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Behavior-based safety in industry: Realizing the large-scale potential of psychology to promote human welfare

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Abstract

In the spirit of giving psychology away in this "Decade of Behavior," this article reviews the behavioral science approach to preventing workplace injuries, which is currently being applied successfully in numerous companies worldwide. Unlike the traditional command-and-control approach to occupational safety, behavior-based safety (BBS) provides tools and methods employees can use to take control of their own safety performance. The author offers strategies he and his colleagues have been using for more than a decade to teach BBS to safety leaders and line workers. In addition, two conceptual models are explained. One model suggests ways to match the awareness and behavior of an individual with a particular BBS intervention technique. The second model proposes that five psychological states or "establishing conditions" increase the probability a person will use the BBS tools and procedures to actively care for the safety and health of others.

Key words: Occupational safety, Injury prevention, Organizational behavior management, Applied behavior analysis, Actively caring.

More than 30 years ago George Miller (1969) challenged us to give psychology away—to empower people to apply the principles of behavioral science relevant to specific problems they encounter. Referring to people's need for competence (White, 1959), Miller urged psychologists "to give people skills that will satisfy their urge to feel more effective" (1969, p. 1073). To do this, "we must learn to understand those problems in the social and institutional contexts that define them" (pp. 1073–1074). This article illustrates one promising realization of this mission statement, thereby showing how to give psychology away for the large-scale benefit of industrial safety.

The current "Decade of Behavior," officially launched on Capital Hill in September 2000, reflects Miller's earlier treatise. Initiated by the American Psychological Association, and supported by more than 50 scientific organizations, the Decade of Behavior is an interdisciplinary effort to promote the critical relevance of behavioral and social science research to address societal problems in five general areas—health, education, safety, prosperity, and democracy (Carpenter, 2000). As elegantly stated by the current president of the American Psychological Society, "The most fundamental answers to many issues—poor schools, violence in the streets, unhealthy behaviors, safety—are in the behavioral sciences (and therefore) there's a need to sell the behavioral sciences as a national resource (Robert Bjork as cited by Carpenter, 2000, p. 22). This article addresses one of the key themes of the Decade of Behavior—safety—revealing how basic principles of behavioral science are preventing occupational injuries worldwide.

This area of research and teaching focus is termed "behavior-based safety" or "behavioral safety." It exemplifies how to give psychology away effectively by simplifying rather complex environment–behavior relationships and the techniques used to measure and understand them in ways that can be used by employees after minimal training and coaching. This article explains how this is accomplished.

The Problem

Unintentional injury is the leading cause of death to people aged 44 and under (U.S. Bureau of Labor Statistics, 1998), and a large portion of these fatalities occur to people on the job. Every year, an estimated 7,000 to 11,000 U.S. employees are killed at work and 2.5 to 11.3 million are seriously injured (T. R. Miller, 1997). This results in 250,000 potential

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productive years of life lost annually—more than from cancer and cardiovascular disease combined (Leigh, 1995). The overall financial liability of work-related injuries in the United States was estimated at $116 billion in 1992, an increase from the 1989 estimate of $89 billion and dramatically larger than the 1985 estimate of $34.6 billion (Leigh, 1995). The direct costs include lost wages, medical expenses, insurance claims, production delays, lost time of coworkers, equipment damage, and fire losses (T. R. Miller, 1997).

Not only are these costs enormous, they indicate the liabilities of industrial injuries are increasing at an alarming rate. Recent estimates show that each year employers pay approximately $200 billion in direct costs associated with injuries both on and off the job. Occupational injuries account for three quarters of this total or nearly $155 billion annually. This amounts to over $1,400 per work-related injury.

It is noteworthy that these loss figures are likely gross underestimates of the true impact of industrial injuries. Many occupational injuries go unreported and the Occupational Health and Safety Administration (OSHA) does not use transportation deaths, suicides, or homicides (an estimated 50% of all job-related traumatic deaths) to calculate their estimates (Baker, Conroy, & Johnston, 1992; Leigh, 1995; National Committee for Injury Prevention and Control, 1989; Weddle, 1996; J. K. Wilson, 1985).

The Behavior-Based Approach to Occupational Safety

For about a decade, behavior-based safety (BBS) has been flourishing in industrial settings nationwide, and, more recently, throughout the world. Several books have been published that detail the principles and procedures of BBS (e.g., Geller, 1998c, 2001f, 2001g; Geller & Williams, 2001; Krause, 1995; Krause, Hidley, & Hodson, 1996; McSween, 1995; Sulzer-Azaroff, 1998). Moreover, a number of systematic reviews of the literature provide solid evidence for the success of this approach to injury prevention (e.g., DePasquale & Geller, 1999: Grindle, Dickinson, & Boettcher, 2000; McAfee & Winn, 1989; Petersen, 1989; Sulzer-Azaroff & Austin, 2000).

The successful applications of BBS generally adhere to the seven key principles that will be described. Each principle is broad enough to encompass a wide range of practical operations, but narrow enough to guide the development of cost-effective procedures for managing the human dynamics of safety and health. In several sources, I have proposed these as a map or mission statement against which to check interventions designed to improve safety-related behaviors and attitudes in the workplace as well as in homes, neighborhoods, and throughout the community (Geller, 1997b, 1998b, 1998c, 2001b, 2001c; Geller & Williams, 2001). It is noteworthy, however, that all of these presentations of BBS appeared in publications for safety professionals, and therefore most readers of this journal are probably unaware of this large-scale effort to give psychology away for the benefit of humanity.

1. Focus Intervention on Observable Behavior

The BBS approach is founded on behavioral science as conceptualized and researched by B. F. Skinner (1938, 1953, 1974). Experimental behavior analysis and later applied behavior analysis emerged from Skinner's research and teaching, and laid the groundwork for numerous therapies and interventions to improve the quality of life of individuals, groups, and entire communities (Goldstein & Krasner, 1987; Greene, Winett, Van Houten, Geller, & Iwata, 1987). Whether working one-on-one in a clinical setting or with work teams throughout an organization, the intervention procedures always target specific behaviors in order to produce constructive change. In other words, BBS focuses on what people do, analyzes why they do it, and then applies a research-supported intervention strategy to improve what people do.

The focus is on *acting people into thinking differently* rather than targeting internal awareness or attitudes in order to *think people into acting differently.* This latter approach is used successfully by many clinical psychologists in professional therapy sessions, but is not cost-effective in a group or organizational setting. To be effective, attitude-focused intervention requires extensive one-on-one interaction between a client and a specially trained intervention specialist. Even if time and facilities were available for intervention to focus on internal and nonobservable person states, few safety professionals or consultants possess the educational background, training, skills, and experience to implement such an approach.

2. Look for External Factors to Understand and Improve Behavior

Skinner did not deny the existence of internal determinants of behavior (such as personality characteristics, perceptions, attitudes, and values). He only rejected such unobservable inferred constructs for *scientific study* as causes or outcomes of behavior. We obviously do what we do because of factors in both our external and internal worlds. Given the difficulty in objectively defining internal states or traits, however, it is far more cost effective to identify environmental conditions that influence behavior and to change these factors when behavior change is required.

Hans (1996) reports this quote from the Director of the National Safety Council's consulting division: "The all-consuming focus on employee behaviors can mask management inadequacies that otherwise might come to light" (pp. 45–46). In fact, the opposite is true. A behavior analysis of risky work practices can pinpoint many determinants of such behavior, including inadequate management systems or manager behaviors that promote or inadvertently encourage at-risk work. Without the upstream and objective problem-solving perspective fostered by BBS principles, these inadequacies may never be identified (or might be revealed only after a "near miss" or injury).

Examining external factors to explain and improve behav-

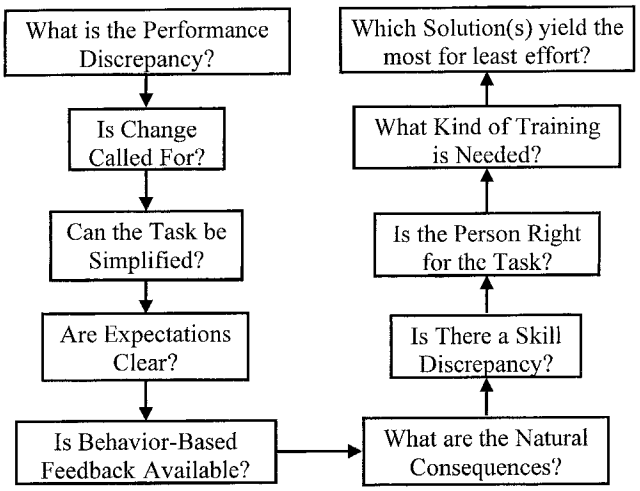

Figure 1. Ten sequential questions asked in a behavioral safety analysis (adapted form Geller, 2000).

ior is a primary focus of organizational behavior management (e.g., Austin, 2000; Austin, Carr, & Agnew, 1999; Bailey & Austin, 1996; Gilbert, 1978). In occupational safety this approach has been termed "behavioral safety analysis" (Geller, 2000, 2001f). It involves a search for answers to the following questions in the order given here and summarized in Figure 1.

Can the task be simplified? Before designing an intervention to improve behavior, it's critical to implement all possible engineering "fixes." Consider the many ways the environment could be changed to reduce physical effort, reach, and repetition. In other words, entertain ways to make the job more user-friendly before deciding what behaviors are needed to prevent injury. This is, of course, the rationale behind ergonomics and the search for engineering solutions to occupational safety and health (Kroemer, 1991).

Sometimes behavior facilitators can be added, such as (a) control designs with different shapes so they can be discriminated by touch as well as sight, (b) clear instructions placed at the point of application, (c) color codes to aid memory and task differentiation (Norman, 1988), or (d) convenient machine lifts or conveyor rollers to help with physical jobs. In addition, complex assignments might be redesigned to involve fewer steps or more people. Or to reduce boredom or repetition, simple tasks might allow for job swapping. Ask these questions at the start of a behavioral safety analysis:

- Can an engineering intervention make the job more user-friendly?
- Can the task be redesigned to reduce physical demands?
- Can a behavior facilitator be added to improve response differentiation, reduce memory load, or increase reliability?
- Can the challenges of a complex task be shared?
- Can boring, repetitive jobs be cross-trained and swapped?

Is a quick fix available? From their more than 60 combined years of analyzing and solving human-performance problems, Mager and Pipe (1997) concluded that many discrepancies between real and ideal behavior can be eliminated with relatively little effort. More specifically, behavior might be more at-risk than desired because expectations are unclear, resources are inadequate, or feedback is unavailable. In these cases, behavior-based instruction or demonstration can overcome informal expectations, and behavior-based feedback can enable continuous improvement. A work team could decide what resources are needed to make a safe behavior more convenient, comfortable, or efficient. When conducting this aspect of a behavioral safety analysis, ask these questions:

- Does the individual know what safety precautions are expected?
- Are there obvious barriers to safe work practices?
- Is the equipment as safe as possible under the circumstances?
- Is protective equipment readily available and as comfortable as possible?
- Do employees receive frequent behavior-based feedback related to their safety?

Is safe behavior punished? In some work cultures, the interpersonal consequences for reporting an environmental hazard or minor injury are more negative than positive. After all, these situations imply that someone was irresponsible or careless. It is not unusual for people to be ridiculed for wearing protective gear or using an equipment guard. It might even be considered "cool" or "macho" to work unprotected and take risky short cuts. The hidden agenda might be that "only a 'chicken' would wear that fall protection." Mager and Pipe (1997, p. 53) refer to these situations as "upside-down consequences," and suggest they are the cause of many, if not most, of the undesirable behaviors occurring in the workplace. Ask these questions during your behavioral safety analysis:

- What are the consequences for desired behavior?
- Are there more negative than positive consequences for safe behavior?
- What negative consequences for safe behavior can be reduced or removed?

Is at-risk behavior rewarded? At-risk behavior is often followed by natural positive consequences, including comfort, convenience, and efficiency. Short cuts are usually taken to save time and can lead to a faster rate of output. Therefore, taking an at-risk short cut may be considered "efficient" behavior. Most people perform the way they do because they expect to achieve soon, certain, and positive consequences, or they expect to avoid soon, certain, and negative consequences. People take calculated risks because they expect to gain something positive and/or avoid something negative. Ask these questions:

- What are the soon, certain, and positive consequences for at-risk behavior?
- Does a worker receive more attention, prestige, or status from coworkers for at-risk than safe behavior?
- What rewarding consequences for at-risk behavior can be reduced or removed?

Are extra consequences used effectively? Because the natural consequences of comfort, convenience, or efficiency usually support at-risk over safe behavior, it's often necessary to add extra consequences. These usually take the form of incentive/reward or disincentive/penalty programs. Unfortunately, many of these programs do more harm than good because they are implemented ineffectively (Geller, 1996, 2001f, 2001g). Disincentives are often ineffective because they are used inconsistently and motivate avoidance behavior rather than achievement. In addition, safety-incentive programs based on outcomes can stifle employee participation in the development and administration of an effective BBS incentive program (Geller, 2001f). Ask these questions when analyzing the impact of using extra consequences to motivate improved safety performance:

- Can the punishment consequences be implemented consistently and fairly?
- Can the safety incentives stifle the reporting of injuries and near misses?
- Do the safety incentives motivate the achievement of safety-process goals?
- Do monetary rewards foster participation only for a financial payoff and conceal the real benefit of safety-related behavior—injury prevention?
- Are workers recognized individually and as teams for completing process activities related to safety improvement?

Is there a skill discrepancy? What about those times when the individual really doesn't know how to do the prescribed safe behavior? The person is "knowingly at-risk." This situation might call for training, which is a relatively expensive approach to corrective action. Mager and Pipe (1997) claim that most of the time undesirable work behavior is not caused by lack of knowledge or skill. People can usually perform the recommended safe behavior if the conditions and the consequences are right. So training should be used relatively infrequently for corrective action. Ask these questions to determine whether the behavioral discrepancy is caused by a lack of knowledge or skill:

- Could the person perform the task safely if his or her life depended on it?
- Are the person's current skills adequate for the task?
- Did the person ever know how to perform the job safely?
- Has the person forgotten the safest way to perform the task?

What kind of training is needed? Answers to the last two questions can help pinpoint the kind of intervention needed to eliminate a skill discrepancy. More specifically, a "yes" answer to these questions implies the need for a skill-maintenance program. Skill maintenance might be needed to help a person stay skilled, as when police officers practice regularly on a pistol range to stay ready to use their guns effectively in the rare situation when they need them. This is the rationale behind periodic emergency training. People need to practice the behaviors that could prevent injury or save a life during an emergency. Fortunately, emergencies don't happen very often; but because they don't, people need to go through the motions just to "stay in practice." Then if the infrequent event does occur, they will be ready to do the right thing.

A very different kind of situation also calls for skill-maintenance training. This is when certain behaviors occur regularly, but discrepancies still exist. Contrary to circumstances requiring emergency training, this problem is not lack of practice. Rather, the person gets plenty of practice doing the behavior ineffectively or unsafely. In this case, practice does not make perfect but rather serves to entrench a bad (or at-risk) habit.

Vehicle driving behavior is perhaps the most common and relevant example of this second kind of situation in need of skill-maintenance training. Most drivers know how to drive a vehicle safely, and at one time performed most of their driving behaviors safely, as prescribed in their driver-training classes. For many drivers, however, safe-driving practices decrease considerably over time, sometimes dropping out of a driving repertoire completely.

Practice with appropriate behavior-based feedback is critical for solving both types of skill discrepancies. If the skill is already used frequently but has deteriorated (as in the driving example), however, it's often necessary to add an extra feedback intervention to overpower the natural consequences that have caused the behavior to drift from the ideal. (Later in this article I explain how BBS provides this critical component of injury prevention.) Ask these questions to determine whether the cause of the apparent skill discrepancy is caused by lack of practice or lack of feedback:

- How often is the desired skill performed?
- Does the performer receive regular feedback relevant to skill maintenance?
- How does the performer find out how well he or she is doing?

Is the person right for the job? A skill discrepancy can be handled in one of two ways—change the job or change the behavior. The first approach is exemplified by simplifying the task, whereas the latter approach is reflected in practice and behavior-based feedback. But what if a person's interests, skills, or prior experiences are incompatible with the job? Before investing in skill training for a particular individual, it's a good idea to assess whether the person is right for the task. If the person does not have the motivation or the

physical and mental capabilities for a particular assignment, the cost-effective solution is to replace the performer. Not doing this suboptimizes work output and increases the risk for personal injury. Ask these questions to determine whether the individual has the potential to handle the job safely and effectively:

- Does the person have the physical capability to perform as desired?
- Does the person have the mental capability to handle the complexities of the task?
- Is the person overqualified for the job and thus prone to boredom or dissatisfaction?
- Can the person learn how to do the job as desired?

The bottom line: Before deciding on an intervention approach, conduct a careful analysis of the situation, the behavior, and the individual(s) involved in any observed discrepancy between desired and actual behavior. Don't impulsively assume corrective action to improve behavior requires training or "discipline." A behavioral safety analysis as summarized here will likely give priority to a number of alternative intervention approaches.

3. Direct with Activators and Motivate with Consequences

This principle enables understanding of why behavior occurs, and guides the design of interventions to improve behavior. It runs counter to common sense or "pop psychology." When people are asked why they did something, they make statements like, "Because I wanted to do it," "Because I needed to do it," or "Because I was told to do it." These explanations sound as if the cause of behavior precedes it. This perspective is generally supported by a multitude of "pop psychology" self-help books and audiotapes that claim we motivate our behavior with self-affirmations, positive thinking, optimistic expectations, or enthusiastic intentions.

The fact is, however, we do what we do because of the consequences we expect to get for doing it. As Dale Carnegie (1936) put it, "Every act you have ever performed since the day you were born was performed because you wanted something" (p. 62). Incidentally, Carnegie (1936) cited the research and scholarship of B. F. Skinner as the foundation of this motivation principle.

The important point here is that activators (or signals preceding behavior) are only as powerful as the consequences supporting them. In other words, activators tell us what to do in order to receive a consequence, from the ringing of a telephone or doorbell to the instructions from a training seminar or one-on-one coaching session. We follow through with the particular behavior activated (from answering a telephone or doorbell to following a trainer's instructions) to the extent we expect doing so will give us a pleasant consequence or enable us to avoid an unpleasant consequence.

This principle is typically referred to as the ABC model or three-term contingency, with "A" for activator, "B" for behavior, and "C" for consequence. Proponents of the BBS approach use this ABC principle to design interventions for improving behavior at individual, group, and organizational levels. More than 40 years of behavioral science research has demonstrated the efficacy of this general approach to directing and motivating behavior change. The next principle provides more specific direction for intervention design.

4. Focus on Positive Consequences to Motivate Behavior

B. F. Skinner's concern for people's feelings and attitudes is reflected in his antipathy toward the use of punishment (or negative consequences) to motivate behavior. "The problem is to free men, not from control, but from certain kinds of control" (Skinner, 1971, p. 41). He goes on to explain why control by negative consequences must be reduced in order to increase perceptions of personal freedom.

To be sure, the same situation can be viewed as control by punishment of unwanted behavior or control by positive reinforcement of desired behavior. Some of the students in my university classes, for example, are motivated to avoid failure (e.g., a poor grade), whereas other students are motivated to achieve success (e.g., a good grade or even increased knowledge). Which of these groups of students feel more in control of their class grade and thus have a better attitude toward my class? Of course you know the answer to this question because you can reflect on your own feelings or attitude in similar situations in which you perceived your behavior as influenced by positive or negative consequences.

Years ago, Atkinson and his associates (e.g., Atkinson, 1957, 1964; Atkinson & Litwin, 1960) compared the decision making of individuals with a high need to avoid failure and those with a high need to achieve success, and found dramatic differences. Although those motivated to achieve positive consequences set challenging but attainable goals, those participants with a high need to avoid failure were apt to set goals that were either overly easy or overly difficult.

Easy goal setting assures avoidance of failure, whereas setting unrealistic goals provides a readily available excuse for failure—termed "self-handicapping" by later researchers (e.g., Berglas & Jones, 1978; Rhodewalt, 1994; Rhodewalt & Fairfield, 1991). Thus, a substantial amount of behavioral research and motivational theory justifies the advocacy of positive reinforcement over punishment contingencies, whether contrived to improve someone else's behavior or imagined to motivate personal rule-governed behavior (Malott, 1992).

Of course, punishment contingencies are relatively easy to implement on a large scale. That's why the government selects this approach to behavior management. Just pass a law and enforce it. And when monetary fines are paid for transgressions, the controlling agency obtains financial support for continuing the enforcement efforts.

In many areas of large-scale behavior management, including transportation management, control by negative consequences is seemingly the only feasible approach. As a result, the side effects of aggressive driving and road rage are common and observed by anyone who drives. Furthermore, most of us have experienced the unpleasant emotional reac-

tions of seeing the flashing blue light of a police vehicle in our rear-view mirror. And we've probably witnessed the temporary impact of this enforcement threat. Classic research in experimental behavior analysis taught us to expect only temporary suppression of a punished behavior (Azrin & Holz, 1966), and to predict that some drivers in their "Skinner box on wheels" will drive faster to compensate for the time they lost when slowing down in an "enforcement zone" (Estes & Skinner, 1941).

Practical ways to apply positive-reinforcement contingencies to driving are available (e.g., Everett, Haywood, & Meyers, 1979; Geller, Kalsher, Rudd, & Lehman, 1989; Hagenzieker, 1991; Kalsher, Geller, Clarke, & Lehman, 1989; Rudd & Geller, 1985), but much more long-term research is needed in this domain. We need to apply various positive-reinforcement contingencies and evaluate their ability to offset the negative side effects of the existing negative-reinforcement contingencies (cf. Geller, in press).

Regarding industrial safety, we can often intervene to increase people's perceptions that they are working to achieve success rather than working to avoid failure. Even our verbal behavior directed toward another person, perhaps as a statement of genuine approval or appreciation for a task well done (Geller, 1997a), can influence motivation in ways that increase perceptions of personal freedom and empowerment. Of course, we can't be sure our intervention will have the effect we intended. Therefore, we need to measure objectively the impact of our intervention procedures, as implicated in the next basic principle of BBS.

5. Apply the Scientific Method to Improve Intervention

Safety professionals frequently suggest that dealing with the human aspects of safety requires only "good common sense" (cf. Eckenfelder, 1996). Readers of this article realize the absurdity of such a premise. Common sense is based on people's selective listening and interpretation, and is usually founded on what sounds good to the individual listener, not necessarily on what works (cf. Daniels, 2000). In contrast, systematic and scientific observation enables the kind of objective feedback needed to know what works and what doesn't work to improve behavior.

The occurrence of specific behavior can be objectively observed and measured before and after the implementation of an intervention process. This application of the scientific method provides feedback with which improvement can be developed. My associates and I use the acronym "DO IT" to teach this principle of BBS to employees who are empowered to intervene on behalf of their coworkers' safety and want to continuously improve their intervention skills. This process puts people in control of improving safety-related behaviors and thereby preventing injuries.

"D" for define. The process begins by defining specific behaviors to target. They are at-risk behaviors that need to decrease in frequency or safe behaviors that need to occur more often. Avoiding at-risk behaviors often requires certain safe behaviors, and therefore safe targets might be behaviors to substitute for particular at-risk behaviors. On the other hand, a safe target behavior can be defined independently of an associated at-risk behavior. The definition of a safe target might be as basic as using certain personal protective equipment (PPE) or "walking within pedestrian walkways." Or, the safe target could be a process requiring a particular sequence of safe behaviors, as when lifting or locking-out energy sources.

Deriving a precise definition of a DO IT target is facilitated with the development of a checklist that can be used to evaluate whether a certain target behavior or process is being performed safely. Developing such behavioral definitions provides an invaluable learning experience. When people get involved in deriving a behavioral checklist, they own a training process that can improve human dynamics on both the outside (behaviors) and the inside (feelings and attitudes) of people.

"O" for observe. When people observe each other for certain safe or at-risk behaviors, they realize everyone performs at-risk behavior, sometimes without even realizing it. The observation stage is not a fault-finding procedure, but is a fact-finding learning process to facilitate the discovery of behaviors and conditions that need to be changed or continued in order to prevent injuries. Thus, no behavioral observation is made without awareness and explicit permission from the person being observed. The observer should be open to learning as much (if not more) from the postobservation feedback conversation as s/he expects to teach from completing the behavioral checklist.

Regarding an observation process, teams of workers answer the following critical questions:

- What kind of checklist should be used during one-on-one observations?
- Who will conduct the behavioral observations?
- How often will the observations be conducted?
- How will data from the checklist be summarized and interpreted?
- How will people be informed of the results from an observation process?

There is not one generic observation procedure for every situation, and the customization and refinement of a process for a particular setting never stops. It is often beneficial to begin with a limited number of behaviors and a relatively simple checklist. This reduces the possibility that some people will feel overwhelmed at the start. Starting small also enables the broadest range of voluntary participation, and provides numerous opportunities to successively improve the process by expanding its coverage of both behaviors and work areas. Details on how to design and use a critical-behavior checklist for constructive observation and feedback are given elsewhere (Geller, 1998c, 2001f, 2001g; Geller & Williams, 2001; Krause et al., 1996; McSween, 1995).

"I" for intervene. During this stage, interventions are designed and implemented in an attempt to increase safe behavior or decrease at-risk behavior. As reflected in Principle 2, intervention means changing external conditions of the system in order to make safe behavior more likely than at-risk behavior. When designing interventions, Principle 3 is critical. Specifically, the most motivating consequences are soon, certain, and sizable; and positive consequences are preferable to negative consequences.

The process of observing and recording the frequency of safe and at-risk behavior on a checklist provides an opportunity to give individuals and groups valuable behavior-based feedback. When the results of a behavioral observation are shown to individuals or groups, they receive the kind of information that enables practice to improve performance. Considerable research has shown that providing workers with feedback regarding their ongoing behavior is a very cost-effective intervention approach. See, for example, the important analysis of the Hawthorne Effect by Parsons (1974) and comprehensive reviews by Alvero, Bucklin, and Austin (2001), and Balcazar, Hopkins, and Suarez (1986). Furthermore, occupational safety has significantly improved following the feedback display of workers' percentages of safe versus at-risk behavior (e.g., Austin, Kessler, Riccobono, & Bailey, 1996; Sulzer-Azaroff & de Santamaria, 1980; Williams & Geller, 2000; Zohar, Cohen, & Azar, 1980).

In addition to behavioral feedback, researchers have found a number of other intervention strategies to be effective at increasing safe work practices. These include worker-designed safety slogans, "near miss" and corrective action reporting, safe behavior promise cards, individual and group goal setting, actively caring thank-you cards, safety coaching, as well as incentive/reward programs for individuals or groups. These are detailed elsewhere (Geller, 1996, 1998c, 2001f, 2001g; McSween, 1995), and recently the author offered guidelines for matching the intervention strategy with the behavioral target and situation (Geller, 2001d).

"T" for test. The test phase of DO IT provides work teams with the information they need to refine or replace a behavior-change intervention, and thereby improve the process. If observations indicate significant improvement in the target behavior has not occurred, the work team analyzes and discusses the situation, and refines the intervention or chooses another intervention approach. On the other hand, if the target reaches the desired frequency level, the participants can turn their attention to another set of behaviors. They might add new critical behaviors to their checklist, thus expanding the domain of their behavioral observations. Alternatively, they might design a new intervention procedure to focus only on the new behaviors.

Every time the participants evaluate an intervention approach, they learn more about how to improve safety performance. They have essentially become behavioral scientists, using the DO IT process to: (a) diagnose a human-factors problem, (b) monitor the impact of a behavior-change intervention, and (c) refine interventions for continuous improvement. The results from such testing provide motivating consequences to support this learning process and keep the participants involved. The systematic evaluation of a number of DO IT processes can lead to a body of knowledge worthy of integration into a theory. This is reflected in the next principle.

6. Use Theory to Integrate Information, Not to Limit Possibilities

Although much, if not most, research is theory driven, Skinner (1950) was critical of designing research projects to test theory. Theory-driven research can narrow the perspective of the investigator and limit the extent of findings from the scientific method. In other words, applying the DO IT process to merely test a theory can be like putting blinders on a horse. It can limit the amount of information gained from systematic observation.

Many important findings in behavioral science have resulted from exploratory investigation. That is, systematic observations of behavior occurred before and after an intervention or treatment procedure to answer the question "I wonder what will happen if . . . ?", rather than "Is my theory correct?" In these situations, the investigators were not expecting a particular result, but were open to finding anything. Subsequently, they modified their research design or observation process according to their behavioral observations, not a particular theory. In other words, their innovative research was data driven rather than theory driven.

This is an important perspective for safety professionals, especially when applying the DO IT process. It is often better to be open to many possibilities for improving safety performance than to be motivated to support a certain process. Numerous intervention procedures are consistent with a BBS approach, and an intervention process that works well in one situation will not necessarily be effective in another setting. Thus, the author and his colleagues teach safety leaders to make an educated guess about what intervention procedures to use at the start of a BBS process, but be open to results from a DO IT process and refine procedures accordingly. Of course, Principles 1 to 4 should always be used as guides when designing intervention procedures.

After many systematic applications of the DO IT process, distinct consistencies are likely. Certain procedures will work better in some situations than others, with some individuals than others, or with some behaviors than others. Summarizing relationships between intervention impact and specific situational or interpersonal characteristics can lead to the development of a research-based theory of what works best under particular circumstances. This implies the use of theory to integrate information gained from systematic behavioral observation. Skinner (1950) approved of this use of theory, but cautioned that premature theory development can lead to premature theory testing and limited profound knowledge.

7. Design Interventions with Consideration of Internal Feelings and Attitudes

As discussed previously, B. F. Skinner was certainly concerned about unobservable attitudes or feeling states. This is evidenced by his criticism of punishment because of its impact on people's feelings or perceptions. This perspective also reflects a realization that intervention procedures influence feeling states, and these can be pleasant or unpleasant, desirable or undesirable. In other words, internal feelings or attitudes are influenced indirectly by the type of behavior-focused intervention procedure implemented, and such relationships require careful consideration by the developers and managers of a BBS process.

The rationale for using more positive than negative consequences to motivate behavior is based on the differential feeling states provoked by positive reinforcement versus punishment procedures. Similarly, the way we implement an intervention process can increase or decrease feelings of empowerment, build or destroy trust, or cultivate or inhibit a sense of teamwork or belonging (Geller, 2001f, 2001g, 2002b). Thus, it is important to assess feeling states or perceptions that occur concomitantly with an intervention process. This can be accomplished informally through one-on-one interviews and group discussions, or formally with a perception survey (O'Brien, 2000; Petersen, 2001).

Thus, decisions regarding which intervention to implement and how to refine existing intervention procedures should be based on both objective behavioral observations and subjective evaluations of feeling states. Often, however, it's possible to evaluate the indirect internal impact of an intervention by imagining yourself going through a particular set of intervention procedures and asking the question, "How would I feel?" Perhaps in this case, basic common sense is as good as any evidence one could gather from subjective evaluations of other persons' feeling states.

The Flow of Behavior Change

As reviewed earlier, an effective BBS process requires a careful analysis of the context in which target behaviors occur. Subsequently, behavior-change intervention needs to be designed, implemented, and evaluated, as reflected in the DO IT process. In fact, each of the BBS principles summarized previously manifests guidelines for developing intervention procedures or assessing intervention impact. In addition, the choice of an intervention process to improve safety-related behavior should depend on whether the at-risk behavior is intentional and whether it is other-directed, self-directed, or automatic (Watson & Tharp, 2002).

Three Types of Behavior

Safety-related behavior in an industrial setting usually starts out as other-directed, in the sense that employees follow someone else's instructions. Such direction can come from a training program, an operations manual, or a policy statement. After people learn what to do, essentially by memorizing or internalizing the appropriate instructions, their behavior can become self-directed. They talk to themselves or formulate an image before performing a behavior in order to activate the right response.

Sometimes they talk to themselves after performing a behavior in order to reassure themselves they performed it correctly. Or, they use self-dialogue to figure out ways to do better next time. At this point they are usually open to corrective feedback that is delivered well.

When some behaviors are performed frequently and consistently over a period of time, they become automatic. A habit is formed. Some habits are good and some are not good, depending on their short- and long-term consequences. If implemented correctly, rewards, recognition, and other positive consequences can facilitate the transfer of behavior from the self-directed state to the habit state.

Of course, self-directed behavior is not always desirable. When workers take a calculated risk, for example, they are choosing intentionally to ignore a safety precaution or take a short cut in order to perform more efficiently or with more comfort or convenience. In this state, people can be considered "knowingly at-risk." It's often difficult to change self-directed behavior from at-risk to safe, because such a transition usually requires a relevant change in personal motivation.

Before a bad habit can be changed to a good habit, the target behavior must become self-directed. In other words, people need to become aware of their undesirable habit (as in at-risk behavior) before an adjustment is possible. Then, if people are motivated to improve (perhaps as a result of feedback or an incentive/reward program), their new self-directed behavior can become automatic.

Three Kinds of Intervention Strategies

The ABC (activator-behavior-consequence) model was reviewed previously (Principle 3) as a framework to understand and analyze why behavior occurs, as well as to develop interventions for improving behavior. Consider that activators and consequences are external to the performer (as in the environment), or they can be internal (as in self-instructions or self-recognition). They can be intrinsic or extrinsic to a behavior, meaning they provide direction or motivation naturally as a task is performed (as in a computer game), or they are added to the situation extrinsically in order to improve performance. An incentive/reward program is external and extrinsic. It adds an activator (an incentive) and a consequence (a reward) to the situation in order to direct and motivate desirable behavior (Geller, 1996).

Instructional intervention. An instructional intervention is typically an activator or antecedent event used to get new behavior started or to move behavior from the automatic (habit) stage to the self-directed stage. Or, it is used to improve behavior already in the self-directed stage. The aim is to get the performer's attention and instruct him or her to transition from unknowingly at-risk to knowingly safe. You

assume the person wants to improve, so external motivation is not needed—only external and extrinsic direction.

This type of intervention consists primarily of activators, as exemplified by education sessions, training exercises, and directive feedback. Because the purpose is to instruct, the intervention comes before the target behavior and focuses on helping the performer internalize the instructions. This type of intervention is more effective when the instructions are specific and given one-on-one. Role-playing exercises provide instructors opportunities to customize directions specific to individual attempts to improve. They also allow participants the chance to receive rewarding feedback for their improvement.

Supportive intervention. Once a person learns the right way to do something, practice is important for the behavior to become part of a natural routine. Continued practice leads to fluency (i.e., fast and accurate behavior) and in many cases to automatic or habitual behavior. Practice does not come easily, and benefits greatly from supportive intervention. We need support to reassure us we are doing the right thing and to encourage us to keep going.

Although instructional intervention consists primarily of activators, supportive intervention focuses on the application of positive consequences. Thus, when receiving rewarding feedback or recognition for particular safe behavior, people feel appreciated and are more likely to perform the behavior again (Allen, 1990; Daniels, 2000, 2001; Geller, 1997a). Each occurrence of the desired behavior facilitates fluency and helps build a good habit. Note that supportive intervention is typically not preceded by a specific activator. In other words, the support of self-directed behavior does not need an instructional antecedent. The person knows what to do.

Motivational intervention. When people know what to do and don't do it, they require some external encouragement or pressure to change. Instruction alone is obviously insufficient because they are knowingly doing the wrong thing. In safety, this is referred to as a "calculated risk." People take calculated risks when they perceive the positive consequences of the at-risk behavior to be more powerful than the negative consequences. The positive consequences of comfort, convenience, and efficiency are immediate and certain, whereas the negative consequence of at-risk behavior (such as an injury) is improbable and seems remote.

In this situation an incentive/reward program is useful. Such a program attempts to motivate a certain target behavior by promising people a positive consequence if they perform it. The promise is the incentive and the consequence is the reward. In safety, this kind of motivational intervention is much less common than a disincentive/penalty program. A disincentive takes the form of a rule, policy, or law that threatens to give people a negative consequence (a penalty) if they fail to comply or take a calculated risk.

Often a disincentive/penalty intervention is ineffective, because like an injury, the negative consequence or penalty seems remote and improbable. The behavioral impact of these enforcement programs are enhanced by increasing the severity of the penalty and punishing more people for taking the calculated risk. The large-scale implementation of this kind of intervention can seem inconsistent and unfair, however. In addition, threats of punishment appear to challenge individual freedom and choice (Skinner, 1971), and therefore this approach to behavior change can backfire and activate more calculated risk-taking, even sabotage, theft, or interpersonal aggression (Sidman, 1989).

Motivational intervention is clearly the most challenging, requiring enough external influence to get the target behavior started without triggering a desire to assert personal freedom (Brehm, 1966, 1972). Powerful external consequences might improve behavior only temporarily, as long as the behavioral intervention is in place. Hence the individual is "knowingly safe," but the excessive outside control makes the behavior entirely other-directed. Excessive control on the outside of people can limit the amount of control or self-direction they develop on the inside. This issue is addressed in more detail in the next major section of this article.

Putting it all together. Figure 2 reviews this intervention information by depicting relationships among four competency states (unknowingly at-risk, knowingly at-risk, knowingly safe, and habitually safe) and four intervention approaches (instructional intervention, motivational intervention, supportive intervention, and self-management). When people are unaware of the safe work practice (i.e., they are knowingly at-risk), they need repeated instructional intervention until they understand what to do. Then, as depicted at the far left of Figure 2, the critical question is whether they perform the desired behavior. If they do, the question of behavioral fluency is relevant. A fluent response becomes a habit or part of a regular routine, and thus the individual is habitually safe.

When workers know how to perform a task safely but don't, they are considered knowingly at-risk. This is when an external motivational intervention can be useful, as discussed previously. Then when the desired behavior occurs at least once, supportive intervention is needed to get the behavior to a fluent state.

Figure 2 also illustrates a distinction between knowingly safe/other-directed and knowingly safe/self-directed. If a safe work practice is self-directed, the employee is considered responsible and a self-management intervention is relevant. As detailed elsewhere (Watson & Tharp, 2002), the methods and tools of effective self-management are derived from behavioral science research and are perfectly consistent with the principles of BBS.

In essence, self-management involves the application of the DO IT process (Principle 5) to one's own behavior. This means (a) defining one or more target behavior(s) to improve, (b) monitoring these behaviors, (c) manipulating relevant activators and consequences to increase desired behavior and decrease undesired behavior, and (d) tracking

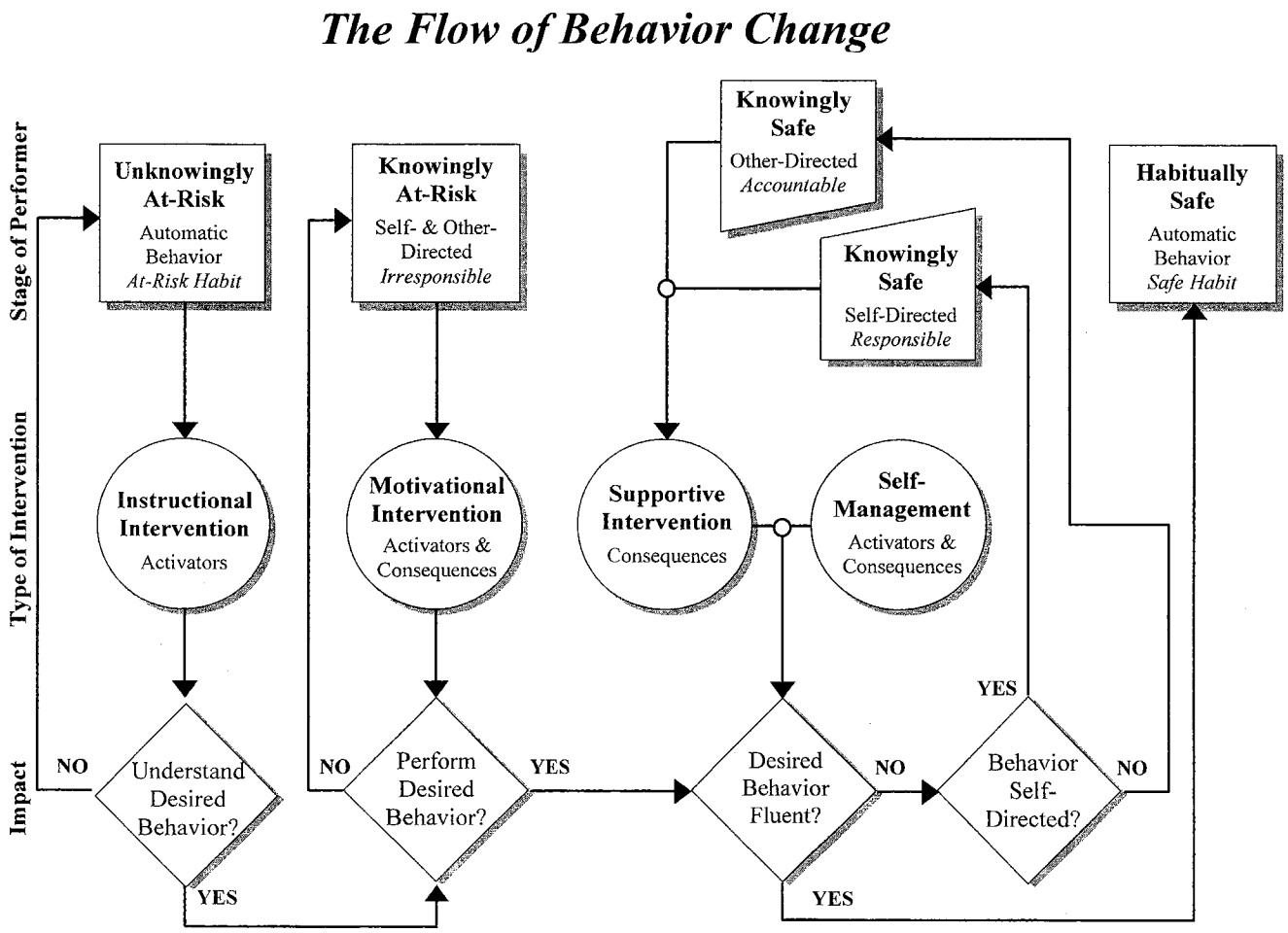

Figure 2. The flow of behavior change model proposed to match awareness (knowingly vs. unknowingly) and safety-related behavior (safe vs. at-risk) with four basic types of intervention (adapted from Geller, 2001d).

continual change in the target behavior(s) in order to determine the impact of the self-management process (Geller, 2001b; Geller & Clarke, 1999).

Accountability versus responsibility. From the perspective of large-scale safety and health promotion, the distinction in Figure 2 between accountable (other-directed) and responsible (self-directed) is critical, implicating one of the greatest challenges in the safety profession. When people are held accountable, they are asked to reach a certain objective or goal, often within a designated time period. However, they might not feel responsible to meet the deadline, or they might feel responsible enough to complete the assignment, but that's all. They do only what's required and no more. In this case, accountability is the same as responsibility.

There are times, however, when people extend their responsibility beyond accountability. They do more than what's required. They go beyond the call of duty as defined by a particular accountability system. This is often essential when it comes to industrial safety and health. To improve safety beyond the current performance plateau experienced by many companies, workers need to extend their responsibility for safety beyond that for which they are held accountable. They need to transition from an other-directed state to a self-directed state.

Many jobs are accomplished by a lone worker. There are no supervisors or coworkers around to hold the employee accountable for performing the job safely. So the challenge for safety professionals and corporate leaders is to build the kind of work culture that enables or facilitates responsibility or self-accountability for safety. This requires a consideration of psychological theory and research not typically linked to BBS. Specifically, the concepts of self-perception (Bem, 1972) and self-persuasion (Aronson, 1999) are pertinent.

The Challenge of Sustaining Behavior Change

The intervention approaches reviewed previously can change behavior, but will the target behavior continue when the intervention is removed? Some behavior analysts consider this primarily a challenge of institutionalizing the ABC contin-

gencies of the intervention process (Malott, 2001; McSween & Matthews, 2001). In other words, the external and extrinsic activators and consequences need to be transferred from the behavior analyst or intervention agent to the indigenous personnel of the organizational setting in which the target behavior occurs. Thus, the intervention is not actually removed; rather those who deliver the intervention contingencies are changed.

Other behavior analysts talk about this maintenance challenge in terms of the behavior continuing in the absence of the external and extrinsic intervention (Baer, 2001; Boyce & Geller, 2001; Geller, 2001d; Stokes & Baer, 1977). Some presume the objectives of the intervention are internalized, and as indicated earlier, people act themselves into thought processes consistent with the new behavior (Geller, 2001e). As such, personal change is viewed as a continuous spiral of behavior causing thinking, thinking inducing more behavior, and then this additional behavior influencing more thinking consistent with the behavior, and so on. However, programmatic research indicates that some interventions do not facilitate an attendant change in thinking. This is reflected profoundly in Bem's (1972) classic theory of self-perception.

Behavioral Self-Perception

Bem (1972) prefaced his behavioral presentation of self-perception theory with "individuals come to 'know' their own attitudes, emotions, and other internal states by inferring them from observations of their own overt behavior and/or the circumstances in which this behavior occurs" (p. 2). In other words, we write mental scripts or make internal attributions about ourselves from our observations and interpretations of the various three-term contingencies that enter our life space. And, "if external contingencies seem sufficient to account for the behavior, then the individual will not be led into using the behavior as a source of evidence for his self-attributions" (p. 19).

Thus, children who had the excuse of a severe threat for not playing with a "forbidden toy" did not internalize a rule, and therefore played with the forbidden toy when the threat contingency was removed (Lepper & Green, 1978). Similarly, college students paid $20 for telling other students a boring task was fun did not develop a personal view that the task was enjoyable (Festinger & Carlsmith, 1959). The reinforcement contingency made their behavior incredible as a reflection of their personal belief or self-perception.

In contrast, participants who received a mild threat or low compensation (only $1) to motivate their behavior developed a self-perception consistent with their behavior. The children avoided playing with the forbidden toy in a subsequent situation with no threat, and the college students who lied for low compensation decided they must have liked the boring task. In theory, these participants viewed their behavior as a valid guide for inferring their private views, because their behavior was not under strong contingency control.

The More Outside Control, the Less Self-Persuasion

Much additional research supports the notion that self-persuasion is more likely when the extrinsic control of the three-term contingency is less obvious or perhaps indirect. In other words, when there are sufficient external consequences to justify the amount of effort required for a particular behavior, the performer does not develop an internal justification for the behavior. There is no self-persuasion (Aronson, 1999) and performing the behavior does not alter self-perception (Bem, 1972). Under these circumstances the maintenance of the behavior is unlikely, unless it's possible to keep a sufficient accountability system (e.g., incentives or disincentives) in place over the long term, as was in fact the case for a 13-year incentive process that successfully reduced injuries in an open-pit mine (Fox, Hopkins, & Anger, 1987).

Thus, intervening to improve behavior over the long term is more complex than applying the three-term contingency. Not only is it necessary to consider whether the performer needs instruction, motivation, or only support to improve or maintain behavior (Geller, 2001d), it seems internal cognitive factors are important whenever external contingencies cannot remain in place to hold people accountable. This implicates self-persuasion and self-directed behavior, topics not typically considered in BBS. These concepts imply that indirect influence is more likely to lead to sustained behavior change than direct persuasion.

Direct persuasion. Advertisers use direct persuasion. They show us people enjoying positive consequences or avoiding negative consequences by using their products. As such, they apply the three-term contingency or ABC paradigm to sell their goods and services. The activator (or "A" of the ABC contingency) announces the availability of a reinforcing consequence (the "C" of the ABC contingency) if the purchasing behavior is performed (the "B" of the ABC contingency).

Advertisers also apply research-based principles from social psychology to make their messages more persuasive. Specifically, social scientists have shown advantages in using highly credible communicators and in arousing their audience's emotions (Aronson, 1999; Hovland & Weiss, 1951). Therefore, sales pitches are often given by authority figures and attempt to get viewers emotionally involved with product-related issues.

Note, however, these attempts at direct persuasion are not asking for behavior that is inconvenient or difficult. Normally, the purpose of an advertisement is to persuade a consumer to select a certain brand of merchandise they already use. This boils down to merely choosing one commodity over another at the retail store. This is hardly a burdensome change in lifestyle.

Safety-related behavior is usually more inconvenient and requires more effort than switching brands at a supermarket. In other words, long-term participation in a safety-related work process is far more cumbersome and lifestyle-changing than the consumer behavior targeted by advertisers. In fact,

direct attempts to persuade people to make inconvenient changes in their lifestyle have often yielded disappointing results. For example, communication strategies have generally been unsuccessful at persuading smokers to quit smoking (Elder, Geller, Hovell, & Mayer, 1994), drivers to stop speeding (Geller, 1998a), homeowners to conserve water (Geller, Erikson, & Buttram, 1983) or insulate their water heaters (Geller, 1981), bigoted individuals to cease prejudicial behavior, or sexually active people to use condoms (Aronson, 1999). Similarly, the "Just Say No to Drugs" campaigns have not influenced much behavior change.

The direct approach can give the impression the target behavior is accomplished for someone else's benefit. This can cause a disconnection between the behavior and self-perception. There is no self-persuasion—a mindset needed for lasting change in the absence of incentives/rewards, disincentives/penalties, or another type of extrinsic and external accountability system.

The indirect approach. Self-persuasion is more likely to occur when the motivational strategy is less obvious. For example, compliments regarding a person's performance are often more powerful when they are more indirect than direct (Allen, 1990; Geller, 1997a). Your personal experience probably verifies this. Consider that you overhear a person tell someone else about your superb achievement on a particular assignment. Or, suppose a friend gives you secondhand recognition by sharing what another person said about your special talents. Both of these situations reflect indirect commendation, and would likely have more influence on your self-perception than a direct interpersonal statement of praise. Why? Because the direct approach is tainted by the possibility the flattery is given for an ulterior motive.

Indirect persuasion deviates significantly from the standard "command and control" method of promoting compliance with safety regulations. Both approaches might be equally effective at motivating behavior change, but an indirect approach will be far more successful at enhancing the kind of internal dialogue needed to maintain behavior in the absence of an external motivator or accountability system.

Defining intervention conditions that can make this happen is not easy, but start by asking "Does the situation promote individual choice, ownership, and personal accountability?" "Does the context in which safety participation is desired contribute to connecting or disconnecting the link between what people do and what they think of themselves?" "Are the safety-related activities only behaviors or do they stimulate supportive cognitive activity or self-persuasion?" These questions reflect the role of psychological states, or expectancies in facilitating safety-related behavior. Indeed, if certain feelings or beliefs affect people's participation in safety-related activities, then enhancing these states could be a powerful indirect way to improve safety performance. This is reflected in another theoretical perspective relevant to the large-scale prevention of unintentional injuries and fatalities.

Propensity to Actively Care

The author has proposed that certain psychological states or expectancies affect the propensity for individuals to actively care for the environment (Geller, 1995, 2002a) and for the safety or health of others (Geller, 1991, 2001a, 2001f, 2001g). Furthermore, the author theorizes that certain conditions (including behavioral antecedents and consequences) can influence these psychological states, and thereby enhance the probability an individual will emit caring-related behavior.

This notion that beliefs, expectancies, or person states influence one's propensity to perform in certain ways is analogous to the behavior analysis concept of "establishing operations" (Agnew, 1998; Michael, 1982). For example, behavior therapists have shown significant behavior change in both normal and developmentally disabled children as a function of simple manipulations in the social context (Gewirtz & Baer, 1958a, 1958b) or the temporal proximity of lunch and response-consequence contingencies (Vollmer & Iwata, 1991). Thus, the point that certain operations or environmental conditions (past or present) can influence (or establish) psychological states within humans, which in turn affects their behavior, is not new to applied behavior analysis. However, this indirect approach to behavior change is founded on empirical research not typically consulted by the behavior analyst.

The Actively Caring Model

Figure 3 depicts a model the author and his associates have used for more than a decade to stimulate discussions among industry employees about specific situations, operations, or incidents that influence their willingness to actively care or participate in safety-improvement efforts. Factors consistently listed as affecting self-esteem include communication strategies, reinforcement and punishment contingencies, and leadership styles. Participants have suggested a number of ways to build self-esteem, including: (a) providing opportunities for personal learning and peer mentoring, (b) increasing recognition for desirable behaviors and personal accomplishments, and (c) soliciting and following-up on a person's suggestions. Common proposals for increasing an atmosphere of belonging among employees have included decreasing the frequency of top-down directives and "quick-fix" programs, and increasing team-building discussions, group goal setting and feedback, group celebrations for both process and outcome achievements, and the use of self-managed (or self-directed) work teams.

In the management literature, empowerment typically refers to delegating authority or responsibility, or sharing decision making (Conger & Kanungo, 1988). In contrast, the psychological perspective of empowerment focuses on the reaction of the recipient to increased power or responsibility. In other words, this view of empowerment requires the per-

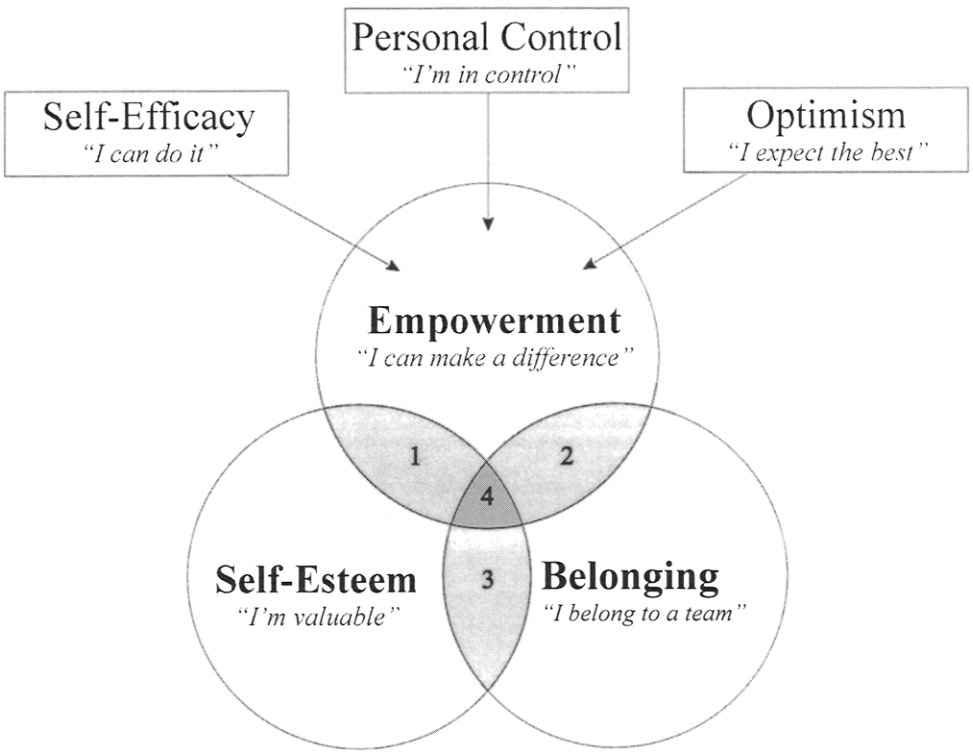

Figure 3. The person states proposed to predict one's willingness to actively care for the safety and health of others (adapted from Geller, 2001a).

sonal belief "I can make a difference," and this belief is strengthened with perceptions of personal control (Rotter, 1966), self-efficacy (Bandura, 1977, 1997) and optimism (Scheier & Carver, 1985; Seligman, 1991). Such an empowerment state is presumed to increase motivation (or effort) to "make a difference" or go beyond the call of duty, and there is empirical support for this intuitive hypothesis (e.g., Bandura, 1986; Barling & Beattie, 1983; Ozer & Bandura, 1990; Phares, 1976).

Employees at my actively caring training sessions have listed a number of ways to increase empowerment, including: (a) setting short-term goals and tracking achievements; (b) offering frequent rewarding and correcting feedback for safety-related process activities rather than only for outcomes such as total recordable injury rate; (c) providing opportunities to set personal goals, teach peers, and chart "small wins" (Weick, 1984); (d) teaching employees basic behavior-change intervention strategies (e.g., response feedback and recognition procedures), and providing them time and resources to implement and evaluate intervention programs; (e) showing employees how to graph daily records of baseline, intervention, and follow-up data; and (f) posting response feedback graphs of group performance.

Research Support for the Actively Caring Model

There are actually a number of empirical studies, mostly in the social psychology literature, that support the individual components of the actively caring model depicted in Figure 3. The bystander intervention paradigm (Darley & Latané, 1968) has been the most common (and rigorous) laboratory technique used to study variables related to actively caring. With this approach, one or more of the person states presumed to affect actively caring (i.e., self-esteem, empowerment, and belonging) were measured or manipulated among subjects, and subsequently these individuals were placed in a situation in which they had an opportunity to help another individual who presumably encountered a personal crisis (e.g., falling off a ladder, dropping personal belongings, or feigning an illness or heart attack). The latency in attempting to help the other person was the primary dependent

variable, studied as a function of a subject's social situation or personality state.

Self-esteem. Michelini, Wilson, and Messe (1975) and J. P. Wilson (1976) measured subjects' self-esteem with a sentence completion test and then observed whether they helped another individual in a bystander intervention situation. Subjects with high self-esteem were significantly more likely than subjects with low self-esteem to help another individual pick up dropped books (Michelini et al., 1975), and to exit an experimental room to help someone in another room who screamed he had broken his foot following a mock "explosion" (J. P. Wilson, 1976). Analogously, subjects with higher self-esteem scores were more likely to help a stranger by taking his place in an experiment that would presumably give them electric shocks (Batson, Bolen, Cross, & Neuringer-Benefiel, 1986).

Belonging. By systematically manipulating a person's sense of belonging in groups of two and four, Rutkowski, Gruder, and Romer (1983) found group cohesion to reverse the usual bystander-intervention effect (i.e., the finding of more individual intervention in smaller groups). Cohesiveness was manipulated by having groups discuss topics and feelings related to college life. Both frequency and speed of helping a "victim" (confederate) who had ostensibly fallen off a ladder were greater for the cohesive groups. Indeed, the most helping was found among subjects in the high cohesion/four-person group condition.

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

Personal control. The personal-control factor of the actively caring model represents one of the most extensively researched individual-difference variables in psychology, and refers to a general expectancy regarding the location of forces controlling an individual's life (i.e., internal versus external factors). Persons with an *internal* locus of control believe they normally have personal control over important life events as a result of knowledge, skills, and abilities. In contrast, individuals with an *external* locus of control believe factors like luck, chance, or fate have significant influence in their lives (Rotter, 1966; Rushton, 1980). From a behavioral perspective, externals generally expect to have less personal control over the pleasant and unpleasant consequences in their lives than do internals.

Those high-esteem subjects who showed more actively caring than low-esteem behavior in Wilson's (1976) bystander-intervention study (discussed previously) were also characterized as *internals,* in contrast to the lower self-esteem *externals,* who were less apt to help the victim. Similarly, Midlarsky (1971) observed more internals than externals willing to help another person perform a motor coordination task that included receiving electric shocks. In addition, those who helped at a vehicle crash scored significantly higher on personal control (i.e., internals) and self-esteem than those who only stopped and watched (Bierhoff, Klein, & Kramp, 1991).

Sherrod and Downs (1974) asked subjects to perform a task while hearing loud, distracting noise. They manipulated subjects' perceptions of personal control by telling half they could terminate the noise (if necessary) by notifying them through an intercom. The subjects who could have terminated the noise (but did not) were significantly more likely to comply with a later request by another individual to take some extra time (with no extrinsic benefits) to solve math problems.

Self-efficacy. Self-efficacy refers to people's beliefs that they have the personal skills and resources to complete a task successfully (Bandura, 1977, 1997). Other individual-difference factors relate significantly to this construct, including self-esteem (Rosenberg, 1965), locus of control (Rotter, 1966), and learned hopefulness (Zimmerman, 1990). Thus, research that showed more actively caring from internals with high self-esteem (e.g., Bierhoff et al., 1991; Midlarsky, 1971) indirectly supported this aspect of the actively caring model. Zimmerman (1990) defined "empowering experiences" as experiences providing opportunities to learn skills and develop a sense of personal control. He proposed empowerment to be a product of learned hopefulness. In other words, people become empowered as they gain control and mastery over their lives and learn to use their skills to affect life events.

Optimism. Optimism is the learned expectation that life events, including personal action, will turn out well (Scheier & Carver, 1985; Seligman, 1991). Researchers have manipulated optimistic states (or moods) among individuals by giving them unexpected rewards or positive feedback and then observing the frequency of helping behaviors. Isen and Levin (1972), for example, showed that individuals who found a dime in the coin-return slot of a public phone (placed there by researchers) were more likely to help a stranger who dropped a folder of papers than were individuals who did not find a dime. Similarly, students given a cookie while studying at the university library were more likely than those not given a cookie to agree to help another by participating in a psychology experiment. Carlson, Charlin, and Miller (1988) reviewed these and other studies that showed direct relationships between an optimistic mood state and actively caring.

Direct tests of the actively caring model. Geller, Roberts, and Gilmore (1996) developed a "safety culture survey" (SCS) for industrial application, which includes measures of each person factor hypothesized to influence actively caring. This actively caring scale includes adaptations from standard measures of self-esteem (Rosenberg, 1965), self-efficacy (Sherer et al., 1982), personal control (Nowicki & Duke, 1974), optimism (Scheier & Carver, 1985), and group cohesion (Wheeless, Wheeless, & Dickson-Markman, 1982). The survey also includes direct measures of willingness to actively care from an environment focus ("I am willing to pick up after another employee in order to maintain good housekeeping"), a person focus ("If an employee needs assistance with a task, I am willing to help even if it causes me inconvenience"), and a behavior-change focus ("I am willing to observe the work practices of another employee in order to provide direct feedback to him/her"). Respondents' reactions to each of the 154 items of the survey are given on a 5-point Likert-type scale ranging from "Highly Disagree" to "Highly Agree."

Analyzing the SCS results from three large industrial complexes showed support for the actively caring model (Geller et al., 1996; Roberts & Geller, 1995). The personal-control factor was consistently most influential in predicting willingness to actively care. Belonging scores predicted significant differences in actively caring propensity at two of three plants. Self-esteem and optimism always correlated highly with each other, and with willingness to actively care, but only one or the other predicted independent variance in actively caring propensity. For these studies, our survey did not include a measure of self-efficacy. The multiple regression coefficients and sample sizes were .54 ($n = 262$), .57 ($n = 307$), and .71 ($n = 207$) at the three plants, respectively.

In a field test of the actively caring model, Roberts and Geller (1995) studied relationships between workers' on-the-job actively caring and prior measures of their self-esteem, optimism, and group cohesion. More specifically, employees ($n = 65$) were instructed to give their coworkers special "actively caring thank-you cards" (redeemable for a beverage in the cafeteria) whenever they observed a coworker going beyond the call of duty (i.e., actively caring) for another person's safety. Those employees who gave or received thank-you cards scored significantly higher on measures of self-esteem and group cohesion than those who did not give or receive an actively caring thank-you card.

In an unpublished study, five of the author's students asked individuals ($n = 156$) who had just donated blood at a campus location to complete a 60-item survey that measured each of the five person factors depicted in Figure 3. The high return rate of 92% was consistent with an actively caring profile, but most remarkable was that this group scored significantly higher ($p < .001$) on each of the five subscales than did a group of students ($n = 292$) from the same university population (Buermeyer, Rasmussen, Roberts, Martin, & Gershenoff, 1994).

Conclusions

This article reviewed applications of behavioral science for occupational safety currently occurring in numerous industries worldwide, thereby illustrating one successful attempt to meet the challenge of giving psychology away (G. A. Miller, 1969). Industrial safety has been identified as a domain in need of large-scale and long-term behavior and attitude change. For this to happen, however, a prominent paradigm shift is called for. The standard command-and-control or enforcement approach to industrial safety has limited effectiveness, as witnessed by the safety-performance plateaus experienced by numerous organizations. The BBS approach summarized in this article provides tools and methods employees can use to take control of their own safety performance, thereby enabling a bottom-up empowerment approach to preventing workplace injuries.

This shift in perspective and intervention approach to occupational safety was demonstrated at the company safety celebration the author attended immediately after completing the initial draft of this article. Certain energy-producing plants of this utility company had been applying BBS procedures for 1 to 4 years, and this 1-day conference provided an opportunity for the various work groups to share their experiences, consider additional possibilities, and develop new action plans. This gathering was typical of the new wave of industrial safety meetings, but markedly different than the standard safety conference the author has witnessed numerous times in the past.

Consider the following aspects of this corporate safety meeting, as compared with those uninfluenced by the principles and procedures of BBS. First, the gathering of about 100 safety leaders from six different energy-producing plants included an equal proportion of management and hourly (i.e., union) employees, with only a few safety professionals. This contrasts dramatically with the more typical safety conference of mostly safety professionals, or the safety meetings held separately for management and union members. Indeed, this change in participants at safety conferences is one of the most obvious changes in industrial safety that occurred concomitantly with giving organizations BBS observation and feedback methodology—a process employees can use on each other to initiate and support safe work practices. In fact, several consulting firms, as well as the Cambridge Center for Behavioral Studies, sponsor an annual BBS "User Conference" that line workers attend in large numbers to learn more about BBS procedures and to network with other users of the principles and methods reviewed in this article.

Second, at this safety conference line workers (i.e., union members) gave more presentations than did managers and safety professionals. Although the conference started with a safety professional reviewing the company's current safety performance and plant managers offering motivational statements and visions, hourly workers did most of the present-

ing. After the author taught some advanced BBS lessons and process ideas, teams of hourly workers from the four facilities with the most improved safety records detailed what they did to increase safe behaviors and reduce at-risk work practices. After lunch, the author facilitated a "workshop" whereby teams of employees from the various fossil-fuel and hydroelectric plants customized action plans for getting more employee involvement in their settings. Subsequently, each team presented its plan, including support requirements and expected results. Each of these presentations was followed by reactions or questions from audience members, as well as commentary from the author. The session ended with supportive statements from two plant managers and the Chair of the Conference Planning Committee.

Unlike the traditional safety conference, the focus was not on compliance with OSHA safety rules, government standards, or company policy, but rather on how to get more people involved in a BBS observation and feedback process. The theme was not on how to reduce such outcome numbers as total recordable injury rate, but instead on what can be done to achieve more quality participation in ongoing injury-prevention processes. Only the author mentioned unobservable or ambiguous concepts like "attitude," "mindset," "perception," and "culture." Everyone else focused on observable and trackable behaviors. The popular slogan "safety is an attitude" has been replaced with "Keep on doing what you're doing and you'll keep on getting what you're getting." It's no longer just "care," it's "actively care."

The basic BBS principles and procedures that precipitated this paradigm shift in occupational safety were reviewed in this article, including the approaches this author and his colleagues have used for more than a decade to teach BBS to safety leaders and line workers. Two conceptual models were explained—a "flow of behavior change" theory that suggests ways to match the awareness and behavior of an individual with a particular intervention approach, and an "actively caring model" that proposes a direct relationship between certain psychological states and a person's propensity to go beyond the call of duty for the safety or health of others.

Research support was provided for each of these models, but more empirical validation is certainly needed. However, in the spirit of giving psychology away in this "Decade of Behavior," the author offers these models as teaching tools—ways to disseminate principles and procedures that can be applied effectively to prevent unintentional injury in organizations, communities, neighborhoods, and homes. This obviously requires more interdisciplinary networking between psychologists and safety organizations from both the private and public sectors. The lack of a single safety organization among the 50 organizations currently supporting the "Decade of Behavior" (Carpenter, 2000) suggests there is much room for improvement.

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