INCREASING COMPLIANCE WITH THE FIRE DOOR SAFETY CODE AT A UNIVERSITY

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ABSTRACT

The importance of complying with fire safety codes is paramount. The consequences of noncompliance range from simple inconvenience, to costly fines, and, regrettably, to potential loss of life. This study evaluated the compliance with the 'fire door' safety code of particular buildings on a university campus, and a simple, yet effective, method of increasing compliance. It was found that the use of an antecedent, in the form of laminated signs, attached to the doors in question, was enough to significantly increase compliance. Perhaps identification of the doors as 'fire doors' was enough to modify behavior. This simple modification could result in tremendous overall savings to the university.

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CHAPTER I

INTRODUCTION

Safety is a concern for business and other institutions. Safety costs to industries are estimated to be in excess of $33 billion annually (McAfee & Winn, 1989). The fines by OSHA (Occupational Safety and Health Act) for noncompliance have recently increased sevenfold. Much early research in the area of safety focused on the compilation of statistical information, such as reporting the percentage of accidents that had occurred within a given period of time or within particular departments.

Literature Review

A number of interventions have been used to reduce the costs of safety. Some organizations combine safety training with disciplinary actions. When it was observed that it was actually 'unsafe acts' that caused accidents, the focus shifted to the use of behavioral techniques (Reber, Wallin, & Duhon, 1993). According to Chhokar and Wallin (1984), "Applied behavior analysis, by identifying and stressing positive and safe behaviors, avoids this inadvertent reinforcement of unsafe behaviors" (p. 142). Behavioral interventions most often used involve antecedents (interventions prior to the unsafe behavior in question), feedback, goal-setting, training, and/or some combination of these. Feedback, particularly, has been found to be effective in significantly altering behavior (Ilgen, Fisher, & Taylor, 1979).

Most studies begin with some form of safety analysis to pinpoint areas of hazards and potential accidents within an organization (Saarela, 1989). In a comparison study of low and high accident rate organizations involving a variety of industries, it was found that one of the primary characteristics of the low accident rate organization was a high degree of commitment by the management to safety (Smith, Cohen, & Cleveland, 1978). In a review of 24 studies, McAfee and Winn (1989) found that while safe behavior did not improve in every study, feedback and incentives did improve safety and/or reduce accidents. The review considered a number of industries, including coal mining, manufacturing, maintenance, transit, weaving, police, and metal fabrication.

Smith, Anger, and Uslan (1978) found that praise for the wearing of safety glasses by shipfitters decreased the number of eye injuries at a shipyard that had previously had the highest injury rate. This safety behavior increased when supervisors were trained to observe and praise their subordinates behavior.

Komaki, Collins, and Penn (1982) conducted research to compare the effectiveness of antecedents and feedback on safety at a poultry processing plant. The antecedent intervention consisted of displaying a list of rules and having a 'rule of the day' which was discussed at weekly meetings conducted by supervisors. During the feedback

intervention the focus of the weekly safety meetings became the attainment of safety goals. In addition, the 'rule of the day' was replaced by performance results. While two of four departments showed a significant change in safety behavior during the antecedent condition, all four departments changed significantly during the feedback intervention.

In a vehicle maintenance division, employees were trained in safety by discussing safety rules and receiving a copy of the rules. Goals were then established for each unit. While some improvement in safety behavior occurred after training, the most significant change occurred when feedback was introduced in the form of posted and updated charts on the amount of progress being made toward goal achievement (Komaki, Heinzmann, & Lawson, 1980). In a similar study, Chhokar and Wallin (1984) used training, goal-setting, and feedback at a metal fabrication plant. A significant increase in safe behavior occurred after a training and goal-setting phase, and an additional increase occurred when feedback was introduced.

To determine whether or not feedback would decrease hazardous activity and reduce accidents, Sulzer-Azaroff and De Santamaria (1980) conducted a study of factory workers. Six major departments in the production section participated in the study. A hazardous check list was developed for each department. Intervention consisted of feedback regarding

number and location of hazards that were found, suggestions for improvement, and any deserved positive comments. When compared to baseline levels, all departments showed a decrease in mean frequency of hazards during intervention.

Komaki, Barwick, and Scott (1978) studied the effects of training, praise, and feedback on safety behavior of bakery employees. Training consisted of a videotape that showed correct and incorrect ways of performing typical behaviors, such as carrying loaded trays or removing large trays from ovens. After training, employees were shown a graph indicating current safety performance. The graph and safety reminders were then posted in conspicuous places and observations were conducted. Feedback consisted of updated information posted on the graph and praise given by the supervisor when an employee performed one of five acts in a safe manner. Safely performed acts increased, and feedback was determined to be the biggest factor. Furthermore, feedback in the form of specific behaviors that were operationally defined seemed to be the most effective.

At a residential school for the mentally retarded the goal was to decrease the number of injuries received by workers when lifting and transferring patients (Alavosius & Sulzer-Azaroff, 1986). A task analysis was done in which each lifting technique was broken down into its component parts and an observational checklist made from it. Workers were observed twice a week while they lifted and transferred

clients. Feedback forms were provided to each worker weekly. While baseline data varied greatly for the six workers, safety performance improved and increased even more with additional feedback.

Fellner and Sulzer-Azaroff (1984) conducted weekly inspections using a behavioral checklist of hazardous acts at a paper mill. Feedback consisted of a graph on performance that was posted in every room of the plant, visible to all employees and updated after each weekly inspection. A significant change did occur between baseline and intervention, and a modest significant difference occurred in the number of injuries.

Finally, Chhokar and Wallin (1984) wanted to find out if more frequent feedback was more effective in improving safe behavior performance than less frequent feedback in a manufacturing setting. Training, goal-setting, and feedback interventions were used. Feedback did have an effect, but the frequency of feedback had no significant effect on performance.

The Present Study

OSHA requirements (Secs. 4, 6, 8, Occupational Safety and Health Act of 1970; Secretary of Labor's Order No. 12-71, 8-76, or 9-83) stipulate that fire doors remain closed in buildings in order to contain a fire within specific areas and to prevent a fire from spreading. There is much available evidence to support the effective use of feedback

in safety research with some use of antecedent intervention as well. The purpose of this study was to determine the type of intervention that would increase safety behavior in terms of adherence to fire safety codes with an emphasis on fire doors.

Hypothesis: The use of an antecedent intervention in the form of posted signs will be effective in significantly improving compliance with the fire door safety code.

CHAPTER II

METHOD

The study took place on the campus of a small state university located in the southeastern United States. Three of the larger buildings on the campus were involved. These buildings were selected based on their continuous noncompliance to fire door safety codes, traffic within the building, and accessibility (Janice Poindexter, personal communication, May 26, 1994). Noncompliance resulted from fire doors being propped or wedged open in spite of attempts by the Safety Office (in the form of memos to building coordinators) to keep them closed. A multiple baseline design was used. As Komaki (1977) pointed out, the use of the multiple-baseline design was appropriate here because changes are compared within groups rather than between groups. Comparisons are made between baseline and intervention phases to determine whether change occurs as a result of intervention and that no change occurs in any control group(s).

Dependent Variable

The dependent variable consisted of the number of fire doors in compliance with the safety code. A total of 23 fire doors were observed as follows: Building A - 9, Building B - 8, Building C - 6. Compliance was defined as any fire door (as identified by an automatic closure attached to the top-most part of the door) that was closed.

If it was a double-door, then both doors must be closed to be in compliance. If only one of two doors was closed, this was to be annotated as a fire door in non-compliance.

Independent Variable

The independent variable consisted of white laminated signs (8 1/2" x 11") with red lettering that read:

FIRE DOOR
KEEP CLOSED
Do Not Block
Do Not Fasten Open

These signs were posted on all fire doors within each building under study. On the double doors a sign was posted on each door on alternating sides. On single doors a sign was posted on both sides of the door. The signs were located 65 to 72 inches from the floor.

Procedure

Approximately two weeks of baseline data was taken at random times throughout the five-day work week, once every day. A checklist of doors for each building was used to annotate compliance and noncompliance. At the end of the baseline, signs were introduced in Building A. A sign was posted on each fire door and the door(s) closed to indicate compliance. Simultaneously, a memo was distributed by the Safety Director to the building coordinator indicating that the fire safety code stipulates that fire doors be closed at all times and that signs had been posted identifying the applicable doors. Baseline continued to be monitored in Buildings B and C as intervention was being monitored in

Building A. Building A was monitored for approximately two weeks, at which time intervention was introduced to Building B in the same manner. Building C remained the control with monitoring cut back to three times a week due to no change in activity in this building. Building B was monitored for two weeks, along with Building A, at which time observations were decreased to three times a week for intervention and once a week for control. This last schedule of data collection remained in effect for an additional three weeks.

Reliability

Reliability was established by having an individual periodically take data after the experimenter, such that the number of total agreements divided by the total number of observations equated to overall reliability. The mean agreement rate was 97.83%.

CHAPTER III

RESULTS

Building A

Baseline consisted of eleven recordings with a mean compliance rate of .9%. The range was from a low of 0% compliance to a high of 10% compliance, with a median and mode compliance rate of 0%. Intervention consisted of 33 recordings with a mean compliance rate of 85.48%. The range was from a low of 38% compliance to a high of 100% compliance. The median was 90% compliance and mode was 100% compliance. The mean increase over baseline was 105% (Figure 1).

Building B

Baseline consisted of 15 recordings with a mean compliance rate of 51.46%. The range was from a low of 37% compliance to a high of 75% compliance. The median compliance rate was 52.5% and the mode compliance rate was 55%. Intervention consisted of 22 recordings with a mean compliance rate of 94.18%. The range was from a low of 37% compliance to a high of 100% compliance. The median and mode compliance rates were each 100%. The mean increase over baseline was 54.64% (Figure 2).

Building C

Data consisted of 24 recordings with a mean, range, median, and mode compliance rate of 0% (Figure 3).

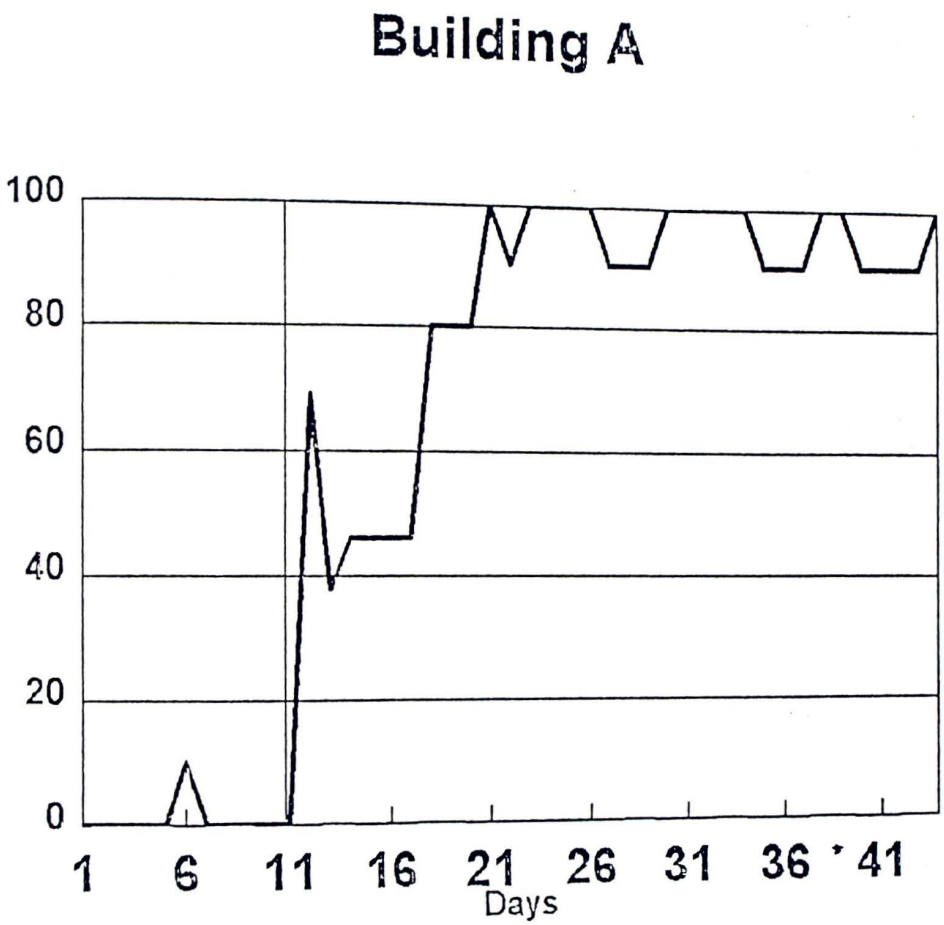

Figure 1. Percentage Compliance for Building A.

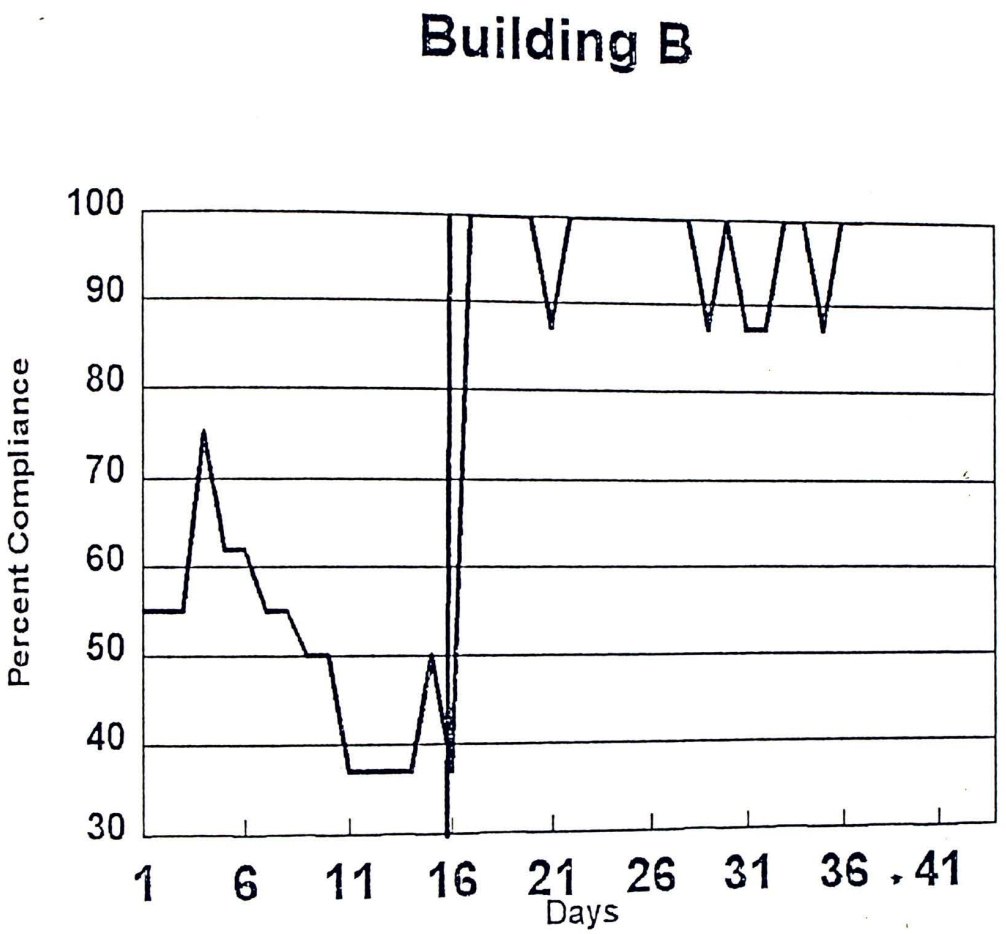

Figure 2. Percentage Compliance for Building B.

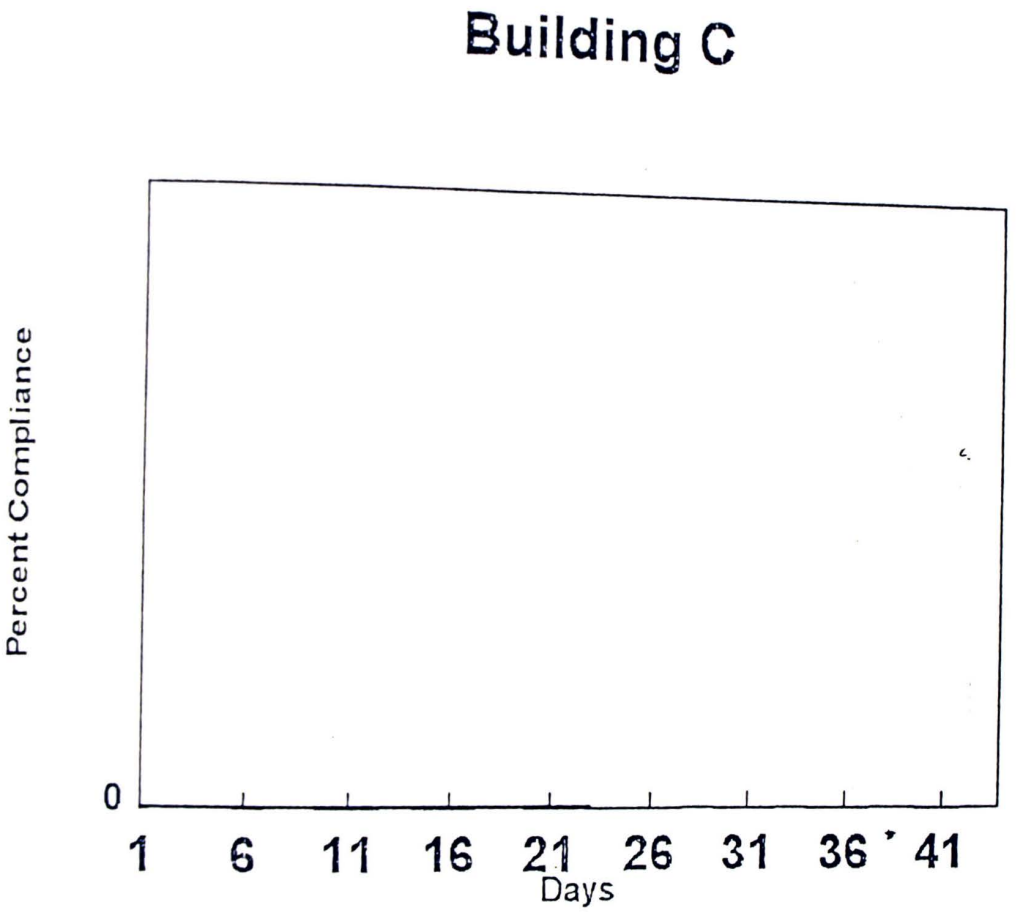

Figure 3. Percentage Compliance for Building C.

CHAPTER IV

DISCUSSION

Both Buildings A & B showed significant increase of compliance from baseline to intervention. Building A, which had the lowest baseline compliance rate between the two, showed the greatest increase. Of particular importance is the mode compliance rate for both buildings. The mode compliance rate for Building A for baseline was 0% and increased to 100% for intervention. In Building B the mode compliance rate for baseline was 55% and increased to 100% for intervention. This indicates that the largest percentage of the time was spent in compliance after intervention. Building C (control) showed no change during the entire study.

The posted signs seem to have contributed to a change in behavior, such that those individuals within the building were aware of what doors were actually fire doors and, therefore, once identified, were more likely to keep them closed. This suggests that it is not blatant noncompliance, but rather a lack of information that had contributed to low compliance rate, and supports the effective use of an antecedent intervention without the use of feedback.

Some alternatives to posting signs as a means of increasing compliance are: the installation of automatic closers that work in conjunction with the sprinkler system in a building; having someone continuously monitor all fire doors and constantly send memos to building coordinators in

the hope that they will eventually pay attention, and thereby, taking the chance of being fined by a visit from the fire marshall; another alternative is doing nothing, and not only risking a fine but also risking the cost of a fire out of control that could perhaps have been contained within the confines of closed fire doors. The cost of a few signs strategically posted on all fire doors pales in comparison to the cost of any of the alternatives.

Limitations

The study was conducted during the summer semester when there are fewer students, and subsequently, less traffic within the buildings on campus. The results could have been different during a fall or spring semester.

The length of the intervention phase was relatively short and, with more time, may have shown a smaller increase in overall mean rate of compliance.

Building A had several large heavy door stops (anchors for theater curtains) that were not removed at the initiation of intervention. These door stops were not used again during intervention, but in the future could pose an impediment to compliance.

At the initiation of intervention the Safety Director required and sent a memo to the building under study informing the building coordinator of the OSHA regulation and of the signs that were being posted. This might have

influenced compliance in that it was a factor other than the signs alone.

The posted signs appear to have been successful in alerting people to the fire doors and providing them with the information that they were to remain closed. Compliance increased significantly as a result. It is this author's recommendation that, given the limitations of the study, compliance continue to periodically be monitored and the building coordinators periodically reminded of the need for compliance. This continuous intermittent feedback, along with the signs, will, hopefully, be all that is needed to maintain a high rate of compliance with the fire door safety code.

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VITA

Tina Victoria Rhoades was born in Flint, Michigan on December 23, 1957. She began elementary school at Alger B. Wilkins Elementary School in Fayetteville, North Carolina and graduated from Fort Campbell High School at Fort Campbell, Kentucky in 1976. Although she entered Western Kentucky University in Bowling Green, Kentucky directly from high school and transferred to Austin Peay State University in Clarksville, Tennessee the next year, she did not complete her higher education at that time. In 1980 she entered civil service while living at Fort Clayton, Panama, transferring to Fort Campbell, Kentucky in 1982. She worked at Fort Campbell, Kentucky until August 1989, at which time she resigned from civil service to attend college full-time at Tennessee Technological University in Cookeville, Tennessee. Due to the illness of her mother she transferred to Austin Peay State University the following year and received her Bachelor of Science degree in Psychology in May, 1992. She immediately followed with graduate school and received her Master of Arts degree in Psychology, with a concentration in Industrial/Organizational Psychology in December, 1994.