Behavioral Safety Theory

Understanding the theoretical foundation

By Stephen E. Johnson

FOR THE PAST DOZEN OR SO YEARS, SH&E professionals have used behavioral psychology to reduce risk in the workplace. This attention has been justified on the basis that at-risk behaviors are the last measurable and observable events preceding workplace injuries. Controlling the expression of these behaviors has been argued to be key to safety improvement.

Various programs have emerged to address at-risk behavior with the expectation that effective control will result in reduced injuries. Although few studies have been conducted to determine the association between behavioral safety and reduced injuries, safety literature contains numerous testimonials asserting the effectiveness of behavioral safety programs. Two research teams compiled results from several case studies and concluded that strong evidence exists to support the relationship between behavioral safety and reduced injury rates (Sulzer-Azaroff and Austin; Krause, et al). Additionally, some researchers have studied the impact of specific interventions and have concluded that some behavioral programs positively affect injury experience (Lingard and Yesilyurt; Lingard; Lingard and Rowlinson; Duff, et al).

While evidence supports the effectiveness of behavioral safety, little time has been dedicated to explaining mechanisms, theory and models underlying behavioral safety programs. In other words, organizations are beginning to understand how to affect behavioral change, but do not fully comprehend why behavioral interventions are effective. According to Argyris, both components (theoretical basis and actionable elements) are critical to the development of effective management theories. That is, Argyris argues, management must be guided by knowledge containing actionable and theoretical elements. When this occurs, theories become consequential and have pragmatic value within management contexts. In other words, management theories become actionable and meaningful [Argyris(a)].

This article concerns the theoretical foundation of behavioral safety programs. It discusses behavioral and industrial psychological theories that explain the effectiveness of behavioral safety programs. In essence, this article completes the construction of a consequential management theory by integrating established behavioral safety methods with accepted behavioral science theory. This objective is accomplished through 1) a review of popular behavior theory; 2) the construction of a model that integrates behavioral science within a framework of systems-thinking; and 3) a brief application related to safety.

Popular Behavior Theory

Several theoretical concepts help explain the causation of behavior. According to Geller, theory is the foundation of effective safety behavior intervention strategies [Geller(b); (c)]. Each of the concepts presented in this section are interrelated and collectively form a reasonable explanation for the emergence of behavior. While many applicable theoretical elements exist, important concepts include the definition of behavior, and models explaining the emergence of behavior, motivation, organizational commitment and organizational culture.

The Definition of Behavior

The study of behavior begins and ends with the definition of behavior. This definition is not only critical to the theoretical model presented in this article, it is also essential to the operation of behavioral safety programs. Without a clear definition, it would be difficult to discern desired behaviors.

Dictionaries commonly define behavior as a function of *behave*. In particular, these definitions describe behavior as the way someone behaves or in terms of a response to specified conditions (Microsoft). Behavior may also be described as an activity (Hersey, et al). In this sense, it is the particular manner in which someone acts, reacts or functions, and is driven by the strength of an individual's motives, probability of meeting the goal (expectancy) and the accessibility of the goal (availability). Behavior, therefore, relates to activity, response, underlying motivation/meaning and

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intent. While these definitions certainly conform to an intuitive understanding of the term, they serve little pragmatic value to the scientific application of behavioral psychology.

To improve utility, preferred definitions must have the capacity to be operationalized as quantitative or qualitative research variables. In other words, the term must be defined in a manner that allows for the collection of data. As a result, behavioral scientists sometimes describe behavior as observable actions that can be interpreted in the same manner by different observers. For example, Geller defines behavior as the "acts or actions by individuals that can be observed by others" [Geller(c) 115]. In addition, he states that the acid-test of an effective description of a particular behavior is "whether other people using the definition can accurately observe if the target behavior is occurring" [Geller(c) 116]. Therefore, Geller's definition is preferred in this context, and is particularly useful since his professional activities are directly related to safety.

Emergence of Behavior

While behavior is easy to define, its emergence is harder to explain; scientists have different theories concerning the causation of behavior. Two theories, however, can potentially explain behavior, particularly because each has been validated in a variety of research studies. These include the 1) value-attitude-behavior hierarchy model and 2) theory of planned behavior (TPB) model.

Value-attitude-behavior. Homer and Kahle assert that human behavior is a function of attitude which, in turn, is a consequence of an individual's value system. In other words, the value-attitude-behavior hierarchy model demonstrates that "influence should theoretically flow from the abstract values to mid-range attitudes to specific behaviors" (Homer and Kahle 638). Thus, a connection appears to exist between values and behavior, through intermediary attitudes. Therefore, Homer and Kahle postulate a mechanistic explanation for human behavior, independent from the environment.

This model has been validated on several occasions, most notably in the field of consumer research. For example, studies have related personal values to mall shopping behavior (Shim and Eastlick). Goldsmith, et al demonstrate the effectiveness of the model with respect to food purchasing habits (352+). Vaske and Donnelly show a connection between voter values and their propensity to vote for key environmental initiatives (523+). Another study provides evidence that personal values of owners/managers of small furniture factories in Australia had an influence on their strategic decisions or behavior (Kotey and Meredith).

These examples confirm the underlying thesis of the Homer and Kahle model—that values, attitudes and behavior are intimately linked. While none of the examples asserts a predictive benefit, they validate an association among these variables. As such, the model is mainly an affective theory, and is not designed to demonstrate cause and effect—only

influence. The model benefits from the simple presentation of variables that affect behavior, but fails from the perspective that other factors are not explicitly considered. Despite this weakness, the model's major contribution is the connection of values to the emergence of human behavior.

Theory of planned behavior. Ajzen acknowledges the influence of values, but indicates environmental and other factors also impact the creation of behavior. That is, social norms, intent to perform the behavior and perceived behavioral control affect the emergence of behavior. According to Ajzen, values certainly affect behavior, but their effects seem to converge on variables related to social norms, attributes and perceived control (Ajzen 179+). These variables are more reliable than values as predictors of behavior, perhaps because they are closer to the behavior under examination (Hrubes, et al). Ajzen's contributions demonstrate that there is not necessarily a one-to-one relationship between behavior, values and attitudes. Instead, behavior may be the product of several different pathways.
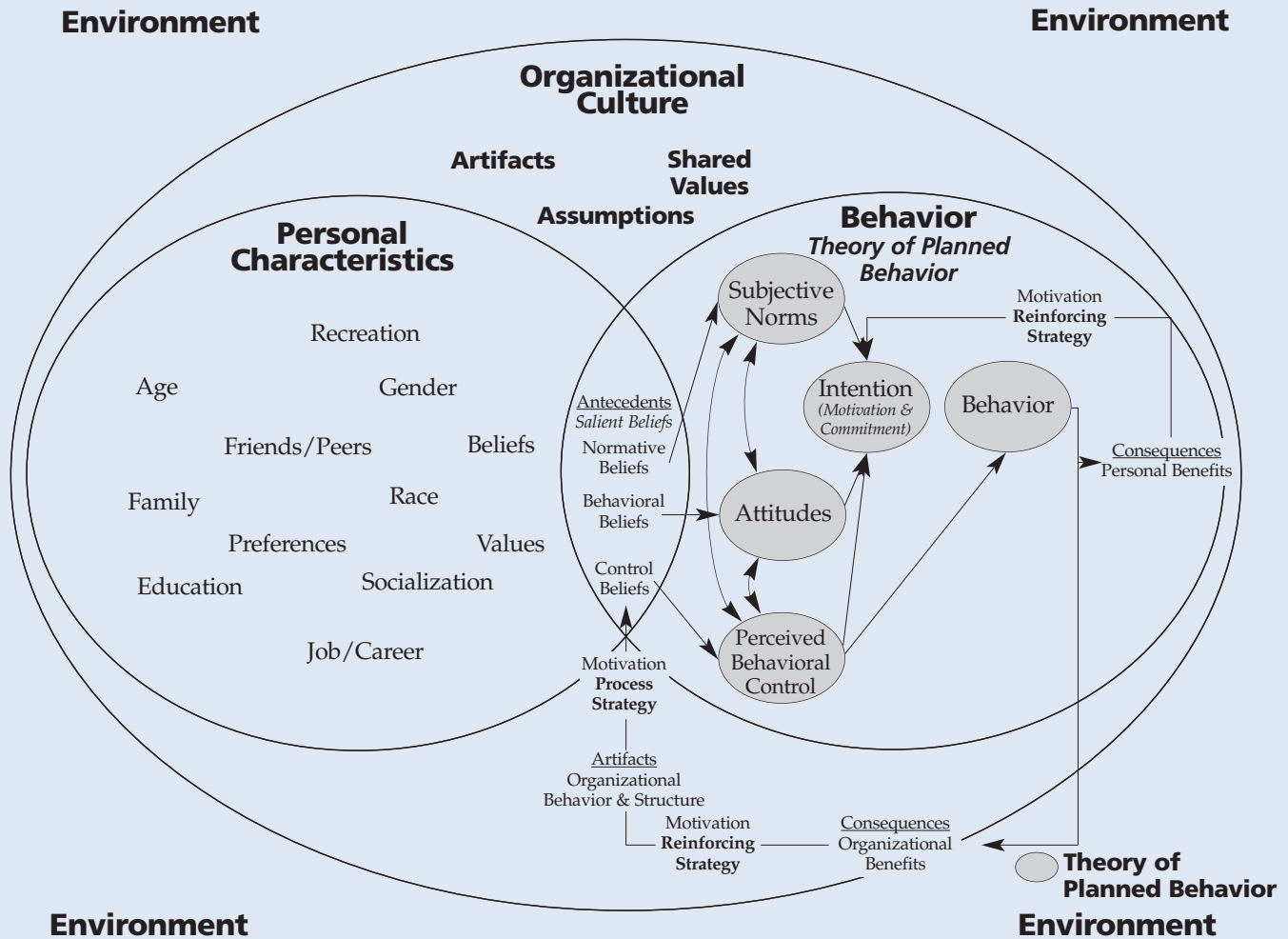
This theory asserts that behavior results from an individual's intention to perform a particular behavior, and that intention is affected by both attitude toward the behavior and perception of the social pressures to perform the behavior (subjective norms). The theory of planned behavior also asserts that intention and behavior are functions of perceived ease or difficulty of performing a behavior (perceived behavioral control). Finally, the theory relates behavior to underlying salient (readily available) normative, control and behavioral beliefs. Each of these beliefs is defined in terms of an expectancy-value framework where individuals have certain beliefs concerning the value of outcomes produced by a behavior, and expectancies of whether a behavior will produce the outcome. The theory also emphasizes interdependence among variables associated with the generation of behavior. The shaded circles in Figure 1 illustrate this theory and the interactions with associated salient beliefs.

As with the value-attitude-behavior hierarchy model, the TPB model has been validated in several studies. For example, it is used to help explain physical activity intention of Canadian children (Mummery, et al). The theory is confirmed in a study concerning decisions of undergraduate college students to attend graduate school (Ingram, et al). The model was also tested with respect to the willingness to pay for leisure activities (Ajzen and Driver); student decisions to complete high school (Davis, et al); and video game ability (Doll and Ajzen). The model was also tested to investigate the influence of personal values (Hrubes, et al). This study determines that while values influence behavior, variables described by the TPB model serve as better predictors of behavior. Each of these studies validates the effectiveness of the TPB model.

On the surface, these two models seem to offer differing perspectives for the causation of behavior. The value-attitude-behavior model argues values as effective predictors, while the TPB model asserts social

Firms are now beginning to understand how to affect behavioral change, but many do not yet fully comprehend why these interventions are effective.

Figure 1

Figure 1

Theoretical Model for the Emergence of Behavior Within a Systems-Thinking Perspective

norms, attitudes and perceived behavioral control as the major influence. Deeper examination reveals the two models to be more complementary, while competing attributes become subdued. In particular, both models identify attitudes as an important precursor to behavior. The TPB model suggests that salient beliefs associated with behavioral control are influential and that these beliefs are, in turn, affected by other factors, including values. Homer and Kahle's model, on the other hand, uses values as the predecessor to attitudes without the use of intermediary beliefs. As a result, values, beliefs, attitudes, intention and behavior can be aligned in a manner to support either model (Figure 1). Other factors (e.g., social norms and perceived behavioral control) can be modeled to give additional dimension to the causation of behavior without upsetting the associative structure of either theory.

Motivation

Two strategies for motivation are particularly useful in understanding the emergence of safety-related behavior. First, reinforcement strategies explain how consequences affect an individual's intention to perform a particular behavior (Schermerhorn, et al). These strategies are derived from the work of B.F.

Skinner (classical and operant conditioning) and typically involve reinforcement of a desired behavior through careful design and administration of consequences. Geller emphasizes that this motivational strategy is the most appropriate tactic for controlling safety-related behavior. In particular, he suggests that consequences are the true motivators of behavior, and that they must be designed in a manner consistent with behavioral science theory. He emphasizes that the most effective consequences are those which are soon (delivered immediately after the behavior), certain (reliable to occur) and positive [Geller(c)]. The most effective reinforcement strategies generally occur at the immediate behavior level, and directly affect intent to perform (TPB model) (reinforcement loop in Figure 1).

While reinforcement strategies affect the behavior level, process strategies are effective on salient beliefs (Schermerhorn, et al) (process strategy loop of Figure 1). Equity and expectancy theories are examples of this strategy. In the case of equity theory, "people will act to eliminate any felt inequity in the rewards received for their work in comparison with others" (Schermerhorn, et al 115). Expectancy theory "argues that work is determined by individual beliefs regard-

ing effort/performance relationships and outcomes" (Schermerhorn, et al 116). Unlike reinforcement strategies, tactics used to implement process theories are more time consuming, less direct, more costly, and require an emphasis on leadership and organizational culture. When used effectively, however, these strategies can affect lasting behavior change.

Interestingly, organizations are more likely to affect process strategies if the consequences of the employee's behavior (outcome) are perceived as being rewarding (e.g., reduced absenteeism, profits, lowered costs) by an organization. As a result, organizations are also motivated by reinforcing-type strategies and become more likely to implement/sustain process motivational strategies.

Organizational Commitment

Organizational commitment is an expression of a person's intent to perform a behavior (TPB model). When people are committed to an organization, a higher likelihood exists that they will behave according to institutional norms. As a result, commitment strengthens an person's intent to perform behaviors desired by the organization. Conversely, low commitment diminishes the likelihood (intent) that people will behave in a manner acceptable to an organization.

Organizational commitment is concerned with the alignment of personal and organizational characteristics. Kristof related organizational commitment in terms of personal-organizational fit, broadly defined to mean "the compatibility between people and organizations that occurs when: a) at least one entity provides what the other needs; b) they share similar fundamental characteristics; or c) both" (Kristof 5). Meyer and Allen identified three levels of commitment including affective (desire to follow), continuance (need to follow) and normative (obligation to follow). In safety, affective commitment is of central interest since the objective is to inspire a willingness to reduce at-risk behavior, improve conditions and control hazards [Meyer and Allen(a); (b)].

Finegan studied commitment with particular emphasis on its association to personal and organizational values. In other words, she studied the relationship between personal/organizational values (characteristic) and the level of employee commitment in a petrochemical organization. A key finding from the study was that the level of affective commitment was primarily associated with employee perception of organizational values (149+). Finegan's study demonstrated that employees whose personal values were congruent with their perception of organizational values were more committed (affective) than those holding perceptions that diverged from personal values. That is, commitment was primarily concerned with an organization's theories-in-practice, not its espoused values [Argyris(b)]. Or, in simpler terms, commitment was a function of management's ability to "practice what it preached." Thus, the lesson is that an organization's cultural artifacts must be viewed from the employee's perspective, and great care should be taken to ensure that these artifacts clearly represent organizational values, assumptions and beliefs.

Organizational Culture

Organizational commitment introduces the concept that culture has an influence on behavior. Cultures consist of groups, and groups consist of people. The interaction of people in these groups creates culture. Commitment is the desire to belong to these groups. Thus, the subject of commitment is very much part of organizational culture.

The subject of organizational culture has been a hot topic for SH&E professionals. Much has been written about the influence of culture on safety-related behavior including recent articles by Geller [Geller(a); (d)] and Cooper. Despite the numerous articles on the subject, most theories share a similar basis. In particular, Schein's model of organizational culture is sometimes used as the theoretical framework for the development of cultural approaches to improving safety behavior. Schein's model is simple; it defines culture in terms of assumptions, values and artifacts. Under this theory, assumptions (unconscious, taken-for-granted beliefs and perceptions) drive organizational values (espoused justifications), which in turn influence the creation of artifacts such as heroes, stories, myths, structures and processes.

Culture is reflected in Figure 1 as the larger oval. Members of the organization are depicted as the Venn diagram-like structure inside the cultural oval. Although only one Venn diagram is displayed, it represents all individuals coexisting within a given culture. Their interactions are so close and intimate that they coalesce into one structure. Since much has been written about culture in safety, this simplified discussion will cover cultural influences on behavior.

An Integrative Model

While it is pragmatically appealing to seek mechanistic if-then explanations (like the value-attitude-behavior model), this approach has proved to be "insufficient to deal with theoretical problems" (von Bertalanffy 11). Instead, as demonstrated by Ajzen's model of human behavior, some phenomena are best explained in terms of a set of interrelated elements (open to the environment) organized into a complex whole. In other words, consideration of these phenomena as "systems" provides for a more complete understanding (von Bertalanffy). As a result, systems-thinking is crucial to the interpretation of observations. It is not sufficient to build models that exclude environmental and other factors for the sake of utility and simplicity. Instead, one must accept the complexity of life; this suggests the need for a deeper understanding of systems theory. Figure 1 represents an attempt to integrate the theories presented in the previous section within a systems-thinking framework.

Figure 1 is not limited to the areas enclosed by ovals; it also includes the external environment. While system elements are drawn with borders, the borders are permeable and are provided to illustrate relationships. Thus, all system components are open to each other and the environment. This creates conditions in which there is a continuous exchange of resources and a steady-state flow through the system. Consequently, equilibrium and homeostasis are not possible because

of the dynamic nature of open systems. Systems, therefore, tend to operate as a whole, where linear if-then processes are not reliable. As a result, the same outcome (e.g., behavior) can be produced by different paths (equifinality) (von Bertalanffy).

Within the systems model, behavior is explained via the TPB model. Desired behavior produces consequences that are rewarding to people (e.g., ease of task, satisfying experiences, recognition) and organizations (e.g., lower costs, lower absenteeism). These serve as motivators (reinforcing strategy) for both the organization and the worker. Senge refers to these "motivational loops" as "circles of causality." In fact, Senge specifically names these archetypes as reinforcing loops. From an organizational perspective, these motivators drive the creation and/or maintenance of artifacts that support continuation of desired behaviors. These artifacts serve as process strategy motivators that affect worker beliefs and expectancies regarding behavior and its outcomes.

This process is affected by various other factors, which create alternate pathways explaining the emergence of a given behavior. First, behavior is affected by personal characteristics such as age, preferences, gender, values and other beliefs. Second, individuals coexist with other people within a culture. Interaction within these cultures creates socialization pressures that add more explanations for the emergence of behavior. While the model only displays one Venn diagram (representing an individual), this diagram is a symbol for the close relationship among multiple individuals. Within the culture, social norms, values, artifacts and assumptions also act to influence behavior. Finally, cultures exist within a postmodern environment characterized by change, ambiguity and diversity.

Actionable Knowledge: Application to Safety

As noted, management theories are inconsequential unless they possess properties to enhance pragmatic value. Theories become consequential when actionable elements are provided, enabling managers to place them into practice [Argyris(a)]. When this occurs, management theories become actionable knowledge. At first glance, controlling the complexity of the system displayed in Figure 1 seems daunting. The number of pathways explaining a particular behavior appears limitless. While it is difficult to control all elements, several points exist where action will have the greatest impact. In particular, the reinforcing and process strategy motivation loops provide an opportunity where leaders and managers can exert significant influence on behavior. These loops are the elements that make the model truly actionable and consequential. In fact, these are leverage points where most safety behavior programs exert their influence.

Define the Behavior

As an example, consider the problem of convincing employees to wear eye protection. As noted, the study of behavior begins with the definition of behavior. So, the first step is to define the desired behavior in a manner that can be clearly identified by

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When people are committed to an organization, a higher likelihood exists that they will behave according to institutional norms.

different observers. In addition, the definition must be actionable by individuals who will be performing the behavior. This means the definition must have a specific target, action, context and timing, often referred to as TACT (Ajzen). In the case of eye protection, the definition might be, "Wear approved eye protection (as listed in the safety manual) whenever in areas with signs requiring eye protection." In this example, the target is eye protection, the action is the act of wearing, the context is defined by the signs and the timing is characterized by the word "whenever."

Consequences must be designed so that both the company and individual are motivated to continue practicing and supporting the behavior.

Manage the Consequences

Once the behavior is defined, the next step is to manage the consequences. Consequences must be designed so that both the organization and individual are motivated to continue practicing and supporting the behavior. These consequences must be soon, certain and positive. To meet these parameters, the process must be carefully designed to ensure that consequences emerge as a natural (intrinsic) part of the process. This requires a careful understanding of reasons people resist wearing eye protection, as well as an understanding of the factors that motivate management to provide the processes and resources needed to address these reasons.

In the case of eye protection, consequences for the individual may relate to comfort, style, availability, distortion of vision or prescriptions. These factors must be addressed because their solutions are the consequences that will be perceived as soon, certain and positive by the individual. Organizations, on the other hand, may be motivated by consequences demonstrating the level of compliance with eye protection requirements. They may also be interested in knowing the degree to which injuries are being controlled by eye protection. As a result, measurement and feedback systems that demonstrate the level of compliance may be needed along with data concerning eye injury experience. The organization may also be motivated by efficiencies created by fewer complaints concerning wearing required protection.

Lead the Process

Management of the consequences primarily addresses reinforcing motivational strategies. This is largely a management issue. Successful mitigation of behavioral issues also requires leadership. While leadership is critical to the entire safety behavior program, it is particularly important as a process motivational strategy addressing salient (readily available) beliefs. People need to believe that the act of wearing eye protection produces desired outcomes and consequences. In addition, people need to believe their employers will provide necessary resources and facilities to support desired behaviors, and that the behavior is under personal control. Furthermore, organizations and individuals frequently need to know whether the program is actually producing the desired behavior.

To address these beliefs, leadership must exercise its responsibility to diffuse dissatisfaction with the current level of compliance and inspire individuals to want improvement. Leaders must convince everyone of the urgency surrounding the issue, and demonstrate that the problem can be solved. In other words, leaders need to initiate change in their organizations. To accomplish these goals, leaders need reliable data displaying the level of effort, investment, compliance and outcomes (injuries) resulting from behavior safety interventions. This information is needed to provide employees with tangible evidence supporting beliefs required to sustain desired behaviors. If employees see that wearing eye protection correlates with lowered risk and fewer eye injuries, beliefs supporting the behavior will be strengthened. In essence, leading the process is about creating cultures that support acceptable behavior—this is the primary function of leadership. It is about building a society in which cultural artifacts are perceived by employees as being congruent with organizational values.

Conclusion

The theoretical basis for behavioral safety is well established. While direct research related to safety is limited, plenty of research is available from other fields to support models that explain behavior, motivation, culture and organizational commitment. Findings from studies in these arenas provide valuable insight into the development of behavioral safety programs. This article has attempted to integrate behavioral science into a cohesive framework to provide SH&E practitioners insight into the complex nature of human behavior. SH&E professionals require this knowledge to build intervention strategies with the greatest potential for success.

The model presented compiles various theories that affect human behavior within a systems perspective of wholeness, openness and equifinality. While its complexity may seem daunting, there are points (motivational loops) where leaders and managers can take action. Although success is not guaranteed, action at these points creates a high degree of leverage to influence behavior to the greatest degree. Therefore, this model is actionable and creates a useful theory that Argyris terms consequential. ∎

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