SAFE BEHAVIOR IN THE WORKPLACE: ASSESSING THE EFFECTS OF A FEEDBACK AND THANK YOU PROGRAM

by

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Committee Chairperson:  E. Scott Geller
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(ABSTRACT)

The present field study investigated the application of an applied behavior analysis package (consisting of Feedback and Thank You interventions) to one department of a large manufacturing plant for the purpose of increasing safe work behaviors. Safe behaviors increased following the introduction of a Feedback intervention and continued to increase somewhat following the introduction of a Thank You intervention. Safe behaviors decreased when interventions were withdrawn. Responses to a Safety Climate Survey showed employee perceptions did not change as a result of the safety interventions. Results and directions for future research are discussed.
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INTRODUCTION

The study of occupational safety has increased dramatically during the last several years. Although the number of deaths and injuries due to accidents has generally been declining over the past few years (Sulzer-Azaroff, 1982), this overall decrease may be deceiving. When accident record-keeping was initiated, working conditions were terrible. Today, most industrial settings are extremely technologically advanced, and safety conditions are improving all the time. Unfortunately, the reduction in accidents and injuries is not keeping pace with the improvement in equipment and environmental conditions. Additionally, OSHA reporting and record keeping standards have become much more stringent. This has resulted in an increase in the number of safety-related studies during the past couple of decades. According to the National Safety Council (1991), accidents are the fourth leading cause of death in the United States behind heart disease, cancer, and stroke. Each year accidents on the job are thought to account for about 75 million lost work days, almost 2 million injuries (60 thousand of those being permanent), and some 10.5 thousand work deaths (National Safety Council, 1991). The costs in human life and limb are stunning, but the actual dollar cost is even more astounding.
According to Accident Facts (1991), the estimated total cost of work injuries in 1990 was over 63 billion dollars, and this figure is considered conservative since it does not include many of the indirect costs associated with occupational injury.

While some researchers have been studying the problem of industrial accidents for several years, only recently has the area of occupational safety become a popular research target. Now, however, the problem is too big to ignore. It is obvious that injuries have not been avoided, even with new technological advances, company policies, and more rigorous OSHA standards. It seems obvious that efforts are needed to study why these accidents are occurring, in other words, to study the worker behaviors leading to work-related injuries. According to Chhokar and Wallin (1984), the best approach to the problem is applied behavior analysis: "The need for vigorous, well controlled, empirical field studies dealing with the human aspect of occupational safety is evident. Applied behavior analysis is an approach that seems eminently suitable for this purpose." (p.142).

According to many estimates (e.g., Heinrich, Petersen, & Roos, 1980), about 90% of all occupational injuries are the result of unsafe acts, while the remaining 10% are due to
unsafe conditions. From this, Heinrich developed his axiom that says out of every 330 unsafe acts, 300 will result in no injury at all, and of the remaining 30, 29 will cause minor injuries and 1 will cause a major injury (Heinrich et al., 1980). These estimates reveal that the best way to reduce the number of occupational accidents and injuries is to focus on reducing the occurrence of unsafe acts.

Safety Climate

The study of organizational climate has spanned the last twenty years in the field of psychology. Many researchers (e.g. House & Rizzo, 1972 and Schneider, 1975) have applied organizational climate research to various areas of study such as job design and satisfaction, but very few researchers have study organizational climate as it relates to safety. In fact, only 2 researchers have developed and tested instruments for measuring the safety climate of an organization.

The first of these safety climate models was developed by Zohar (1980) and was designed to measure employee perceptions of the importance of safety in 20 industrial organizations in Israel. Testing a 40-item measure, Zohar found 2 important dimensions determined the level of safety climate—the workers’ perceptions of management’s attitudes toward safety
and their perceptions of safety’s importance relative to their everyday jobs. The second model by Brown and Holmes (1986), a three-factor model of safety climate based on Zohar’s original scale, was tested on several construction sites in the United States. The dimensions in the Brown and Holmes model included (1) employee perceptions of management’s concern for employee well-being, (2) employee perceptions of management’s actions related to this concern and (3) employee perceptions of risk associated with their jobs. Both Zohar’s and Brown and Holmes’ models use the same questions, yet measure the dimensions or factors according to slightly different models. Likewise, both models assume that climate is a "summary of molar perceptions that employees share about their work environment" (Zohar, 1980, p.96). These perceptions serve as a means for employees to gauge the appropriateness of their work behaviors, especially as they relate to safety.

Although no other models of climate have been developed to measure perceptions of organization safety, many researchers have proposed a variety of factors which may influence safety perceptions. For instance, Dejoy (1985) suggested that supervisors responses to employee injury and attention of upper management to safety issues may influence
safety climate. Additionally, Hansen (1988) proposed that personality variables such as locus of control, extraversion, aggression, social maladjustment, and neurosis may be related to accident proneness. These and other measures of personality characteristics may also be important to determining employee perceptions of safety of their work environment. Perhaps some of these variables will be incorporated in future measures of organizational safety climate.

By learning how employees perceive their work environments, it may be possible to determine what differentiates those employees or even companies who have accidents from those who do not. In a similar vein, since changes in attitudes often follow behavior change, (Geller et al., 1989) a safety climate measure may be used to determine the effectiveness of a behavior-based safety intervention. If the safety climate in an organization improves following a safety initiative, this would certainly be evidence the program was effective. It was for this purpose a safety climate instrument was used in the present study.

Behavior vs. Outcome-Based Approaches to Safety
Two trends have emerged in the occupational safety literature. Some researchers follow the applied behavior analysis philosophy and advocate a behavior-based approach to accident prevention programs which includes identifying the key behaviors that lead to safe or unsafe acts, and trying to increase or decrease them with interventions based on behavioral science principles. The other approach, an outcome based approach, targets outcomes, usually injuries, as the dependent variable. For example, employees receive various rewards for going a certain number of days without an injury. Typically, there is no mention of "near-misses" or potential safety hazards. As long as no recordable injury occurs for a given period of time, employees are rewarded for "safety".

Those researchers who choose the behavior-based approach believe injuries should not be used as the primary measure in the study of safety for two main reasons: (1) Lost time accidents are few and far between and are very unpredictable. It is not appropriate to judge the efficacy of a safety program merely on the basis of lost time and/or recordable injuries (Komaki, Barwick, & Scott, 1978), and (2) Injuries are merely after the fact records of a problem. Instead, safety programs should focus on the assessment and prevention of unsafe behavior (Chhokar & Wallin, 1984). The main
difference between the two approaches seems to be that most behavior-based approaches focus on the process rather than merely the outcome, implying that it is necessary to identify all unsafe acts related to accidents and reduce or eliminate them, or to identify and reinforce safe acts and increase them. An increase in safe acts will also reduce injuries.

The assumption of the outcome-based approach comes at a different point. Those who use the outcome approach assume that defining the end goal (no injuries) is adequate, and that workers are capable of figuring out the process (reducing unsafe and increasing safe behavior) to get to the final outcome of a reduced number of injuries. In fact, Wilde (1991) stated that it is not appropriate to base interventions on specific safety behaviors rather than "accident free performance" (p. 82). If specific behaviors are rewarded, it is likely that occurrence of those behaviors will go up, however, this is no guarantee the rate of accidents will decline. Instead, Wilde pointed out, there is a risk that "accident substitution or accident metamorphosis" will occur (p. 82). In these cases, while the targeted behavior improves, other related behaviors decline and accidents continue to occur, only their causes have changed. Therefore, Wilde argued, the only way to reduce accidents and injuries is to
base incentives on the outcome variable, namely, accident free performance.

**Arguments for an Outcome-Based Approach**

Fox, Hopkins, and Anger (1987) focused on an outcome approach, citing that most behavioral research does not link the behavior change to a reduction in injuries. The authors argued that it is not possible to demonstrate that the safety program is working if the data is never examined to determine whether or not injuries were actually reduced. Although Fox et al. agreed with the goals of the behavior-based approach, they contended that an intervention cannot be considered effective without that final link to outcome. However, in this case, workers only knew that they had to perform without injury. They did not have specific appropriate or inappropriate behaviors outlined for them as was done in other studies. Thus, in their study, Fox et al. employed a token economy intervention with rewards contingent upon accident free performance. Along the same lines, Haynes, Pine, and Fitch (1982) concurred with the pinpointing and reduction of unsafe behaviors as is appropriate in behavioral approaches, but attested to the view that the ultimate measure must be an outcome. Thus, they chose to base their entire incentive
program (which included feedback, team competition, and frequent rewards) on the outcome measure of accident rates.

Karan and Kopelman (1986) suggested that behavioral approaches and outcome approaches are each appropriate in different circumstances. In their study on feedback, the authors concluded that perhaps "outcome feedback will be more effective when individuals know how to perform effectively; in contrast, intermediate (behavioral) feedback may be more effective when this knowledge is lacking" (Karan & Kopelman, 1986, p. 56).

Arguments for A Behavior-Based Approach

In addition to some of the points made earlier, several researchers have advocated the use of behavior based approaches for other reasons. First, behavioral approaches focus on safe and unsafe acts. Some of the reasons why people commit unsafe acts are: (1) they have been rewarded previously for committing unsafe acts or penalized for working safely (Chhokar & Wallin, 1984), (2) actions associated with prevention, such as using personal protective equipment, are often found to be unpleasant or inconvenient (Geller, Lehman, & Kalsher, 1989), and (3) following Heinrich's 300-29-1 ratio, workers perceive that their chance for being involved in an
injury-producing accident are very low (Heinrich, Petersen, & Roos, 1980). According to Heinrich, some other reasons for the occurrence of unsafe acts include: (a) a "bad attitude" on the part of the worker, (b) lack of skill or knowledge to do the job safely, (c) a physical incapability to do the job, and (d) not having the proper tools or safety equipment to do the job safely. While some of the reasons cited above suggest that all unsafe acts cannot be controlled, it is still Heinrich's contention that the vast majority of unsafe acts can be related directly to intentional behaviors of the worker. In other words, workers know that the behaviors they perform are risky, and can be avoided, yet they continue to perform these behaviors despite the risk involved.

According to applied behavior analysis, it is essential that the reasons for unsafe acts be discovered so the reinforcing contingencies can be increased or decreased appropriately. If people are reinforced for emitting unsafe acts (for instance, cutting corners may allow a worker to go home early for the day), something must be done so the worker is no longer reinforced for performing unsafely. The contingencies must be altered so safe rather than unsafe behaviors are being reinforced.
The weakness of the outcome-based approach is that it pays limited attention to the unsafe acts of individuals, but rather, focuses only on the consequences of those unsafe acts. Consequently, unsafe behaviors may continue unnoticed, an accident waiting to happen, but as long as injuries decrease following the intervention, the outcome approach claims a victory. Thus, the same argument outcome supporters used on behavior advocates can be reversed--it is impossible to determine the efficacy of an outcome-based approach simply by noting a decrease in the number of injuries for a short period of time.

Perhaps the most serious consequence of an outcome-based approach was noted by Fox et al. (1987). It is possible that an individual may fail to report certain accidents and injuries if he or she faces a reprimand or penalty for having a work-related injury, or if he or she believes the loss of a reward may affect relationships with co-workers. Employees are lulled into a false sense of security, thinking they are performing their jobs safely simply because their unsafe acts have never resulted in an injury. Is it appropriate to assume that because injuries decrease, the unsafe acts that lead to them are decreasing too? Not necessarily. According to Fox et al., it is possible "the contingencies may have caused
workers not to report accidents and injuries" (p.223). An apparent decline in injury rates may be nothing more than a big cover-up. Furthermore, when employees cover up minor injuries and leave them untreated, they run the risk of developing more serious problems.

Finally, Chhokar and Wallin (1984a) pointed out that the behavioral approach is preferred because it avoids many of the pitfalls of the outcome approach. With its identification and reinforcement of safe behaviors, the behavioral approach sets the stage for a long-term safety program, and avoids the unintentional reinforcement of unsafe behaviors which could cause injury in the future. Komaki, Barwick, and Scott (1978) also identified the importance of using a program centered around positive reinforcement. By concentrating on desired, safe behaviors, workers can integrate these safe behaviors into their everyday work patterns and begin to build toward achieving the goal of performing their jobs in a continuously safe manner rather than being distracted by the threat of punishment. In other words, if safe behavior becomes a work habit, employees will no longer concern themselves with worrying about what the consequences will be if an accident should occur, because accidents will not occur as long as they are performing their jobs in a completely safe manner.
Intervention Strategies

Consistent with the debate over whether to use safe behavior or injury (outcome) as the major dependent variable in any study, researchers have also argued over whether to give feedback based on subjects’ responses or outcomes. The arguments supporting the two options are also consistent with those of the behavior vs. outcome approach. Those who support giving outcome feedback suggest ideas as simple as posting signs at the facility entrance or in various departments to display the number of safe hours worked or the number of days since the last serious injury. Those who support response feedback choose some intermediate criteria, such as percentage of personal protective equipment used, or percentage of specific behaviors performed in a safe manner as the subject of feedback. Response feedback and outcome feedback can be given in a variety of ways, however visual displays seem to be one of the most popular formats.

Feedback has been one of the most frequently used techniques for improving safety performance. Researchers have used various forms of feedback to help workers perform their jobs more safely--public, private, written, verbal, and all possible combinations. Regardless of format, feedback has
been very effective in increasing safe work practices. In fact, Chhokar & Wallin (1984b) indicated that "the usefulness of feedback in improving performance has been described as ‘perhaps one of the most dependable and thoroughly tested principles in modern-day psychology.’" (p. 254.) The literature is full of references for effective outcome and response feedback programs in occupational safety studies. However, response feedback is by far the most popular choice. Seventeen articles which used feedback as a safety intervention were reviewed for the present research. Of those 17, 13 based the feedback program on behavioral or response measures and only 4 provided feedback on outcome measures.

Perhaps one of the reasons feedback is so commonly used is because it can be one of the most inexpensive intervention strategies available. Outcome feedback is especially cost effective. Every industrial facility is required to keep track of the number of injuries sustained on the worksite in order to report these figures to government agencies. Therefore, it requires very little extra work to make this information available to employees. In fact, most companies do make this information public to employees, whether they are attempting an intervention or not. However, while outcome feedback is common in safety, few reports (only 4 this author...
could find) in the literature recommend this type of feedback as an effective intervention technique for safety. Perhaps employees are so used to seeing the number of "safe days" posted, they begin to ignore it after a while.

Response feedback typically requires a little more effort to deliver than outcome feedback, but it is also usually quite effective. In addition to keeping records on numbers of injuries, some companies also record intermediate criteria such as near misses, or take audits on certain safety behaviors so response feedback can be as easy to deliver as outcome feedback.

For those companies who do not collect this type of data already, it is necessary to choose and provide feedback about the safety criteria which have the most potential to affect the workers' behavior in a positive way. While the process of discovering these criteria may be a little more costly and time consuming than simply choosing to provide outcome feedback, this process can be very beneficial. Not only can this search lead to the discovery of some of the major underlying causes of accidents in the workplace, giving workers feedback on these criteria has been shown to decrease not only the number of unsafe behaviors (or increase safe ones) but also the accidents resulting from these unsafe
behaviors. One of the reasons for the success of response feedback may simply be that employees are not used to receiving feedback about their behaviors. The feedback may seem novel, perhaps more personal, and workers relate to things that affect them directly. Perhaps this is one reason why response feedback, alone or combined with other strategies, continues to be a popular intervention in safety research. However, the more obvious reason feedback continues to be used is quite simple—it works.

In a study which combined response feedback with training and other interventions, Komaki, Barwick, and Scott (1978) performed a safety behavior analysis in two departments of a food manufacturing plant and discovered that workers did not perform their jobs safely because there was almost no opportunity for receiving any kind of positive reinforcement. Additionally, the authors noted that the workers never got the chance to learn how to avoid performing unsafe acts. In an effort to correct this, Komaki et al. (1978) developed observational codes listing all the areas in the two departments where there could be a potential accident. Based on the items in these observational codes, the researchers developed a training program for employees, consisting of showing the workers pairs of slides of safe and unsafe ways to
do the various components of their jobs. Employees were then shown a graph of their performance during the baseline phase of the study and were told this graph would be updated following observation sessions during the next several weeks. It was suggested to the workers that they try to improve their safety performance based on what they learned from the graphs. Employees in the two departments improved their safety performance 21% and 29% over baseline, reaching levels between 96% and 99% safe behaviors. The authors attributed most of this increase to the response feedback portion of the intervention, particularly because safety performance returned to baseline during the withdrawal portion of the study.

In another response feedback study, Komaki, Heinzmann, and Lawson (1980) used a multiple baseline design to determine whether training alone or combined with response feedback was necessary to maintain good safety performance. This was one of the first experiments conducted to analyze the separate components of a safety intervention. Using procedures very similar to those employed by Komaki et al. (1978), the research results showed that training, although important, was not a sufficient condition for improving safety performance, and that response feedback played an important role in increasing safe behavior.
Recognizing the importance of feedback in the safety improvement process, Chhokar & Wallin (1984b) studied the effect of varying the frequency of response feedback, in addition to training and goal-setting interventions. Although Chhokar & Wallin considered "percentage of completely safe employees", an outcome variable, the variable of interest, this percentage was calculated by determining how many key behaviors employees performed in a safe manner. Thus, this feedback was similar to response feedback because employees could link their feedback results back to a list specific behaviors (shared with the employees, and supplemented by training on proper safe procedures for each behavior) rather than simply avoiding injury, which is the case with most outcome feedback. While it could not be determined exactly which behavior(s) was not performed safely if the percentage was less than 100, at least the employees knew if they performed all of the items safely, they would be labeled a "completely safe employee." Results showed that providing feedback once a week did not have a significantly different effect on performance than feedback once every two weeks. Not only was response feedback effective at improving performance, its impact was over and above the effect of goal-setting. In fact, the target level of safety performance could only be
reached after feedback was provided. Thus, feedback was again shown to be a critical component of the safety intervention.

Sulzer-Azaroff and de Santamaria (1980) conducted a study similar to those described previously in which they used a "feedback system" to try to improve occupational safety and reduce accidents. Unlike the previous studies, these experimenters chose to develop a checklist of safe/unsafe conditions in several departments of a small factory rather than observing actual safety behaviors. Their "feedback system" consisted of describing the type of safety hazard observed (where, category, etc.), giving positive comments on hazard-free or improved areas, and providing suggestions for areas of improvement. While this study was slightly different because safety hazards rather than actual safety behaviors were observed, the assumption was made that a reduction in hazards would carry over to a reduction in unsafe behaviors and injuries. Thus, while this type of feedback seems to be outcome feedback upon initial consideration, it is actually quite similar to response feedback. Unlike outcome feedback on injuries which can be traced to any number of causes, feedback on safety conditions can be linked directly to the performance or non-performance of very specific behaviors. The feedback on safety conditions in this study was therefore,
quite similar to the response feedback delivered in the studies mentioned previously.

The majority of this feedback was delivered in written form, however, positive comments were also delivered orally upon occasion when the written feedback was delivered. Feedback was given twice per week. As expected, the number of observed hazards dropped considerably from baseline to the intervention portion of the experiment. An average 60% drop in hazards was observed across the four departments studied, ranging from 29% to 88%. Again, a feedback program, especially one with so many positive elements, was quite effective in improving safety by reducing the number of conditional hazards. In addition to observed reductions in the number of safety hazards, the authors also noted an increase in the number of safety meetings, employee questions about safety issues, and a voluntary continuation of the inspections initiated in this study.

Komaki, Collins, and Penn (1982) investigated the effects of antecedents and consequences on occupational safety behaviors. Most of the previous research had focused on behavioral consequences only, ignoring the possible effect of antecedents. This study also included a high degree of
supervisory involvement, presumed to be a very important component of any safety effort.

A safety-behavior checklist, developed specifically to monitor behavioral responses in four departments in a food processing plant, was used for 46 consecutive weeks. In the antecedent condition, safety rules were posted, explained and shown on 35mm slides, and supervisors discussed the rules at safety meetings. During the consequence condition, behavioral response feedback was posted and supervisors talked about performance changes at the weekly meetings. Results indicated that although the antecedents produced some safety improvement (in two of four departments), this effect was not nearly as large as the increase in safe behaviors during the consequence condition. The authors concluded that behavioral consequences such as feedback are necessary for maximum effectiveness in the application of applied behavior analysis for occupational safety. Although behavioral antecedents may help to improve safety, they alone, or even in combination with a high degree of supervisory involvement, cannot be relied upon as the sole intervention for reducing work injuries. In addition to the effectiveness of using behavioral consequences, the authors noted that the employees responded quite positively to
receiving specific information about their current safety performance.

Along the lines of the previous study, Fellner and Sulzer-Azaroff (1985), looking for possible behavioral antecedents, investigated the possibility that either assigned or participative goal-setting would increase safe practices and conditions in a paper mill beyond the level achieved following a response feedback intervention. Baseline measures of percentages of safe conditions and safe practices were collected during a feedback only phase and then phases of assigned and participative goal-setting based on safe conditions and practices were introduced. Results showed improvements in safe practices and conditions, which continued on an upward trend during the goal-setting phases. However, the authors attributed this improvement to a continuing reaction to the feedback phase, especially in light of the fact that injury rates did not decline during either goal-setting intervention. Thus, it appeared that an intervention of feedback alone would have been sufficient for increased safety performance in this case.

Most of the previous research efforts have used behavior checklists or some other form of intermediate criteria as the focus of feedback rather than using the actual outcomes
(accidents) of the safety program. Karan and Kopelman (1986) were among the few researchers to base feedback on actual outcomes, including both vehicular and industrial accidents, rather than some intermediate criteria such as safety scores and checklists. Feedback was given on the number of accidents--damage to trucks for vehicular accidents and recorded injuries for industrial accidents--that occurred during the course of the study. The authors argued that since the goal of any safety intervention is to reduce the number of accidents that occur, it makes sense that a feedback effort would target accident frequency rather than a safety score or some other intermediate measure.

Feedback was given in the form of large signs posted in a common area for all personnel which listed the number of accidents that had occurred year-to-date, the number of days since the last accident had occurred, and a ranking of each of the three shifts on safety performance. The authors reported that the outcome feedback intervention had a significant effect on the number of accidents occurring in the experimental facility. Although the percentage of accidents decreased by only a small amount (5%) in the experimental facility, accidents actually increased by 17% in the two control facilities. Therefore, the authors calculated a net
improvement in safety of 22% for vehicular accidents and 16% for industrial accidents.

As mentioned earlier, Karan and Kopelman suggested outcome feedback is sufficient for those employees who already know how to perform their jobs safely. However, there is a difference between knowing how to perform a job safely and doing so. If workers always performed their jobs in the safest way possible, there would have been very few injuries. Yet the fact remained that injuries continued to occur. Perhaps members of the experimental group in this study covered up accidents, knowing that they were being watched and recorded. Ever the authors themselves noted that there were many possible explanations for their data, starting with the fact that the experimental and control groups were at different facilities so any number of different conditions could have affected the results. The attraction of choosing a response criterion, such as behaviors, is that they cannot be covered up easily, either the behavior is performed or it is not. This is why most researchers (13 of 17 in this review) choose to base their interventions, such as feedback, on behaviors rather than outcomes.

Many other authors (e.g., Alavosius & Sulzer-Azaroff (1986); Chhokar & Wallin (1984); Fellner & Sulzer-Azaroff
(1984); Geller, Eason, Phillips & Pierson (1980); Haynes, Pine & Fitch (1982); Nasanen & Saari (1987); Sulzer-Azaroff, Loafman, Merante & Hlavacek (1990); and Zohar, Cohen & Azar (1980)) have studied the effects of response or outcome feedback either alone, or in combination with other interventions designed to increase safe behaviors and conditions in various industries. It should be evident from this research that feedback, primarily response (or behavior) feedback, is the most widely used behavior change technique in occupational safety programs, and has been the most effective technique for increasing safety. Thus, response feedback was chosen as an intervention component for the present study.

**Application to the present study**

As for the debate over whether to use behavioral or outcome feedback, the decision for the present study was based on several factors. First, safety programs in the target location had always relied on outcome information to promote behavior change. When entering the plant, there was a wall listing the number of days it had been since the last lost-time or OSHA recordable incident in each area of the plant (this usually ranges from zero to two or three thousand days). A littler farther into the plant there was a "safety ladder" on which a bigger-than-life sized man climbs one step each day.
the entire plant went without a recordable injury. If the man
got to the top of the ladder (30 days), the entire plant
received a safety award. Unfortunately, the "safety man" had
not reached the top of the ladder for almost three years. In
addition, various departments offered prizes and incentives
for avoiding injuries for designated numbers of days. Based
on this analysis of the previous safety efforts in this
particular plant, it was decided that outcome feedback was not
particularly effective and that it was time to step back in
the process and try to give feedback on specific safety
behaviors.

Second, although this plant in general and the baling
department specifically had their share of injuries, the
number of recordable and lost time injuries were few compared
to the number of unsafe acts that could be observed. For this
reason, it was decided that providing response feedback on
behavioral rather than outcome measures would be more
appropriate, especially considering the short time frame of
the present study.

Third, as previously mentioned, Karan and Kopelman (1986)
suggested that behavioral indices might be more appropriate
when workers do not know how to perform their jobs safely.
Although the supervisors and department officials of the
particular area of the plant where the study was performed believed their workers did know how to perform their jobs safely, many of these workers had a significant amount of job tenure and it may have been several years since they had been through extensive training. It was quite possible many of these workers did not know when they were committing an unsafe act. Additionally, many of the procedures in this department had changed in recent years, and workers who were present prior to these changes may not have adapted to them.

Fourth, it is possible that the employees in this area actually did know exactly how to perform their jobs in the safest manner possible, but for some reason, they were not doing so, even when they were receiving outcome feedback. It was necessary to begin to understand just why people were committing these unsafe acts, and to alter the reinforcing contingencies in the environment to promote safe, rather than unsafe job behaviors. Perhaps it was not a matter of knowledge, but rather a matter of motivation. If employees knew they would be held responsible for not only the outcomes of their acts at work but the acts themselves, perhaps they would be more aware of their actions and thus, perform their jobs in a safe manner.
Fifth, as forewarned by Fox et al. (1987), safety officials noted a decline in the number of injuries reported during a recent "safety crackdown" by the plant manager. A new directive was introduced by the head plant official that stated the plant was to have zero injuries. Immediately, there was a decline in the number of incidents (lost time and OSHA-recordable injuries) across the entire plant. Unfortunately, most plant officials agreed that this decline was due to employee fear of reporting accidents. So, another advantage of using a behavior-based rather than an outcome-based program was the avoidance of driving this important information underground. To get at the root of the cause of occupational accidents, people must be willing to discuss the causes of incidents and ways to prevent them. Finally, as is evident from the literature reviewed above, behavior-based programs, especially those including some type of behavioral feedback have had consistent success in the area of safety. In a survey of safety literature since 1978, 4 outcome-based programs were reported as effective, however, the 13 successful behavioral studies outweigh successful outcome programs. For these reasons and others stated at the beginning of this introduction, it was decided that a feedback program based on safe/unsafe behaviors rather than outcomes
(injuries) would be most appropriate for the present organizational safety study.

As is evident from some of the studies described above, many different types of motivational interventions have been paired with feedback. Although a few of these interventions had small effects above and beyond those provided by feedback alone, none has proved particularly robust in lowering the occurrence of unsafe behaviors and injuries. For this reason, it was decided that a new form of intervention would be adopted for the present study. This new intervention, chosen for its applicability to this particular setting, was the use of "Thank You" cards. The Thank You cards were designed so that employees could "thank" fellow employees when they saw them performing safe behaviors. The Thank You cards were paired with Feedback to form an intervention for one group, and then compared to another group which received Feedback Only. Further description of Thank You cards is provided in the methodology section.

As mentioned previously, measurement of the effectiveness of safety interventions seemed to be an appropriate use for a safety climate measure. Although none of the literature on safety climate or safety interventions reported the use of a safety climate measure in this way, the author of the present
study believed it would be an important addition to other measures of the effectiveness of the proposed safety intervention.

The present field study had the potential to contribute to the existing literature in several ways. First, due to the relative brevity of the study, response feedback was delivered more frequently, but in a shorter time frame than previous experiments. If safe behavior percentages showed an increase during the Feedback intervention, it would provide further evidence that feedback, in many different forms and frequencies, is an effective intervention for safety programs. Second, none of the previous studies measured safety attitudes or safety climate in addition to taking behavioral or outcome measures of safety. According to Geller et al. (1989), attitude change follows behavior change. If attitudes as measured by a safety climate survey improved following the safety interventions, this would provide additional evidence of an increase in overall safety in the experimental department. Finally, the Thank You card intervention had not been tested elsewhere. If workers used the cards and safe behavior increased as a result, employers would have a new, low cost option for motivating safe performance. Thus, the following hypotheses were tested in the present field study.
Hypotheses

I. Behavioral Observations. It is expected that employees will perform their jobs in a safer manner following the introduction of the interventions. Feedback is expected to increase safe behavior relative to the Baseline phase and Thank You cards are expected to raise safe behavior performance over and above the level achieved from Feedback alone.

H1: The percentage of safe behaviors in the baling department will be greater during the Feedback phase compared to the Baseline phase for both the Feedback + Thank You and Feedback Only groups during their respective Feedback phases.

H2: The percentage of safe behaviors is expected to increase for the Feedback + Thank You group during the Thank You card phase relative to the Feedback phases of both the Feedback + Thank You and Feedback Only groups.

H3: The percentage of safe behaviors will decrease for both Feedback + Thank You and Feedback Only groups following the removal of the Feedback and Thank You card interventions. Since the Withdrawal phase of the present study is short (only 6 weeks) it is not expected that the percentage of safe behaviors will return to the baseline level (i.e., some residual effects from the interventions are expected).
II. Safety Climate Survey. The Safety Climate Survey was designed to measure differences in the "climate" of the workplace. It is expected that as a result of improved safety behavior performance, employees' perceptions about safety will improve and thus, their responses to the safety climate survey will be more positive (higher on the respective scales).

H4: It is expected the subjects' total scores for each of the four subscales contained in the climate survey will be higher at the second administration (end of the intervention periods) than at the first administration of the climate survey (at the beginning of the baseline phase), signifying a safer climate. This difference is expected for both the Feedback + Thank You and Feedback Only groups.
METHOD

Participants and Setting

This study was conducted in one department of one division in a large fiber-manufacturing plant located in a rural section of southeast United States. The plant employs approximately 2000 workers, most of whom are production workers, and it operates 24 hours a day, seven days a week, 365 days a year. The plant itself is 53 years old, and many of its workers have been with the company for 20 or more years. Turnover is minimal. The majority of the hourly employees in the plant (n= approximately 1800) belong to the local union, which has been represented at the plant since it first opened.

The department identified for the present study consisted of approximately 200 employees, with 40 to 50 working on each shift. The age range of the employees varied from late teens to mid sixties, and the average tenure in the department was 18 years. The majority of the employees worked on a rotating shift schedule (7 a.m. to 3 p.m., 11 p.m. to 7 a.m., and 3 p.m. to 11 p.m., in that order) that changed from week to week, so that each employee would have worked every shift during a three-week period.

The plant personnel had identified safety as their
primary concern, however, there had been much debate over the best approach for increasing safety in the plant, which in their eyes meant reducing number of injuries. Several safety programs had been implemented with varying degrees of success over the plant’s 53-year history. At the time of the present field study, company personnel were considering a behavioral approach as a possibility for a plantwide, and perhaps even a corporate-wide approach to occupational safety. The department in the present study was chosen because the superintendent of that area expressed an interest in participating in a pilot study using the behavior-change approach. Furthermore, first line supervisors and safety personnel indicated they would be willing to provide the cooperation and support needed in this effort. The results of this pilot study will be used by company officials to evaluate whether they believe a behavioral approach is appropriate for the plant in the future.

The superintendent of the department participating in this study, along with the researcher decided it would be most appropriate to choose only two of the four rotating shifts for the present study given that the intervention phase was rather brief, as it was intended as a demonstration project for the rest of the plant. Rather than choosing a specific time
period to make observations and auditing each shift as they rotated through that time slot, it was decided the observers would follow the two shifts through their regular shift schedule and make observations at the beginning of the shift, whatever time that fell during the day.

The "C" and "D" shifts were chosen for the present study for several reasons: (1) these shifts have had the most accidents/injuries during recent years, (2) the department management believed the operators on these shifts would be most receptive to the new safety effort, and (3) the departmental safety specialist who agreed to help with the study was very familiar with the workers on these shifts. Operators felt comfortable having him around and were not suspicious when they saw him making observations. The safety specialist was also in charge of directing shift safety meetings and introducing the phases of the present study.

For the most part, injuries in the department consisted of strains, sprains, cuts and bruises. During 1990, the department of 200 employees recorded the following injury summary: 5 lost time incidents, 6 restricted duty cases, 8 OSHA recordable injuries, and 6 first aid cases. Twenty of these 25 injuries, or 80% were attributed to unsafe acts by the employees, rather than unsafe working conditions. Based
on this data, it was obvious to department management that a new safety effort was needed that focused on eliminating unsafe behaviors, rather than merely looking at the outcomes of unsafe behaviors (i.e., the number of injuries.)

**Dependent Measures**

The safety behavior checklist. A behavioral checklist with both general and specific components was developed for the particular department chosen for the field study. The general portion of the behavior checklist was designed to apply to any employee working in the department and, for some particular items, to any person either working within or traveling through the department. The specific portion of the checklist included items designed to tap the unique hazards of the primary job in the department, the press operator. While not all items contained in the general portion of the behavior checklist could be considered behaviors, all could be traced directly to the occurrence or nonoccurrence of specific behaviors. For this reason, both portions were combined to form one overall safety behavior checklist on a single sheet of paper, with the general safety items on one side and the specific safety items on the other.
Three different categories of items were included in the general portion of the safety behavior checklist: (1) Personal Protective Equipment use, which contained items which described all equipment, clothing and jewelry regulations required of any employee within the operating area of the targeted department, (2) General Conditions, which included items for evaluating the housekeeping in the department as well as proper storage of equipment when it was not in use, and (3) General Behaviors, which included some items describing proper safe behaviors required by anyone within the operating area but not related to a specific job, such as walking within designated walkways and holding handrails when climbing and descending stairs, and some behaviors required by any employee of the targeted department, such as pushing, rather than pulling tow buggies. With the exception of a few items within the general behaviors category, any person within the operating area of the department, whether an employee or not, could be evaluated on the items contained within the general portion of the safety behavior checklist.

The specific portion of the safety behavior checklist included items pertaining only to the job of the press operator. The press operator position was the main job within the experimental department and had many hazards not
experienced in any other job. Each of the items on the specific portion of the checklist was a behavior performed by one or more of the employees each time the bale pressing operation took place (which can be 30 or more times per shift). Although many behaviors could be identified as essential to the safety of the press operating job, as well as the general safety in the department, only items that could be reliably judged by observers were included on the safety behavior checklist (i.e., items were clearly defined so that little subjective judgment was required of observers.)

The general and specific items on the safety behavior checklist were developed from several sources. First, departmental accident records were reviewed for the previous five years to determine the major causes of injury in each job. Second, training manuals were reviewed to identify the procedures for conducting each part of the job safely. The training manuals provided a) detailed procedures for performing each part of the job, b) identification of potential hazards in each procedure, and c) noted potential injuries that could occur if proper procedures were not followed. Third, the job safety analyses for each work task were reviewed and compared with the training manuals to ensure the proper safe procedures had been identified. Finally, a
completed checklist was given the departmental supervisor and safety specialists and other staff familiar with the operating area for their review.

After reviewing and revising the safety behavior checklist, the safety specialist and the author made several tours of the department to determine which behaviors could be observed without interfering with an employee's work and which behaviors occurred often enough for repeated observations (for instance, procedures that were defined for "shutdowns" or "startups" were omitted since these activities rarely occurred.) (See Appendix A for the complete safety behavior checklist.)

**Safety Climate Survey.** A Safety Climate Survey was used to assess employees' general attitudes toward safety (i.e., their perception of control over their own safety, their ability to make a difference in a safety program as an individual worker, their perceptions of their supervisor’s commitment to the safety of the employees, etc.) as well as a few other areas such as locus of control, etc.

A Safety Climate Survey had recently been developed for another department of the company where the present field study was conducted. Since this survey incorporated many of the factors measured in previous safety climate surveys
(Zohar, 1980 and Brown & Holmes, 1986) as well as other potentially important personality variables, it was adopted for use in the present study. Additionally, responses provided on surveys used in the present study could be used with those of the other departments to provide additional information on safety climate for the host company.

The Safety Climate Survey contained a 48-item safety scale which measured such dimensions as perceptions of management involvement in safety, perceptions of the risks associated with working at this site, and perceptions of the importance and adequacy of safety training. In addition to the safety scale, three personality measures believed to be important to determining safety climate were measured with pre-existing scales developed to measure those variables (1) Group Cohesion/Belongingness, or an individual’s perception of closeness with his or her co-workers (Wheelees, Wheeless & Dickson-Markman, 1982), (2) Optimism, or the expectation of positive outcomes (based on a sub-scale of Sheier & Carver, 1985), and (3) Self-Esteem, or the evaluation of one’s own capabilities and attributes (Rosenberg, 1965).

Employees were asked to respond to a series of questions about safety/personality on a 5-point scale ranging from "highly disagree" to "highly agree" (however, two of the
personality subscales had only 4-point scales with the same anchors excluding the "not sure" category.) In preliminary meetings regarding the development of this field study, management personnel in the baling department expressed feeling their employees were not committed to safety and often did not participate in safety efforts both within the department and plantwide, partly because of employee claims that they had no control over the accidents and injuries that occurred within their department. The Safety Climate Survey was administered during the early part of the baseline portion of the experiment in order to assess those beliefs. It was hoped the present study would change some of those beliefs (i.e., that employees would feel more involved in and committed to safety following the intervention portions of the study, and that they would understand that it is possible to prevent the majority of accidents and injuries that occur during their shift.)

The survey was administered during regularly scheduled shift safety meetings, held once every four weeks. Safety meetings were considered mandatory, and employees were paid overtime for 1 to 1/2 hours they spent in safety meetings each month. Participation in the survey was not required, but the importance of the survey was explained by the first author and
the departmental safety specialist and all employees present at the safety meeting received a copy. At the end of the hour long safety meeting, all employees turned in their copies of the Safety Climate Survey.

In order to test whether attitudes and beliefs changed as a result of this safety program, the climate survey was administered a second time near the end of the study, approximately 25 weeks after the first administration. Again, survey administration was completed during regular shift safety meetings, and participation was not mandatory. Changes in ratings from the survey administration at Time 1 to Time 2 were assessed to determine any significant difference in the "Safety Climate" of the department. (See Appendix B for a complete copy of the Climate Survey.)

**Intervention Strategies**

**Feedback.** Consistent with the successes of the research cited previously, graphic, public feedback was included as part of the intervention strategy. Thirteen separate feedback charts were constructed for each of the two experimental groups. There was one response feedback chart for each of the ten specific behaviors of the press operator and one chart for each of three composites of items in the personal protective
equipment, general conditions, and general behaviors categories on the opposite side of the behavior checklist. Each of the separate feedback charts was the size of a standard sheet of paper with the title of the behavior across the top, the date/observation number on the x-axis, and the percentage of safe behaviors on the y-axis. A sample feedback chart is shown in Figure 1. This sample figure represents what a feedback chart looked like for a single behavior for one of the participating shifts. As noted above, during the actual field study, there were 13 feedback charts while the Feedback + Thank You group received feedback and 26 graphs during the time both groups (Feedback + Thank You and Feedback Only) received feedback.

Graphs were placed on brightly colored posters, blue for the Feedback plus Thank You group and red for the Feedback only group. These posters were placed along the entry hallway leading to the main operating area, with the posters for each group on either side of the hallway. Corresponding behaviors were placed directly across from each other in the hallway so the different shifts could compare their percentages on each behavior if they so chose.

At the end of the baseline periods for the respective groups, posters summarizing the baseline data were placed in
the entryway. During the intervention phases posters were updated. Following the completion of each observation session, safe behavior percentages were calculated for each individual behavior or composite of behaviors by dividing the number of safe observations by the number of total (safe + unsafe) observations and multiplying by 100. The observer added the observation number and date to the x-axis and then graphed the percentage of safe behaviors on each of the thirteen graphs for each of the groups. Graphs continued to be updated following each observation session until the intervention portions were complete. After the intervention phases, all graphs and posters were removed.

Thank You Card. The Thank You card, as depicted in Figure 2, was simply a small paper card designed specifically for use in the baling department by both employees and supervisors to "thank" their peers or other employees for performing their jobs in a safe manner. The Thank You Cards had general categories of behaviors listed on one side (e.g., wearing appropriate personal protective equipment, giving positive feedback to a coworker for working safely, recognizing and correcting an unsafe condition, etc.) for the employee to check off, and a space for the employee to record the specific behavior they observed their coworker
performing on the opposite side. In filling out the card, the observing employee was to record the name of the employee observed, the category of safe behavior observed, a description of the specific safe behavior observed, along with the date and time of observation, and then turn it into the supervisor. The supervisor was asked to tear off the bottom portion of the card and give it to the safe employee as soon as possible after the safe behavior was observed. This portion of the card entitled the safe employee to a free beverage in the company cafeteria. Additionally, there were spaces on the card for the observing and observed employees to fill out a designated code. The bottom portion of the card with the actual employee names could be torn off (this was the portion used to exchange for a free drink in the cafeteria) and the top portion with all of the safety information could remain anonymous since it only had the employee codes on it. One unfortunate circumstance associated with the use of the Thank You cards was that, since only one shift of the department had the opportunity to use the cards, members of that shift insisted the cards be located in the supervisor’s office so employees from other shifts could not have access to them. It was hoped this inconvenience would not deter employees from using the Thank You cards.
The Thank You cards seemed suited to this department for several reasons. First, previous efforts in this department using Dupont's "STOP" program (workers and supervisors were supposed to fill out a "STOP" card on an employee if he or she was seen doing an unsafe act) had failed. Workers responded to the "STOP" program by saying they did not like the idea of "policing" each other and that they were tired of only being noticed for the things they did wrong or unsafely.

When the idea of using Thank You cards was presented, it was met with a great deal of enthusiasm. Not only would workers be praised for performing their jobs safely, the whole work environment could change from focusing on the negative aspects of work behavior to focusing on the positive aspects. It was hoped that once employees got used to thanking each other for working safely, they would eventually become comfortable enough to correct a co-worker when he or she was performing a task in an unsafe manner. Finally, this particular program was one that allowed the shift employees to participate actively in safety. It was hoped the Thank You cards, in combination with feedback on safe behavior performance, would be accepted by the employees and result in an increase in safe work behavior.
Design and Procedures

A multiple baseline design was used. Baseline measures were taken daily for several weeks on both "C" and "D" shifts. "C" shift, the group hereafter known as FB+TY (Feedback + Thank You group), began receiving Feedback first while "D" shift, the FB (Feedback) Only group, remained in the Baseline phase. After several weeks, "D" shift joined "C" shift in receiving feedback. Finally, after several more weeks of feedback for both groups, "C" shift participated in the Thank You card intervention while "D" shift continued to get Feedback only. At the beginning of the Baseline phase and toward the end of the observations, both groups filled out the Safety Climate Survey.

Observational tours began in the department with the Baseline portion of the study. Tours were conducted approximately once per working day per shift for an average of 45 minutes to 1 hour. The author was the primary observer, however, a department safety specialist/safety observer or trained undergraduate student accompanied the author on tours and collected data several times per week in order to assess reliability.

During each observational tour, all of the items on the behavior checklist were marked as either "safe", "unsafe", or
"not observed/not applicable". The majority of these behaviors were performed several times during the course of the shift as required by the job. For instance, one side of the observational data sheet listed several behaviors that must be performed in succession in order to complete a particular job task, the job of pressing a bale. Other behaviors, such as wearing appropriate personal protective equipment, were required for any person working in the department. Thus, these behaviors could be observed at least once and possibly several times during one observation session.

Other categories included in the behavior checklist were "general conditions" and "general behaviors". The "general conditions" category included items such as proper housekeeping or placing various types of waste in the appropriate receptacle, and keeping equipment in the proper storage position when it was not currently being used. Although these items are not actually behaviors, observation of waste or equipment in the appropriate position implies that someone performed the behavior of placing that object in that position. Thus, "general conditions" were included as part of the behavior checklist.
The category of "general behaviors" included items that might also be called "safe behavior opportunities". (Geller et al., 1989). Any of these opportunities might have happened at any time during the workday, but were not necessarily performed at any certain time or in any specific order. Examples of safe behavior opportunities include: holding the handrail when climbing or descending steps, walking within designated walkways and pushing rather than pulling when moving objects.

Each of the items listed under the "general conditions" and "general behaviors" categories was also marked as "safe", "unsafe", or "not observed/not applicable" during observational tours. A percentage of safe behaviors was calculated by dividing the number of safe items observed by the total number of behaviors observed and then multiplying by 100. Additionally, individual percentages were calculated for each of the specific work behaviors of the press operators, listed on the front side of the audit sheet. And, items listed on the back of the audit sheet were collapsed into three categories of behaviors: "personal protective equipment compliance", "general conditions", and "general behaviors". Reliability checks were made by having a trained assistant make an observational tour at the same time, but independently
of the primary observer. A reliability index was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

Training of undergraduate observers consisted of three different phases. First, the students were shown a film made by the baling department which depicted common unsafe acts and the resulting injuries. Next, the students were given a tour of the baling department, where they were able to see all of the equipment used during the baling process and the proper procedures for operating the equipment. During the tour and video, the undergraduate trainees studied copies of the behavior checklist and made assessments about proper safe and unsafe behaviors. Finally, the students went into the production area and made some observations. Each undergraduate was given copies of the behavior checklist and was told to follow the procedures for filling them out. The trainees continued to make assessments using the behavior checklists until they were able to identify all items on the checklist as either safe or unsafe as they occurred in the production area. Practice continued until the entire group of observer trainees could reach 100% agreement on all of the behaviors assessed during the observation period.
This multiple baseline study consisted of the following phases:

1. **Baseline observation.** Only the observers were aware of the items defined on the behavior checklist. Workers were aware of the general purpose of the observations (i.e., that observers were collecting data related to a new safety initiative), but they did not know their behaviors were being observed. Prior to beginning the observations, the Safety Climate Survey was given to the employees in both conditions. The baseline portion of the experiment lasted 5 weeks for the FB+TY group and 9 weeks for the FB Only group.

2. **Feedback.** A short discussion was conducted with the FB+TY group during their regularly scheduled shift safety meeting. This discussion explained the purpose of the observations and revealed the behaviors on the safety behavior checklist. The results of the baseline phase were shown in poster/graphic form. There were 13 separate graphs in all, 10 displaying each of the specific behaviors of the press operator and 3 representing compilations of all the behaviors in the personal protective equipment, general conditions, and general behaviors categories respectively. The percentage of safe behaviors was calculated by dividing the number of safe observations by the number of safe plus unsafe observations.
and multiplying by 100 percent. The percentages for each day of observation during the baseline period were posted in graphic form at the end of baseline, and were updated following each observation session during the feedback phase. These graphs were placed at the main entrance to the baling department and remained there until the end of the study. The feedback intervention lasted approximately 12 weeks for this group.

During the 12 week posting of response feedback for the FB+TY group, the FB Only group remained on baseline for an additional 4 weeks. When this time period was up, a meeting was conducted during the FB Only group’s shift safety meeting to explain the observation and feedback procedures as was done with the FB+TY group previously. The FB Only group also had 13 separate graphs of their own safe behavior percentages, and these were placed directly across from those of the FB+TY group in the baling department. Like the FB+TY group, the FB Only group had their safe behavior percentages posted following each observation session. The feedback intervention lasted 18 weeks for the FB Only group, overlapping 8 weeks with the FB+TY group.

3. **Thank You Cards.** Once the FB Only group had received feedback for 8 weeks, another meeting was held for the FB+TY
group, again, during the regularly held shift safety meeting. At this meeting, the process for filling out Thank You Cards was explained. Each employee at the safety meeting was given a Thank You card and a sheet of paper explaining the purpose of the cards and directions for filling them out. Operators were told that a supply of cards would be available in the baling office for their use during the next several (10) weeks, and they were encouraged to use them.

Both the FB+TY and FB Only group continued to have feedback posted, however, the FB Only group did not have access to the Thank You cards during this phase. The Thank You card intervention lasted 10 weeks for the FB+TY group while the FB Only group, as the name implies, continued to receive feedback only. Twenty-five weeks after the first Baseline observation, toward the end of the Thank You card phase of the experiment, the Safety Climate Survey was administered to both groups a second time.

4. Withdrawal. After 10 weeks of the second intervention phase (Feedback + Thank You cards for one shift and Feedback Only for the second shift), all feedback posters were removed and employees were told during their safety meeting the Thank You program would be halted until further evaluation. Observations continued on an irregular basis to
determine the percentage of safe behaviors, however, no feedback was posted as a result of these observations.
RESULTS

I. Reliability

Inter-observer reliability measures were taken on approximately 70 percent of the behavioral observations. Of the 111 observation sessions for the Feedback + Thank You group, secondary observers accompanied the author on observational tours 78 times (70.27%). Secondary observers were present for 75 of the 107 observational tours of the Feedback Only group (70.09%). Partial information was available on several additional occasions when secondary observers started tours but were interrupted before finishing that day’s observations. Therefore, reliability data were calculated only for those observation sessions completed by both primary and secondary observers.

Two observers recorded over 11,000 separate behavioral observations during the course of the field study for the FB+TY group and over 10,000 observations for the FB Only group. Separate reliability calculations were performed for each experimental group during each phase of the experiment. Reliability calculations were broken down further by estimating separate reliabilities for behaviors judged as safe and those judged as unsafe. These reliability estimates are given in Table 1. The results of these calculations showed an
extremely high degree of inter-rater reliability in classifying the behaviors on the safety behavior checklist. II. Behavioral Observations.

The percentage of safe behaviors was calculated for each of the ten individual safety behaviors designated for the press operator on the Safety Behavior Checklist. A separate graph was made for each of these behaviors, each bearing a label at the top of the graph indicating the behavior displayed, including all data points for the baseline period, as well as during the respective interventions for the FB+TY and FB Only groups. These graphs were visually inspected to note changes in the percentage of safe behavior performed during each of the research phases. Additionally, three composite scores were formed from the items on the reverse side of the Safety Behavior Checklist. These three composites, personal protective equipment, general conditions, and general behaviors, were formed because they occurred at more irregular intervals and thus it was not certain there would be behaviors performed in each category during each observation. Therefore, related items were collapsed into categories so there would be at least some observations in each composite to form a data point for that day’s observations. These three
composites were also graphed for each of the experimental phases so they could be visually inspected. A fourth composite was created by combining all those behaviors which had a safe behavior percentage less than 90% during the baseline phase. This composite was formed so it would be possible to determine the effect of the interventions on behaviors not constrained by a ceiling effect.

Figures 3-16 show graphs of the FB Only and FB+TY groups' safe behavior percentages for each of the ten individual behaviors plus the four behavior composites. Each data point on each graph represents the percentage of that particular behavior which occurred safely during that day's observation period. The observation numbers along the x-axis each have a letter designating the phase of the experiment (B=baseline, F=feedback, T=Feedback + Thank You, and W=withdrawal). There is also a line through the data points for each phase of the study which represents the average safe performance for all observations during that particular phase. For ease of comparison, these percentages are also shown in Table 2.

Many of the percentages of safe behavior performance were much higher than anticipated, even during the baseline period. In fact, as shown in Figures 3-16, many of the behaviors
showed little room for improvement. For example, Figure 4 shows that the behavior "push prebale can onto press" was already at 100 percent during the baseline phase. Several other behaviors (11 for the FB+TY group and 10 for the FB Only group) had baseline percentages higher than 90%.

**Feedback Only Group.** Figures 3-16 show clear support of Hypothesis 1 for the FB Only group. There was a visible increase in safe behaviors for nearly every behavioral category (see Figures 3, 5-12, and 14-16). For instance, Figure 5, "press doors latched", shows an increase from 72 percent to 93 percent from baseline to intervention. Most of the other behaviors did not have quite as dramatic an increase, but improvement from baseline to the feedback intervention is obvious. Figure 16, the composite of behaviors not constrained by ceiling effects shows the effectiveness of the feedback intervention exceptionally well, with a 14 1/2 percentage point increase over baseline levels. The few behaviors (see Figures 4 and 13) that did not show a significant change following the intervention are those that already had extremely high safe performance percentages.

These figures also show strong support for Hypothesis 3, which predicted a drop in safe behaviors once the intervention was withdrawn. With the exception of the behaviors "stand
clear when closing press doors" and "stand clear when pressure is released", Figures 8 and 11 respectively, all of the behaviors which showed an increase from Baseline to Feedback also showed a decrease in safe behavior percentage from the Feedback to Withdrawal. Some residual effects from the interventions were expected, so the percentages were not expected to return to baseline levels. Of the 14 different categories of behaviors, (10 press operator behaviors, 3 composites of PPE, Safe Conditions and Safe Behaviors, and one composite of all behaviors with baseline averages below 90%) 10 of the safe percentages during the Withdrawal phase remained above Baseline levels and 4 dropped below the levels achieved during Baseline. The two behaviors that did not change significantly from Baseline to the intervention continued to maintain the same high percentage of safe behaviors during the Withdrawal phase. Thus visual inspection of Figures 3-16 provides strong support for both Hypothesis 1 and Hypothesis 3 as applied to the Feedback Only group.

**Feedback + Thank You Group.** Figures 3-16 show the same pattern of results for the FB+TY group. Figure 14, "general conditions", shows a 12 percentage point increase from Baseline to the Feedback phase. Figure 16, the below-90% composite shows nearly a 16 percentage point increase between
the two phases. Again, the only behaviors that did not show a significant increase were those that had extremely high safe performance percentages during Baseline (see Figures 4, 9, and 13). All of the behaviors that increased during the Feedback phase also decreased during the Withdrawal phase. Nine of the behaviors remained above Baseline percentages (indicating a possible residual effect), 4 fell below the Baseline average and 1 behavior showed no change in safe percentage. Again, visual inspection of Figures 3-16 shows support for Hypotheses 1 and 3 for the Feedback + Thank You group.

Hypothesis 2 predicted that the percentage of safe behaviors performed would increase above what was attained during the Feedback intervention when the Thank You intervention was introduced. As noted above, this was impossible in certain cases because several behaviors had already reached levels of 100% (and several above 90%) safe by the time the Feedback intervention was complete. However, several behaviors did show visible increases from the Feedback intervention to the intervention which combined Feedback with Thank You cards. Figures 3-16 show the mean level of safety performance during the Thank You plus Feedback intervention relative to the Feedback intervention alone. Figures 7, 10, 11, and 13-16 all show evidence of an increase in safe
performance levels for those behaviors when the Thank You intervention was added. There is some partial support for Hypothesis 2, but for reasons discussed later, it may not be due entirely to the reasoning behind the hypothesis.

III. Participation in the Thank You Card Program.

The Thank You card portion (paired with Feedback) of the intervention lasted slightly less than 10 weeks. Although the employees appeared enthusiastic and willing to participate in the program when it was introduced during the regular safety meeting, very few employees actually went through the process of filling out a card and turning it in. In fact, only 8 Thank You cards were turned in, with 5 different employees filling out cards and 6 different employees receiving a "Thank You." All 8 of the cards were distributed and received during the first 2 weeks of the intervention. In terms of participation percentages, approximately 13 percent of the employees in the department filled out a Thank You card and 15 percent received one. Only 2 of the operators both distributed and received a "Thank You."

While only a small percentage of the department participated in the Thank You process, most of the others were aware that the process was going on. The Thank You cards
turned in were posted on the bulletin boards adjacent to the feedback posters. Of course, the cards had the portion of the cards with the participants names removed before posting. Thus, employees who checked their progress on the safe behavior feedback charts could also see what types of behaviors were being thanked (these behaviors ranged from wearing appropriate PPE, to holding the handrail on stairs, to helping a fellow employee move a piece of equipment that was "stuck.") So, even though some employees chose not to distribute cards, they may have been aware that their fellow employees were looking out for each other and "thanking" them for being safe.

IV. Climate Survey.

Participation rates for the climate survey were generally fairly high. Ninety percent of both shifts (38 of 42 for the FB+TY group and 36 of 40 for the FB Only group) participated in the Safety Climate survey at administration 1 by filling out part or all of the survey and turning it in. Eighty percent of both groups (24 of 30 for the FB+TY group and 28 of 35 for the FB Only group) participated in the survey at administration 2.
Reliability measures were calculated for each of the four scales for each administration. Cronbach’s coefficient alpha calculations indicated the following reliabilities for each of the scales: 1) Safety - .80 at administration 1 and .88 at administration 2, 2) Self-Esteem - .73 at administration 1 and .85 at administration 2, 3) Belongingness - .92 at administration 1 and .84 at administration 2, and 4) Optimism, .84 at administration 1 and .70 at administration 2.

In order to maintain the same scale for all questions on the climate survey, (low numbers on the scale representing disagreement or negative answers to climate survey questions, and high numbers representing agreement or positive answers to survey questions) the following questions in each scale were reverse-coded to reflect positive wording (see Safety Climate Survey in Appendix B): (a) Safety Scale, question numbers: 3, 8, 13, 14, 17, 19, 21, 24, 28, 30, 36, 37, 39, 41, and 44, (b) Self-Esteem Scale, question numbers: 3, 5, 8, 9 and 10, (c) Belongingness Scale, question numbers: 3, 4, 8, 10, and 17, and (d) Optimism scale, question numbers: 3, 8, 9 and 10.

It was expected that attitudes, as measured by the safety climate survey, would improve from the first administration of the survey to the second. Although it would have been optimal to use a repeated measures ANOVA for this analysis, it was not
possible in this case. While the members both FB+TY and FB Only groups were essentially the same at both administrations of the climate survey, it was not possible to match individuals. There were individuals on both shifts who chose not to participate in part or all of the survey at either the first or the second administration period, as well as some members of each group who were not available during one or the other administration. Additionally, there were a large number of individuals who chose not to fill in the portion of the survey which served as an identification number. Thus, it was impossible to match all subjects in each group for the two administrations of the survey.

Since the repeated measures procedure was not feasible, a two-way ANOVA (2 shifts x 2 administrations) for unbalanced groups (Huck, Cormier & Bounds, 1974) was used to examine the climate survey data. A separate ANOVA was performed for each of the four subscales in the climate survey: Safety, Self-Esteem, Belongingness and Optimism, with the total score for each subscale as the dependent variable.

Hypothesis 4 predicted the scores on the Safety Climate Survey would be higher at the second administration of the survey (after the interventions had been in place) than at the first administration of the survey (at the beginning of
Baseline). In terms of analysis, a significant main effect for Administration number was expected. No significant differences were expected for the Shift main effect or the Shift x Administration interaction.

Results of the analysis of variance procedures are presented in Table 3. This table reveals very few significant differences among the independent variables for any of the four subscales. Analysis of the Safety subscale, of primary interest in this field study, revealed no significant Shift x Administration interaction, $F(1,109) = 0.02$, $p > .05$ and no main effect for either Shift $F(1,109) = 2.44$, $p > .05$ or Administration number $F(1,109) = 2.58$, $p > .05$. It was evident from these results that neither Shift (FB+TY group versus FB Only group), Administration number or the interaction of these two factors affected the safety score. Thus, Hypothesis 4 was not supported for the Safety Subscale, the safety score did not change significantly from the first to the second administration of the Safety Climate Survey.

Table 2 also reveals no support of Hypothesis 4 for the other three subscales of the Safety Climate Survey, evidenced by non-significant effects for the Administration main effect for each of the three scale scores: Self-Esteem $F(1,101) = 1.93$, $p > .05$; Belongingness $F(1,101) = 1.16$, $p > .05$; and
Optimism $F(1,100) = 2.44$, $p > .05$. Scores did not change significantly from the first time the survey was given out to the second survey administration for any of these three subscales. Additionally, there were no significant Shift x Administration interactions for any of the three scales. In fact, the only significant effect found for any of the 4 scales of the Safety Climate Survey was a main effect for Shift for the Self-Esteem scale $F(1,101) = 4.77$, $p < .05$, indicating the FB+TY group had higher self esteem scores than the FB Only group. No other Shift main effects were significant.

In summary, no evidence was found that time of administration affected any of the 4 subscale scores. The interaction of Shift and Administration number also did not affect the total score for any of the scales. Finally, there was a significant difference between the two shifts for the Self-Esteem portion of the Safety Climate Survey, but not for any of the other three scales. Again, no support was found for Hypothesis 4, which predicted an Administration number main effect.
DISCUSSION

Overall, the results of this experiment were positive. The traditional feedback intervention was quite successful with both groups of employees. The Thank You program did not generate as much participation and support as was hoped, however, several of the behaviors observed increased in safe percentages during the Feedback + Thank You intervention. The results from the comparison of climate survey administrations were somewhat disappointing, since neither group showed improvements from the first to the second administration on any of the four scales. Several reasons for these results are explored throughout this discussion section.

First, many of the behaviors observed in this study had remarkably high baseline levels of safe performance. Many of the management personnel within the baling department were pleasantly surprised that the percentages were so high, considering they picked behaviors to observe which were thought to be a problem. Part of these extremely high levels may be because the employees knew they were being watched, and as a result were on their "best" behavior. Although the primary observer in this field study, the author, had been performing related safety observations in the department for many months prior to this experiment (e.g., to develop the
behavioral checklist and observation procedures) and the operators were used to her observing their behavior, it is possible that the employees were still reacting to being watched. Not only did the operators on the two shifts observed realize they were being observed, during the course of the study it was revealed to them that other parts of the plant may participate in a safety program similar to theirs depending on the outcome of this pilot project. This added pressure could have provided incentive for employees to continue performing their "best" even after they grew accustomed to being observed.

The fact that not all behaviors observed had extremely high baseline safe percentages provides an interesting question. If knowing proper procedures leads to safe performance, as Karan & Kopelman (1986) suggest, perhaps employees had more knowledge about the behaviors with higher percentages and did not realize they were performing the lower percentage behaviors unsafely. These behaviors increased during the interventions, once the behavior checklist was revealed and operators learned which of their behaviors were being observed. Since no additional training occurred, and safe percentages went up for nearly all behaviors, this
suggests employees knew how to perform the behaviors safely all along, but for some reason, they chose not to do so.

Any number of explanations can be offered for why some behaviors started out with extremely high safe percentages and others did not. Perhaps the lower percentage behaviors seemed less risky, less likely to result in injury. Some safety behaviors were definitely more convenient than others, for example, "placing plastic wrap around the bale before box is dropped", an unsafe behavior, is much faster than waiting until the appropriate time to do the procedure. Finally, some safe performance seemed to depend on who was watching. Although the presence of an observer was constant throughout all observations, the author (primary observer) noticed that employees performed certain behaviors more safely during the day and afternoon shifts than during the night shift (11 p.m. to 7 a.m.). For example, many operators wore clothes and jewelry which did not meet the personal protective equipment policy requirements when members of management were not present to "catch" them. Then, when employees went back on daylight shift, they responded by wearing appropriate clothing and jewelry again.

Whatever the explanation(s) for the fact that some behaviors had higher safe percentages than others, it is not
as simple as knowing how to perform safely. This lends further support to the behavioral or response rather than the outcome approach. It is important to discover the contingencies associated with behaving safely or unsafely. Certainly the risk of injury is a contingency that affects working behavior, however often the chance of getting hurt seems remote and other, more immediate contingencies (such as getting the job done fast, without much effort) take precedence. Training employees to perform their jobs according to safe procedures will certainly reduce injury, but it cannot be assumed because employees know how to perform a job safely they will do so all the time.

Although some of the behaviors observed were subject to ceiling effects due to high baseline levels of safe performance, support for the Feedback intervention is unmistakable. During the Feedback phase for both shifts, safe behavior observations increased for every behavior relative to Baseline values, with the exception of those safe behaviors already occurring at extremely high levels during the Baseline portion of the experiment. As revealed in the introduction, feedback has long been recognized as a very effective intervention strategy. Significant support was found for both groups of operators for Hypothesis 1, which predicted an
increase in safe percentages from Baseline to the Feedback intervention. This study follows many others in the field of safety (e.g. Chhokar & Wallin, 1984a; Komaki, Heinzmann & Lawson, 1980; and Sulzer-Azaroff & de Santamaria, 1980), showing that feedback will increase the occurrence of safe behavior in a work environment. Additionally, the present field study provided a slightly new twist, showing that feedback given on a more frequent (nearly every shift) basis is also effective in improving safe behavior percentages.

Along these same lines, support was also found for both the Feedback + Thank You and Feedback Only groups for Hypothesis 3, which predicted that levels of safe behaviors would decrease following withdrawal of the interventions. This is another well established phenomenon in intervention research. Although it would have been optimal if safety behaviors increased and then remained at high levels, the withdrawal design lends support to the hypothesis that the applied interventions were responsible for the increase in behaviors. Most of the behaviors did not return the Baseline averages, indicating a possible residual effect from the interventions, however, a few behaviors did fall below levels achieved during Baseline. This finding is most likely explained by the fact the Withdrawal phase of the experiment
contained so few (6) data points, making the average during this phase susceptible to extreme data points.

Support for the Feedback plus Thank You card intervention was not as convincing as for Feedback alone. Although many behaviors had no room for improvement once this intervention was introduced, several behaviors did show some visible improvement from the Feedback only phase to the Feedback plus Thank You phase. However, there is reason to believe that this increase may not be due entirely to the Thank You intervention. While the supervisor in the department reported that many Thank You cards were taken from the designated area, fewer than 10 were returned with all of the proper information. Some cards were not turned in at all and some were turned in without designating who the employees were who were thanking and being thanked.

There are several possible reasons for the lack of support for the Thank You program. First, the Thank You intervention was relatively short. The employees in this department were very reluctant to try new things, especially when their peers were watching. Also, this group (C-shift) realized they were the only shift allowed to use the Thank You cards, and this might have made the operators even more reluctant to use them. Some departmental officials indicated
in interviews that they believed if the cards were available for a longer period of time, they may have gotten more use. Once a couple of key people got started the majority of the people left would follow.

Second, many employees saw the program as too much trouble. Some of the operators insisted the Thank You cards be locked up in the supervisors office so that employees from other shifts could not have access to them. However, this required employees on the experimental shift to take time out to go in and ask for a card, which required more effort than some employees were willing to make. Third, this program was seen by some to be similar to the "STOP" program which had failed previously in this department. Employees said they were unwilling to "spy" on other people, and did not want to be responsible for anyone else's behavior. Fourth, for reasons explained below in relation to the results for the climate survey, most employees were very reluctant to participate in any program linked to "management." Although this idea was discussed with operators from the baling department while developing this study, any program presented by someone other than an operator was seen as a "management idea."
One additional reason why the Thank You program may not have worked well is that the employees in the plant have traditionally been very suspicious of anything which requires watching other employees and making written notes. Even though only positive behaviors were being recorded, operators were still very wary. They may have believed that somehow their actions could be turned around to hurt them. Employees are very unwilling to confront each other, even in a positive light. Finally, two extremely negative employees indicated that they would not take part in any program which required any effort that was not designated in their job description.

Many of the above attitudes became apparent in the departmental safety meeting following the one during which the Thank You card program was introduced (this occurred approximately 4 weeks into the Feedback + Thank You intervention). The topic of this meeting was the presentation of a plantwide safety program which, although voluntary, asked employees to audit each other, and record the unsafe behaviors of their peers. The reaction to the new safety program was extremely negative, and many employees brought up the points listed above. Although nothing was said directly about the Thank You program, the discontent and anger over the new plantwide safety program may have affected willingness to
participate in the Thank You program (this seems especially plausible since all Thank You cards that were used were turned in prior to this controversial meeting).

Perhaps these reasons indicate why the Feedback Only portion of the experiment was successful. Employees could respond to feedback on their safe behavior performance by doing their job in a safer manner without expending very much extra effort. While the safe method of performing the job may have required a little more time or effort, technically, all of these behaviors were required as part of the job, so employees were more willing to change these behaviors. Also, employees who responded to feedback charts could make that decision individually, without involving or watching any other employee.

Finally, the results of the safety climate survey were somewhat disappointing. Attitudes toward the work group and toward safety were expected to improve following the safety interventions. Despite the fact safety behaviors increased during the interventions, the safety climate not only did not improve, often it got worse. While the level of safety perceptions was neutral for most questions at the first administration of the survey (usually ranging between 2.5 and 3.5 on a 5 point scale) and slightly more negative (ranging
between 2.0 and 3.0) at the second administration, the results were still less than optimal. It was hoped that the level of safety perceptions would be more positive following positive information displayed during the Feedback and Thank You phases, and while the change in safe perceptions was small, it was in the opposite direction as predicted.

Many of the reasons given above for the failure of the Thank You intervention may also relate to the results of the climate survey comparison. In addition to the reasons given above, several events happening both within the department and plantwide may have contributed to the negativity in attitudes even after the interventions were in place. First, it is possible that not enough time elapsed between administrations of the safety climate survey. Not only did the operators remember taking the survey before, many expressed discontent over having to do it again. They could not understand the purpose (in fact, many claimed nothing had changed, although the results show otherwise). In addition to operators being resistant to any management program, they are also very skeptical that the changes implemented will be permanent. Many programs have come and gone during the typical employment period of the operator. Therefore, attitudes are very resistant to change, especially in only a few months time.
Second, many critical events occurred between the two administrations of the survey. The entire plant went through an audit process in order to have the quality process certified. This entailed having auditors come in and ask questions of operators about the process and watch their behavior. The local union also went through contract negotiations during this time frame, and came very close to calling for a strike. One of the results of the contract agreement was that all employees were required to attend one safety meeting per month (attendance was previously voluntary.) Additionally, a three months earlier, the plant had made a personal protective equipment policy mandate which required most employees to wear equipment they did not wear previously. Many employees were outraged, as they do not like to be told they have to do anything not directly required by their jobs.

Another event which caused controversy was the initiation of a plantwide safety incentive program (mentioned earlier in relation to the Thank You card intervention). This program was voluntary, but included components requesting employees to audit each other's behaviors, and look for mistakes or safety hazards. Employees were extremely resistant, citing they did not want to "rat" on their fellow employees, and that somehow
these audits could be used against them and their supervisors. This may be another reason why employees were not interested in filling out Thank You cards.

Finally, during part of the intervention, a new area was being added to the baling department which included new and different machines. This required additional training and different procedures. While these machines actually made the employees' jobs easier, the operators did not like any type of change. Many were afraid that because the job was becoming more automated, more work would be expected of them and there was the possibility that some operators could lose their jobs. All of these factors combined may explain the failure of attitudes to improve as a result of the interventions introduced in this experiment. While the climate survey results did not support the experimental hypotheses, use of safety climate measures may still be a viable option for determining the effectiveness of a safety intervention.

Overall, while the results were not totally supportive of the experimental hypotheses, it was found that key behaviors in the department could become safer with observation and feedback on safe behavior performance. While the Thank You program did not generate as much support as hoped, behaviors still improved and, in industry, this has to be the primary
goal. Perhaps with some modifications, the Thank You program, combined with feedback, can be a successful combination. Future research should examine this question, particularly with regard to employees participating as intervention agents. For feedback to be cost effective over the long term, employees must participate as observers and feedback administrators. Employees must learn to look out for each other, in addition to themselves. Future research must address this challenge.
REFERENCES


APPENDICES
Appendix A: Safe Behavior Checklist

The Safe Behavior Checklist had spaces at the top for the names of the primary observer and secondary observer, the date and time of observation, and the shift observed.

The front of the checklist had blanks for up to ten observations (observers filled in "S" for safe, "U" for unsafe, and "NA" for not applicable) for each of the following behaviors of the press operator:

1) Path clear for prebale can
2) Push prebale can onto press
3) Press doors latched
4) Materials not touched during last 6 inches of box travel (up)
5) Plastic wrap placed after box is dropping
6) Stand clear of doors when closing press (no body parts between doors and bale)
7) Jacks returned to upper storage position when strapping is completed
8) Stand back/to side when receiving bands
9) Stand clear of press when pressure is released
10) Stand clear of press when fork truck picks up bale

The back of the checklist had three categories of behaviors with several items under each. Each of these behaviors also had blanks for up to 10 observations (observers used the same coding strategy as on the front side):

A. Personal Protective equipment
   1) Safety glasses with side shields
   2) Safety shoes
   3) Gloves
   4) Appropriate apparel
   5) Jewelry
      a) earrings
      b) necklaces
      c) rings
   6) Long hair secured

B. General Conditions (When equipment is not in use)
   1) Housekeeping (no hazards/waste)
   2) Press head at floor level
   3) Hand Jacks in upper storage position
Appendix A (cont.)

4) Press doors secure

C. General Behaviors
1) Fork truck driver warns pedestrians of approach
2) Walk in yellow lines (if able)
3) Climbing ladders
4) Use handrails on steps
5) Tow buggies pushed not pulled
Appendix B: Safety Climate Survey

Directions: The following questionnaire contains items about your current feelings and beliefs concerning your job, yourself, and your co-workers. Your answers will be anonymous, and only information about group averages will be disclosed. Please note this is not a test and there are no right or wrong answers.

At the top of the survey there were boxes for the employee to indicate their position of employment (e.g., hourly employee in maintenance, operations or another area), their birthdate, and the shift on which they worked. Employees were also asked to fill out a code consisting of the following information: 1) The first letter of the city where the employee was born, 2) the first letter of the employee’s mother’s maiden name, and 3) the number of the month during which the employee was born.

Safety Subscale Employees were given the following scale:

1  2  3  4  5
highly disagree disagree not sure agree highly agree

and were asked to circle the appropriate number to show reaction to each of the following questions:

1) When employees in your department are reprimanded about working unsafely, that person’s behavior changes in desirable directions.

2) Workers who do not follow safety policy irritate their fellow employees even when no harm has resulted.

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

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

5) My plant manager is well informed about relevant safety issues.

6) The money and effort that are put into safety training programs is sufficient.

7) The best people in my department care about safety and they
Appendix B (cont.)

want other employees to follow safety regulations.

8) It is unusual for an employee to be commended on-the-spot for working safely.

9) The safety engineer has a lot of influence on the safety practices in my plant.

10) Plant management is willing to invest money and effort to improve our safety record.

11) My safety training is useful both at work and at home.

12) Management in my plant is well informed about safety problems and acts quickly to correct them.

13) My chance for being involved in a work accident is quite large.

14) Work productivity and quality usually have a higher priority than work safety.

15) The safety committee in my department is regularly involved in safety activities.

16) Managers in my plant really care about safety and try to reduce risk levels as much as possible.

17) Safety performance in my plant is based entirely on the number of accidents and fatalities.

18) I would like to become a member of my department’s safety committee because I would feel more important.

19) More attention is given to unsafe acts than safe acts.

20) Managers in my plant view violations of safety regulations very seriously even when they do not result in accidents.

21) It is only a matter of time before I will get involved in a work accident.

22) There is a straightforward procedure in my department for suggesting corrective action for correcting potential hazards.
Appendix B (cont.)

23) The efforts put into organizing safety training programs really pay back to the company.

24) The safety problems in my job are serious.

25) When a manager in my department realizes that a dangerous situation has been found, he immediately attempts to put it under control.

26) Employees who work most safely are the more highly respected workers.

27) Employees who use personal protective equipment correctly are respected employees.

28) Employees are reluctant to discuss their "near misses".

29) Compared to other plants, I think mine is rather dangerous.

30) Being involved in an accident has a negative effect on the employee’s reputation.

31) Plant management in my plant is always willing to adopt new ideas for improving the safety level.

32) Working safely is the Number 1 priority in my plant.

33) When an employee confronts a dangerous situation in my plant, he/she reports it.

34) Employees who take safety training courses are doing a better job than those who don’t.

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

36) Most accidents are caused by equipment failures.

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

38) I received adequate job training.
Appendix B (cont.)

39) Supervisors are more concerned about their safety record than about accident prevention.

40) Employees participate in the development of safe work practices.

41) Alcohol or drug abuse is a safety problem in my plant.

42) Employees caution other employees about unsafe practices.

43) Checks are made to be sure required safety equipment is being used.

44) Employees who are using alcohol or drugs on the job are about to work without detection.

45) Information that is needed to operate safely is made available to employees.

46) New employees are assigned to work with experienced employees for job instruction.

47) How many years have you worked for your present company? (blank space provided)

48) How many work related accidents (first aid or OSHA recordable) have you had in the last five years? (blank space provided).

Self-Esteem Subscale  Employees were given the following scale

1 highly disagree  2 disagree  3 agree  4 highly agree

and were asked to respond to the following questions by circling the appropriate number:

1) I feel that I am a person of worth, at least on an equal basis with others.

2) I feel that I have a number of good qualities.

3) All in all, I am inclined to feel that I am a failure.
Appendix B (cont.)

4) I am able to do things as well as most other people.
5) I feel I don’t have much to be proud of.
6) I take a positive attitude towards myself.
7) On the whole, I am satisfied with myself.
8) I wish I could have more respect for myself.
9) I certainly feel useless at times.
10) At times, I think I am no good at all.

Belongingness Subscale  Employees were given the following scale

1  2  3  4  5
highly disagree disagree not sure agree highly agree

and were asked to respond to the following questions by circling the appropriate number:

1) My work group is very close.
2) I trust my co-workers completely.
3) The members of my work group do not really understand each other.
4) I distrust the other workers in my department.
5) I like my current work group much more than other work groups I have participated in.
6) I enjoy my work group.
7) I understand my co-workers.
8) I dislike my work group.
9) I interact/communicate with my current work group much more than with most groups I have been in.
Appendix B (cont.)

10) My work group is not very close at all.
11) The members of my work group share a lot in common.
12) I feel very close to the members of my work group.
13) The people in my work group do a lot of helpful things for each other.
14) The members of my work group feel very close to each other.
15) We (my work group) share some private ways of communicating with each other.
16) My work group relationship satisfies an important need for group affiliation.
17) There is a great deal of hostility and aggression between the members of my work group.
18) I feel an interpersonal need for affiliation with my work group.

Optimism Subscale  Employees were given the following scale

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>highly disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>disagree</td>
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<td></td>
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<tr>
<td>agree</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>highly agree</td>
<td></td>
<td></td>
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</tbody>
</table>

and were asked to respond to the following questions by circling the appropriate number:

1) In uncertain times, I usually expect the best.
2) It's easy for me to relax.
3) If something can go wrong for me, it will.
4) I always look on the bright side of things.
5) I'm always optimistic about my future.
6) I enjoy my friends a lot.
Appendix B (cont.)

7) It's important for me to keep busy.

8) I hardly ever expect things to go my way.

9) Things never work out the way I want them to.

10) I don't get upset too easily.

11) I'm a believer in the idea that "every cloud has a silver lining".

12) I rarely count on good things happening to me.
Figure 1: Sample Feedback Chart
FILTER PRODUCTS BALING
Thank You for WORKING SAFELY!

Date: __________________________

Please describe specifically the observed SAFE behavior: (Check box for appropriate category on back of card.)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Observer's Code:
The first letter of the city where you were born

The first letter of your mother's maiden name

The number of the month you were born

________________________________________________________________________

Recipient's Code:
The first letter of the city where you were born

The first letter of your mother's maiden name

The number of the month you were born

________________________________________________________________________

Please Check Observed SAFE Behavior:

☐ Recognizing and correcting an unsafe condition

☐ Removing or cleaning unsafe objects or debris from a work area

☐ Giving positive feedback to a coworker for working safely

☐ Reporting a near miss

☐ Making a task safer

☐ Wearing appropriate personal protective equipment (PPE)

☐ Showing concern for a coworker's safety

☐ Using tools and equipment safely

☐ Performing a work procedure safely

☐ Other

Hoechst Celanese

Thank You
Limit: 55¢

Observer's Name __________________________

Recipient's Name __________________________

FILTER PRODUCTS BALING
Dept.

Figure 2: Thank You Card

97
Figure 3: Feedback Chart: Path Clear For Prebale Can
Figure 4: Feedback Chart: Push Prebale Can Onto Press
Figure 5: Feedback Chart: Press Doors Latched
Figure 6: Feedback Chart: Materials Not Touched During Last 6 Inches of Box Travel
Figure 7: Feedback Chart: Plastic Wrap Paced After Box is Dropping
Figure 8: Feedback Chart: Stand Clear of Doors When Closing Press
Figure 9: Feedback Chart: Jacks Returned to Upper Storage Position
Figure 10: Feedback Chart: Stand Away When Receiving Bands
Figure 11: Feedback Chart: Stand Clear of Press When Pressure Is Released
Figure 12: Feedback Chart: Stand Clear of Press for When Fork Truck Picks Up Bale
Figure 13: Feedback Chart: Personal Protective Equipment Use
Figure 14: Feedback Chart: General Conditions
Figure 15: Feedback Chart: General Behaviors
Figure 16: Feedback Chart: Composite (Below 90% behaviors)
<table>
<thead>
<tr>
<th>PHASE</th>
<th>BEHAVIOR</th>
<th>C-SHIFT (FB+TY)</th>
<th>D-SHIFT (FB ONLY)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RATIO</td>
<td>%-AGE</td>
</tr>
<tr>
<td>BASELINE</td>
<td>SAFE</td>
<td>1950/1979</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>UNSAFE</td>
<td>217/246</td>
<td>0.88</td>
</tr>
<tr>
<td>FEEDBACK</td>
<td>SAFE</td>
<td>3746/3753</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>UNSAFE</td>
<td>222/229</td>
<td>0.97</td>
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<tr>
<td>FEEDBACK+</td>
<td>SAFE</td>
<td>3926/3929</td>
<td>0.99</td>
</tr>
<tr>
<td>THANK YOU</td>
<td>UNSAFE</td>
<td>153/156</td>
<td>0.98</td>
</tr>
<tr>
<td>WITHDRAWAL</td>
<td>SAFE</td>
<td>708/709</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>UNSAFE</td>
<td>94/95</td>
<td>0.99</td>
</tr>
</tbody>
</table>
### TABLE 2

**AVERAGE SAFE BEHAVIOR PERCENTAGES FOR EXPERIMENTAL PHASES**

#### FEEDBACK PLUS THANK YOU GROUP (C-SHIFT)

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Baseline</th>
<th>Feedback</th>
<th>FB+TY</th>
<th>With.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear Path</td>
<td>95.9</td>
<td>100.0</td>
<td>99.5</td>
<td>94.3</td>
</tr>
<tr>
<td>Push Can</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Doors Latched</td>
<td>70.6</td>
<td>91.5</td>
<td>92.9</td>
<td>77.7</td>
</tr>
<tr>
<td>Box Travel</td>
<td>93.8</td>
<td>99.5</td>
<td>98.0</td>
<td>91.5</td>
</tr>
<tr>
<td>Plastic Wrap</td>
<td>65.6</td>
<td>85.9</td>
<td>92.3</td>
<td>80.5</td>
</tr>
<tr>
<td>Close Doors</td>
<td>94.3</td>
<td>100.0</td>
<td>99.7</td>
<td>97.2</td>
</tr>
<tr>
<td>Jack Storage</td>
<td>98.3</td>
<td>100.0</td>
<td>100.0</td>
<td>97.2</td>
</tr>
<tr>
<td>Receive Bends</td>
<td>75.6</td>
<td>86.1</td>
<td>89.3</td>
<td>79.5</td>
</tr>
<tr>
<td>Pressure Release</td>
<td>92.7</td>
<td>96.7</td>
<td>99.5</td>
<td>86.0</td>
</tr>
<tr>
<td>Fork Truck</td>
<td>93.8</td>
<td>99.5</td>
<td>100.0</td>
<td>94.3</td>
</tr>
<tr>
<td>PPE Use</td>
<td>96.7</td>
<td>96.8</td>
<td>98.7</td>
<td>97.3</td>
</tr>
<tr>
<td>Gen. Conditions</td>
<td>80.2</td>
<td>92.1</td>
<td>95.5</td>
<td>82.0</td>
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<tr>
<td>Gen. Behaviors</td>
<td>72.9</td>
<td>88.4</td>
<td>90.5</td>
<td>79.7</td>
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<tr>
<td>Composite (-90%)</td>
<td>73.0</td>
<td>88.8</td>
<td>92.1</td>
<td>79.9</td>
</tr>
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</table>

#### FEEDBACK ONLY GROUP (D-SHIFT)

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Baseline</th>
<th>Feedback</th>
<th>FB+TY</th>
<th>With.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear Path</td>
<td>96.5</td>
<td>99.7</td>
<td></td>
<td>91.5</td>
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<tr>
<td>Push Can</td>
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<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
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<td>Doors Latched</td>
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<td>80.5</td>
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<tr>
<td>Box Travel</td>
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<td>98.6</td>
<td>97.2</td>
<td>97.2</td>
</tr>
<tr>
<td>Plastic Wrap</td>
<td>69.8</td>
<td>87.2</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Close Doors</td>
<td>97.3</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Jack Storage</td>
<td>97.8</td>
<td>100.0</td>
<td></td>
<td>91.5</td>
</tr>
<tr>
<td>Receive Bends</td>
<td>78.3</td>
<td>90.1</td>
<td>80.0</td>
<td>80.0</td>
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<tr>
<td>Pressure Release</td>
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<td>97.2</td>
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<tr>
<td>Fork Truck</td>
<td>95.3</td>
<td>99.7</td>
<td>89.5</td>
<td>89.5</td>
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<tr>
<td>PPE Use</td>
<td>96.8</td>
<td>98.1</td>
<td>97.7</td>
<td>97.7</td>
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<tr>
<td>Gen. Conditions</td>
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<td>79.5</td>
<td>79.5</td>
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<tr>
<td>Gen. Behaviors</td>
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<td>91.0</td>
<td>76.2</td>
<td>76.2</td>
</tr>
<tr>
<td>Composite (-90%)</td>
<td>77.5</td>
<td>92.0</td>
<td></td>
<td>81.4</td>
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### TABLE 3

**2-WAY ANOVA RESULTS (CLIMATE SURVEY SCALES)**

#### SAFETY

<table>
<thead>
<tr>
<th>Source</th>
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<th>SS</th>
<th>MS</th>
<th>F</th>
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<tbody>
<tr>
<td>Shift</td>
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<td>799.50</td>
<td>799.50</td>
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<td>847.04</td>
<td>847.04</td>
<td>2.58</td>
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<td>6.21</td>
<td>0.02</td>
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<tr>
<td>Within</td>
<td>109</td>
<td>35734.88</td>
<td>327.84</td>
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<tr>
<td>Total</td>
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#### SELF-ESTEEM

<table>
<thead>
<tr>
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<th>F</th>
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<td>37.37</td>
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<td>0.42</td>
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<td>Within</td>
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<tr>
<td>Total</td>
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#### BELONGINGNESS

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<th>F</th>
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<tbody>
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<td>196.20</td>
<td>196.20</td>
<td>3.64</td>
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<td>Admin. #</td>
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<td>S x A</td>
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<td>208.64</td>
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<td>Within</td>
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<td>Total</td>
<td>104</td>
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</tr>
</tbody>
</table>

#### OPTIMISM

<table>
<thead>
<tr>
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<th>MS</th>
<th>F</th>
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</thead>
<tbody>
<tr>
<td>Shift</td>
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<td>10.21</td>
<td>10.21</td>
<td>0.82</td>
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<tr>
<td>Admin. #</td>
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<tr>
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<td>4.71</td>
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<tr>
<td>Within</td>
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<td>12.43</td>
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<tr>
<td>Total</td>
<td>103</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05
VITA

KATHRINE LEIGH SNELL

Personal Information

Date of Birth: July 4, 1967

Home Address
205 Chowning Place
Blacksburg, Virginia 24060
(703) 552-9343

Office Address
Department of Psychology
Virginia Polytechnic Institute
and State University
Blacksburg, Virginia 24061
(703) 231-6581

EDUCATION

1989-present
M.S. Industrial/Organizational Psychology
VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY
Blacksburg, Virginia

Thesis Title: Safe Behavior in the Workplace: Assessing The Effects of a Feedback and Thank You Program.

1985-1989
B.A. with HONORS in Psychology
WAKE FOREST UNIVERSITY
Winston-Salem, North Carolina

Honors Thesis Title: Test-Wiseness in College Students

PROFESSIONAL MEMBERSHIPS

American Psychological Association
Psi Chi
Center for Applied Behavioral Systems
PROFESSIONAL AND RESEARCH EXPERIENCE

5/90 - present
Hoechst Celanese Corporation, Narrows, VA
Intern/Consultant
- Developing, implementing and analyzing surveys to determine employee satisfaction and future needs in the organization.
- Administering, evaluating and making recommendations for improvement following participation in safety survey.
- Developing and implementing safety intervention system in one department as a pilot project for the entire plant.
- Assisting in the development of training program for Environmental, Health and Safety Workshops.
- Assisting in the development of safety and environmental audits for all departments in the plant.
- Assisting in the implementation of these audits.
- Assisting in the training and development of a plant-wide safety incentives program.
- Compiling, analyzing, and disseminating results of a corporate-wide Quality Survey.
- Assisting in the evaluation of several safety programs, and making recommendations for use at the present facility.

12/91 - 1/92
Bell Atlantic Corporation, Washington, DC
Consultant/Test Administrator
- Assisted in the pilot testing of a computer-based selection instrument to be used for selection, placement, and promotion.
1/91 - 4/91  Neil Hauenstein, Blacksburg, VA
Consulting Assistant
-Assisted in the development of a merit
pay system for hospital employees,
including establishing pay structure,
performance appraisal system, and
feedback system.
-Conducted job analysis interviews and
wrote job descriptions for the
development of this pay system.

1/90 - 5/91  Virginia Polytechnic Institute and State
University, Blacksburg, VA
Coordinator, Undergraduate Information
Center
-Supervised advising for over 700 under-
grade psychology majors.
-Acted as liaison between psychology
department, registrar, dean’s office and
career counseling center.
-Supervised and directed graduation
ceremonies for psychology majors.

TEACHING EXPERIENCE

8/89 - 5/90  Virginia Polytechnic Institute and State
University, Blacksburg, VA
Introductory Psychology Recitation Leader
Evaluations available upon request.

PAPER PRESENTATIONS

a Behavioral Checklist to Define and Measure Safety
Behaviors. Paper presented at the South Eastern
Psychological Association. New Orleans, LA.

Finks, M., Snell, K.L., Nolan, D.J., Bass, M. & Richman, C.L.
and Withdrawn Stimulus Sentences. Paper presented at the
American Psychological Association. Atlanta, GA.
RELEVANT COURSE WORK

Content Courses:
Personnel Psychology
Research Methods
Work and Motivation
Organizational Theory and Design
Criterion Development and Evaluation
Contemporary Topics in Applied Psychology
Behavior Management in Large Scale Systems
Organizational Theory and Design
Human Learning/Cognitive Processes

Research Methods and Statistics
Advanced Psychometric Theory
Quantitative Topics in Applied Psychology
Statistics I (Descriptive statistics, probabilities, hypothesis testing, ANOVA, factorial designs and multiple comparisons)
Statistics II (Correlation, simple linear and multiple regression, factorial designs, and multiple comparisons)
Regression Analysis
Multivariate Analysis

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