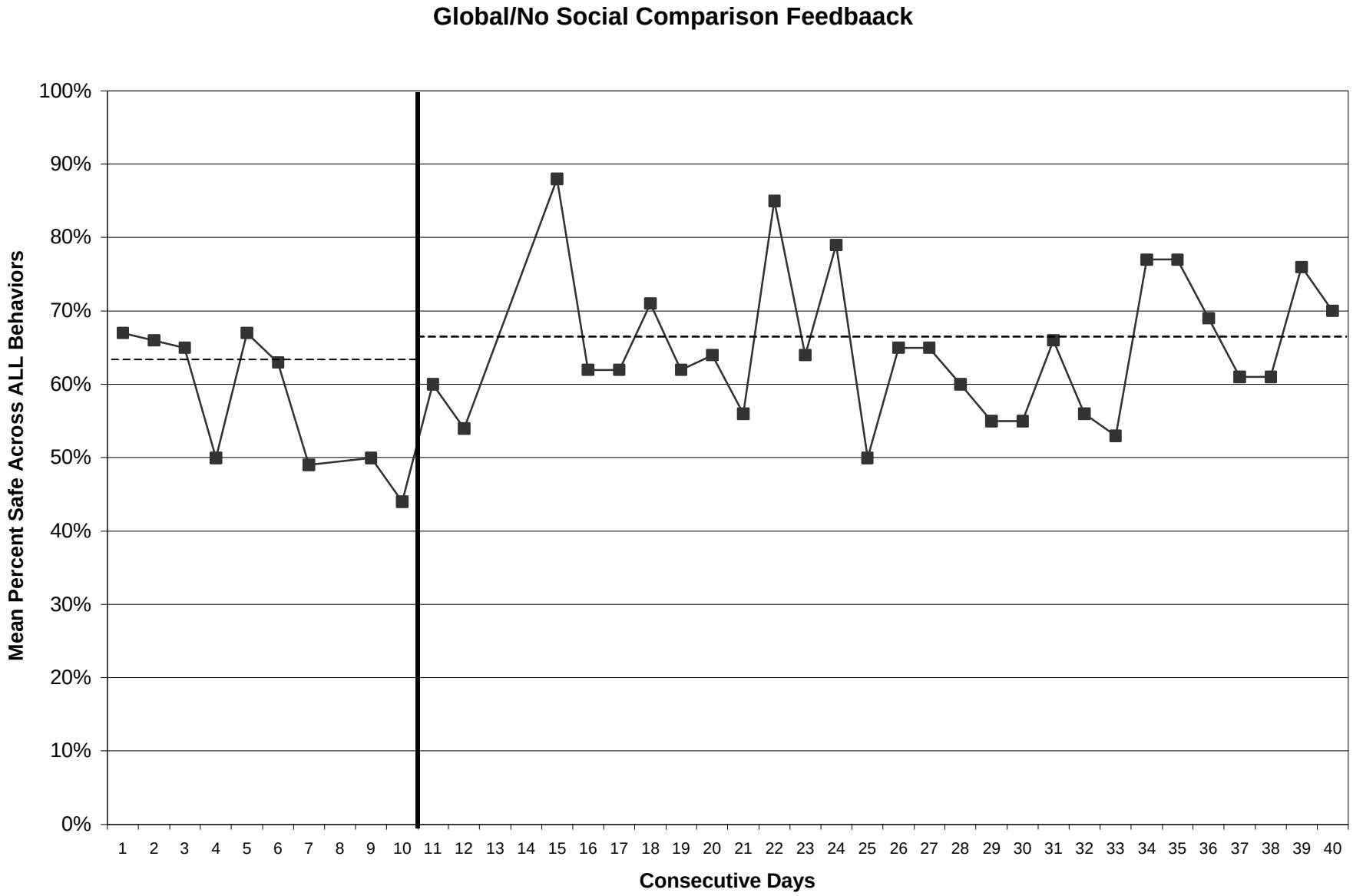

Global/No SCF
80%
75%
70%
65%
60%
55%
50%
Mean Percent Safe Across ALL Behaviors
1
2
3
4
5
6
7
8
Consecutive Weeks

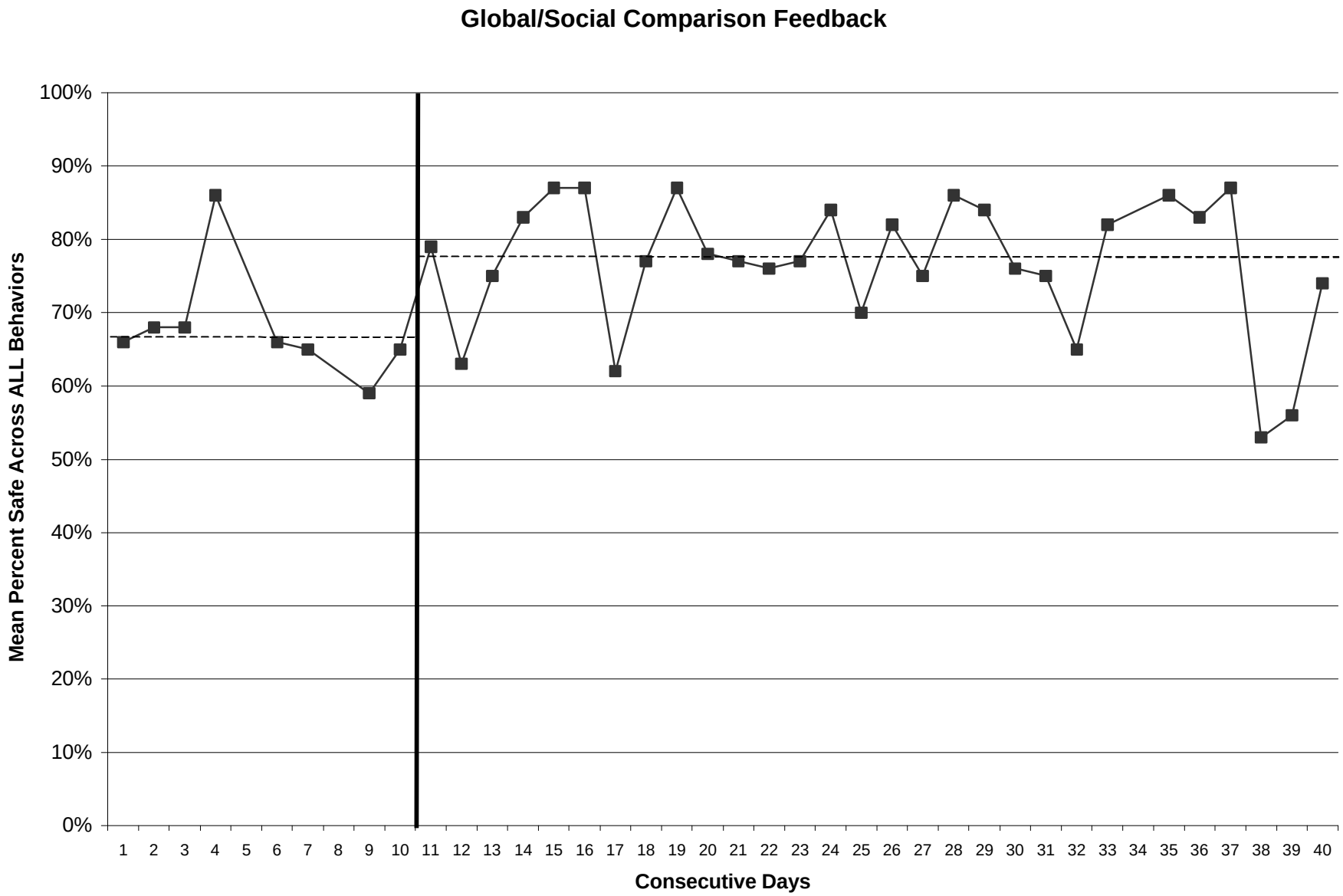

Global/SCF
85%
80%
75%
70%
65%
60%
Mean Percent Safe Across ALL Behaviors
1
2
3
4
5
6
7
8
Consecutive Weeks

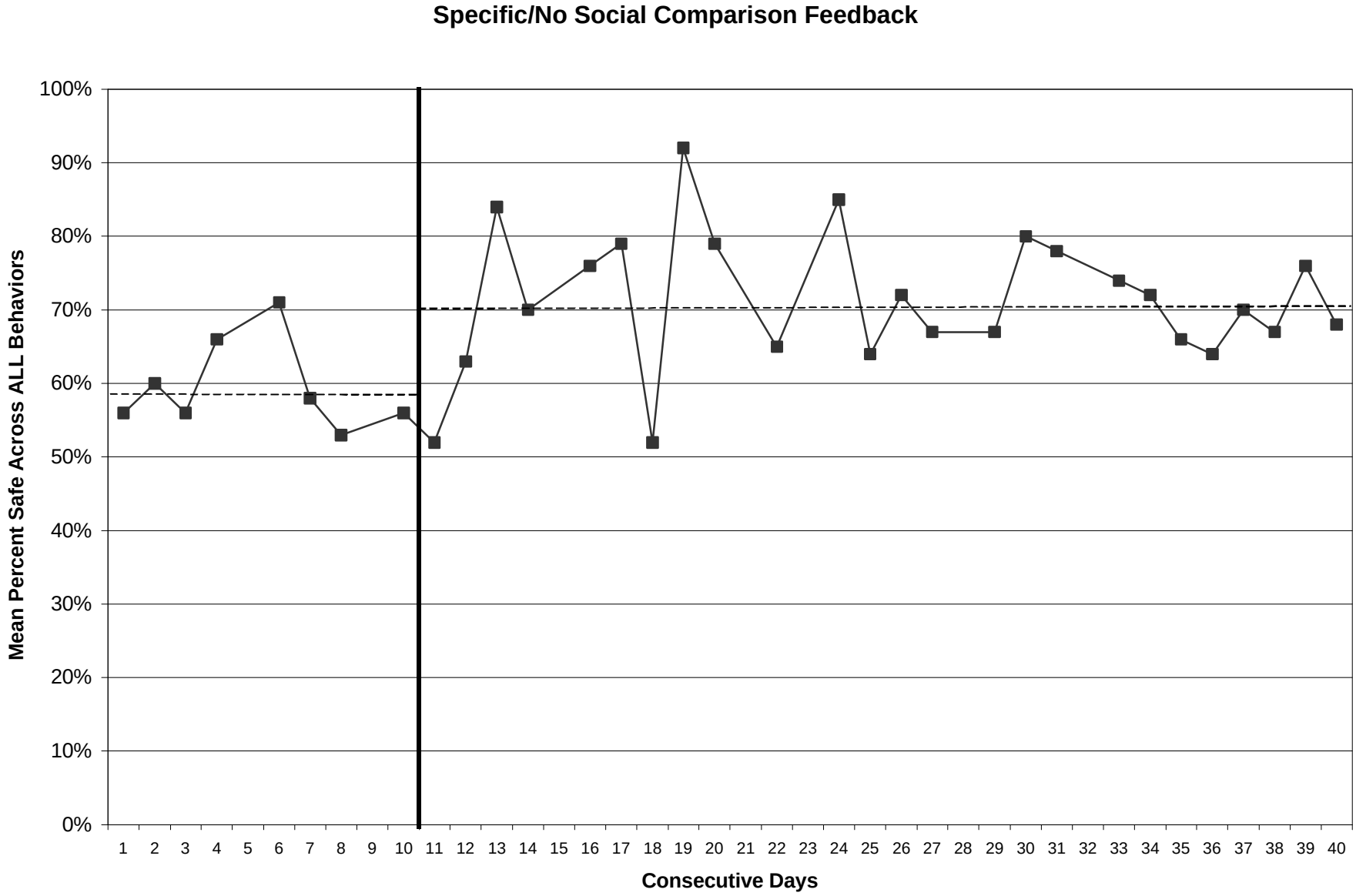

Specific/No SCF
Mean Percent Safe Across ALL Behaviors
90%
85%
80%
75%
70%
65%
60%
55%
50%
1
2
3
4
5
6
7
8
Consecutive Weeks

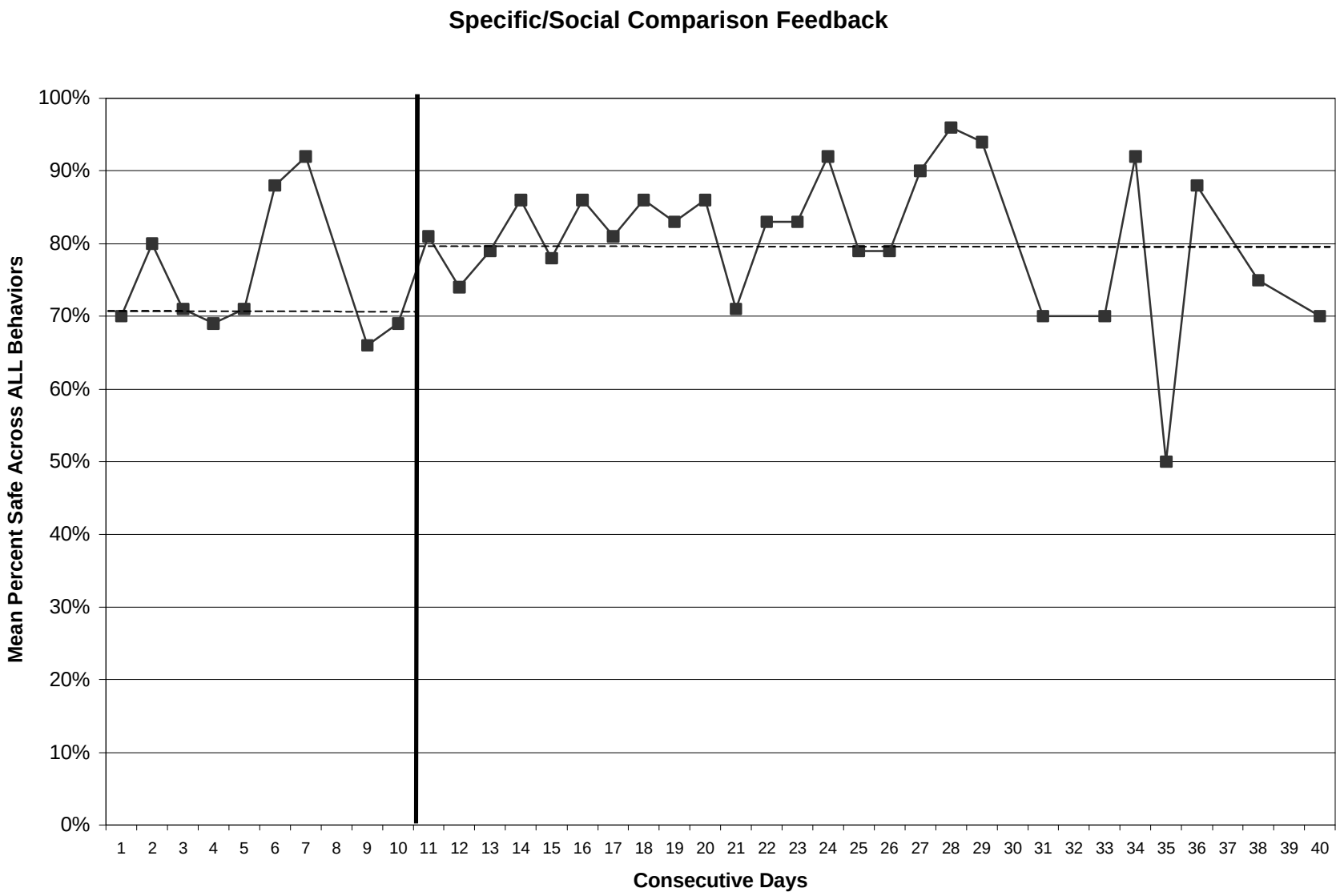

Specific/SCF
Mean Percent Safe Across ALL Behaviors
90%
85%
80%
75%
70%
65%
60%
1
2
3
4
5
6
7
8
Consecutive Weeks

Appendix I:
Graph of Daily Percent Safe Scores by Feedback Conditions

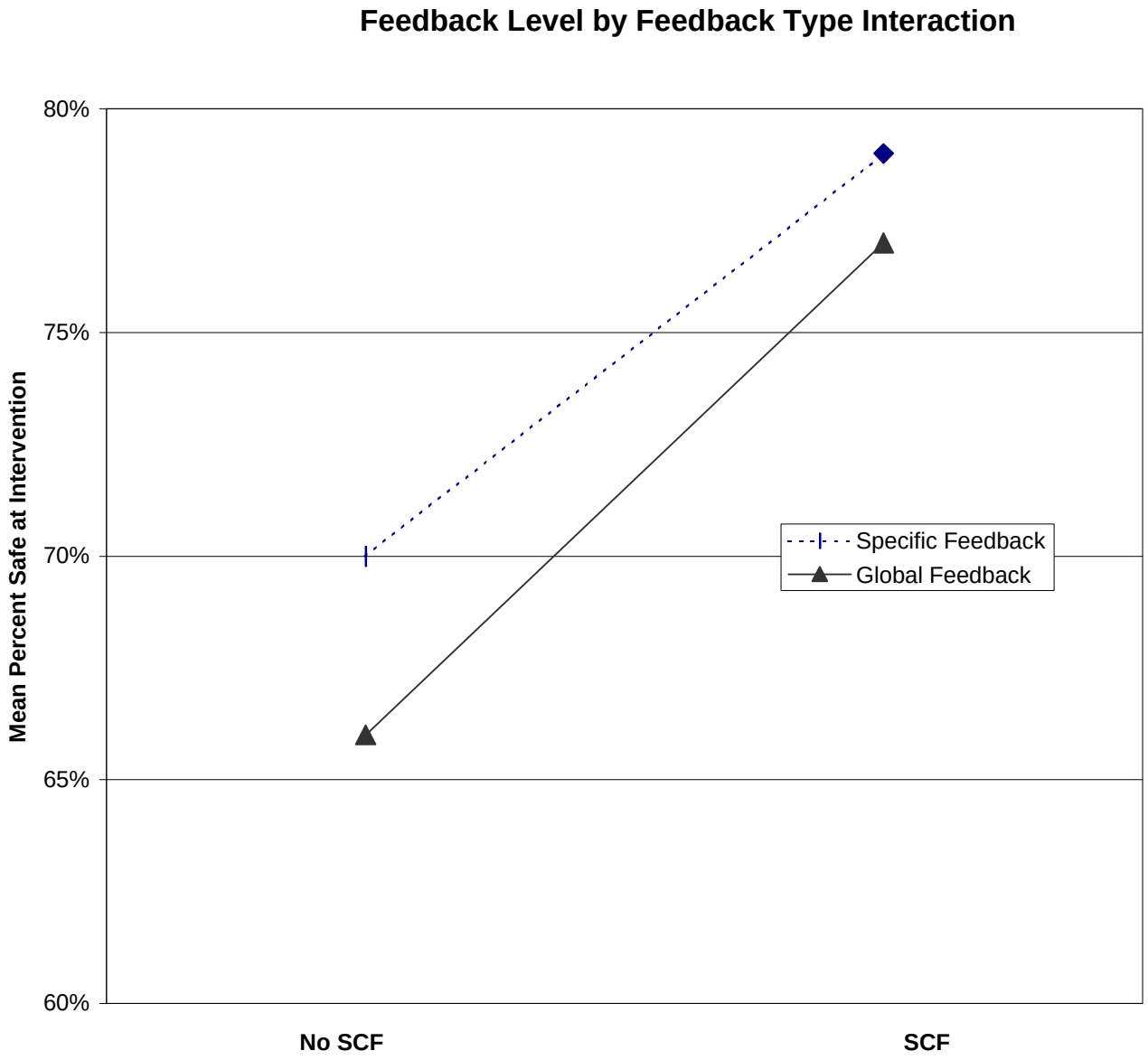

Global/No Social Comparison Feedbaack
Mean Percent Safe Across ALL Behaviors
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Consecutive Days


Global/Social Comparison Feedback
Mean Percent Safe Across ALL Behaviors
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Consecutive Days


Specific/No Social Comparison Feedback
Mean Percent Safe Across ALL Behaviors
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Consecutive Days

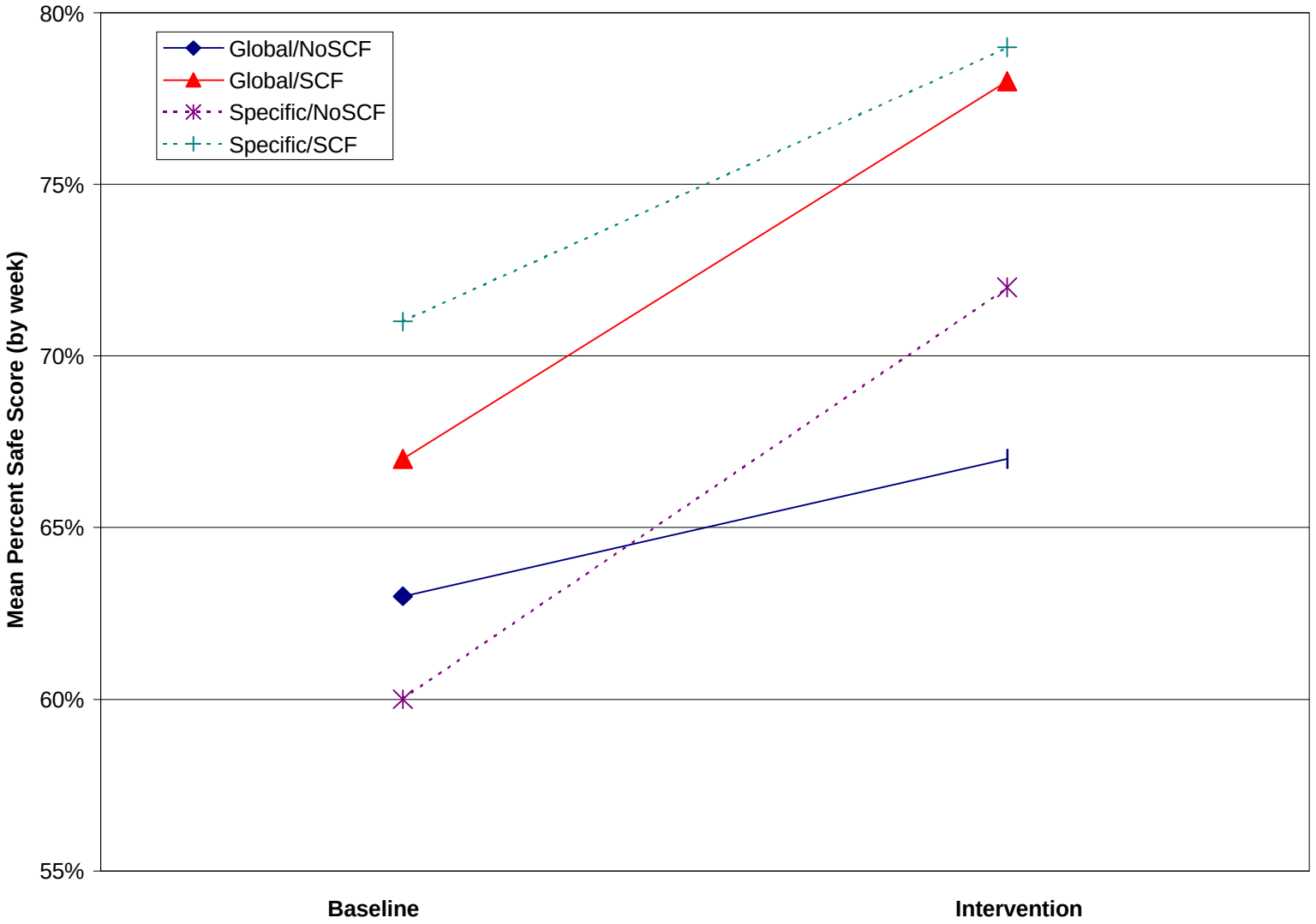

Specific/Social Comparison Feedback
Mean Percent Safe Across ALL Behaviors
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Consecutive Days

Appendix J:
Plot of Feedback Level by Type Interaction


Feedback Level by Feedback Type Interaction
80%
75%
70%
65%
60%
Mean Percent Safe at Intervention
Specific Feedback
Global Feedback
No SCF
SCF

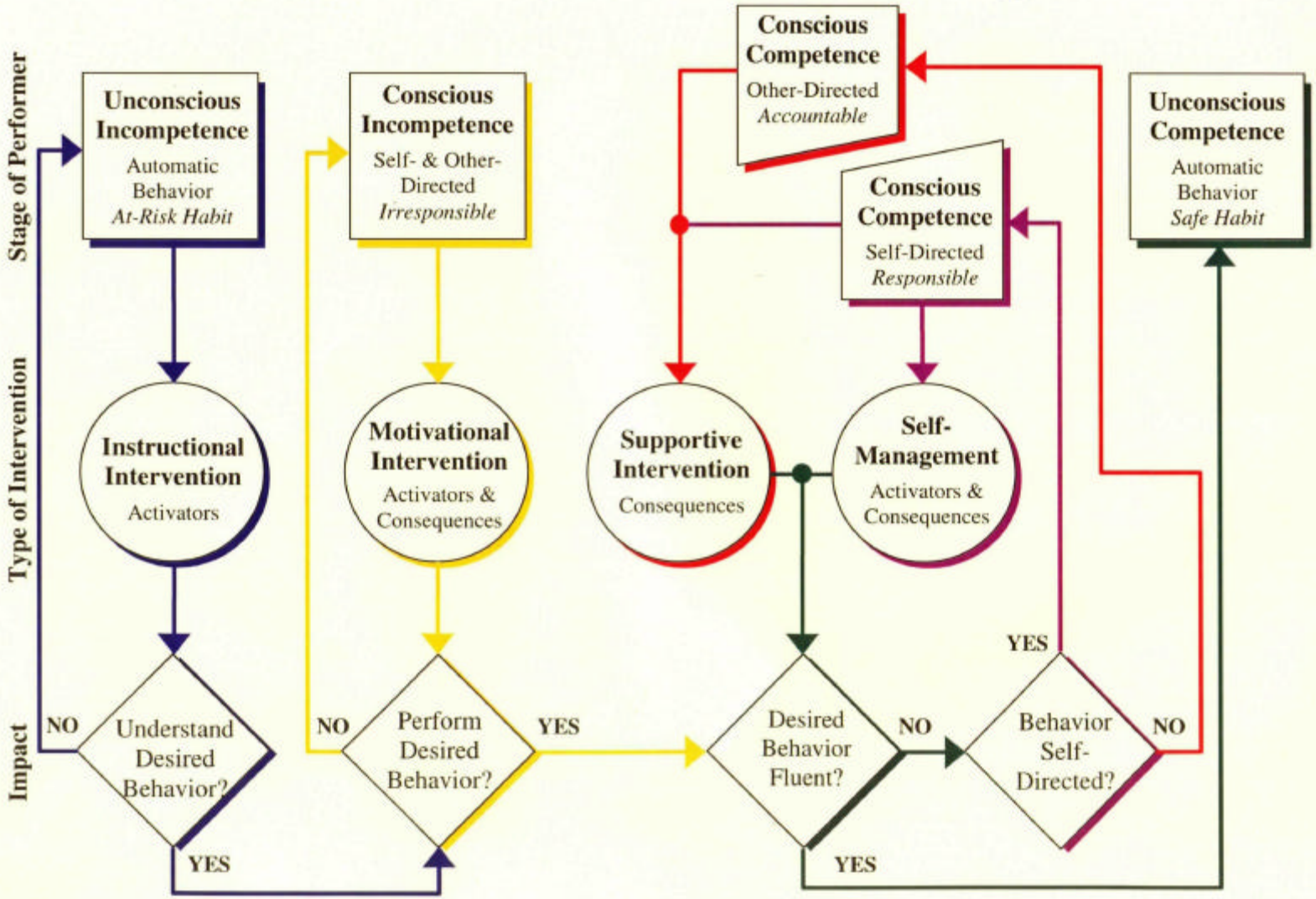
Appendix K:
Plot of Final Feedback Results by Phase

Feedback Results by Condition and Phase



Appendix L:
Flow of Behavior Change Model

The Flow of Behavior Change



Appendix M:
Feedback Survey Given to Employees

To: All Coke Employees

Please take a moment to answer these questions and return this sheet to Kirk McConner. Thank you very much.

Josh Williams
Va. Tech

1. Did you look at the feedback graphs carefully?
2. Did you like the feedback graphs?
3. Did these feedback charts influence your safety performance/behaviors?
4. Would you have preferred more specific feedback?
5. Did your feedback graphs compare your team's results with others?
6. Would you have liked to see your team's safety performance compared to others?
7. What did you like about the feedback graphs?
8. What did you dislike about the feedback graphs?
9. How would you improve the feedback graphs?
10. Was the feedback confidential or was it shared with others?
11. Additional comments:

Again, thank you for your time.

Joshua H. Williams

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Education:

Virginia Polytechnic Institute and State University, Blacksburg, VA.
Doctor of Philosophy, Industrial/Organizational Psychology (Spring, 1999)
Master of Science, Industrial/Organizational Psychology (1997)

Kalamazoo College, Kalamazoo, MI.
American Institute of Spain, Madrid, Spain
Bachelor of Science, Psychology (1991)

Dissertation: Investigating the Influence of Specific, Global, and Social Comparison Feedback on Targeted and Non-Targeted Safety Behaviors. **1st Place ($1,000): Cambridge Center for Behavioral Studies Award.**
Preliminary Examination: The Impact of Stereotypes and Accountability on Female Performance Ratings.
Master's Thesis: Examining the Impact of Impression Management Context and Self-Monitoring on the Leniency and Accuracy of Self-Appraisals.

Professional Highlights:

Senior Research Scientist
Center for Applied Behavior Systems, Virginia Polytechnic Institute and State University, Blacksburg, VA. (Spring 1996 - present)

Assisted in securing over $1.1 million in public and private grants addressing optimal strategies to improve organizational safety performance.
Published seven research articles and one book chapter in leading academic journals and books including *Industrial Safety and Hygiene News* and *Behavior Analysis Digest*.
Presented 15 papers at both academic and professional conferences, including the Society of Industrial Organizational Psychology for the last four years.

Consultant
Safety Performance Solutions, Blacksburg, VA. (Spring 1997 - present)

Provided management consulting, supervisor coaching, and executive assessment for Fortune 500 companies including American Standard, Coca-Cola Consolidated, Exxon Refining, Lucent Technologies, and Philip Morris.
Conducted behavioral safety training in Spanish for Eli Lilly Pharmaceutical in San Juan, Puerto Rico.
Wrote training manuals and technical reports for Monsanto Chemical Company, Coca-Cola Bottling Consolidated, and J. J. Keller Marketing.

Computer Skills:

Microsoft Word, Excel, and Powerpoint; Statistical Program for Social Sciences (SPSS)
World Wide Web programs including: Microsoft Explorer, Netscape, and Eudora

TRAINING MANUALS

Williams, J. H. (1999). Behavioral Observation and Feedback to Reduce Injuries. Training manual developed for Coca-Cola Bottling Consolidated, Inc.

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Williams, J. H., & Geller, E. S. (1999). Investigating Behavioral Feedback Strategies to Optimize Industrial Safety. Presented at the 14th annual conference for the Society of Industrial Organizational Psychology, Atlanta, Georgia.

DePasquale, J. P., **Williams, J. H.,** Pettinger, C. B., Ford, D. K., & Glindemann, K. E. (1998). In Search of Excellence: A Comparative Analysis of Current Behavior-Based Safety Efforts. Presented at the 24th annual conference of the Association for Behavior Analysis, Orlando, Florida.

Weigand, D. M., **Williams, J. H.,** Lee, D. F., & Breland, T (1998). Increasing Safe Behaviors in an Industrial Setting: Global Versus Specific Feedback. Presented at the 24th annual conference of the Association for Behavior Analysis, Orlando, Florida.

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Chevaillier, C. R., **Williams, J. H.,** Michael, P. G., Pettinger, C. B., & Boyce, T. B. (1997). Involve Them and They'll Understand: A Systematic Test of This Training Slogan. Presented at the 23rd annual conference of the Association for Behavior Analysis, Chicago, Illinois.

Fortney, J. N., **Williams, J. H.,** & Gershenoff, A. B. (1997). Relative Application and Perceived Value of Various Approaches to Improve Occupational Safety: A Nationwide Survey of Safety Professionals. Presented at the 12th annual conference of the Society of Industrial Organizational Psychology, St. Louis, Missouri.

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