Unsafe Behavior

Rethinking the Concept

By Ron Gantt

IN BRIEF

- **The beliefs that "unsafe behavior" is a legitimate, objectively identifiable category of an incident cause and that most incidents are caused by unsafe behavior are misleading and should be abandoned.**
- **Behavior and conditions have a reciprocally influential relationship and cannot be analyzed separately without significant misunderstanding.**
- **The same underlying cognitive and behavioral mechanisms that lead to so-called unsafe behaviors also lead to success and, therefore, cannot be eliminated without doing significant harm to the organization.**
- **This article discusses alternative methods for analyzing, understanding and influencing human performance based on understanding everyday, successful work processes.**

A persistent belief held by some OSH professionals is that the primary cause of incidents is unsafe behavior, typically on the part of workers. News reports of incidents confirm this belief, where the media often identifies human error on the part of the frontline worker as the culprit. As a result, many tools have been developed to address unsafe behavior, such as an intense focus on training, behavior-based safety solutions and even initiatives designed to foster safety culture.

Rarely, however, does anyone question the fundamental belief that unsafe behavior causes incidents. This is troubling, given the power that these expectations have in influence cognition. Beliefs and assumptions about causal relationships have profound effects on what people see (and do not see) as the problems within their organizations and, perhaps most importantly, the range of potential solutions perceived to be available to address those problems (Weick, 1995).

This article argues that the belief in unsafe behavior as an objectively identifiable category for analysis and intervention creates a blind spot in the understanding of human and organizational performance, and may contribute to plateauing incident rates, particularly serious injuries and fatalities, seen throughout many industries (Manuele, 2013). Alternative concepts for understanding human performance are presented, based on the latest social and safety science research, which may provide the safety profession with more sustainable alternatives to achieving desired safety performance.

The Current Understanding of Unsafe Behavior

Tracing the belief that unsafe behavior is the primary cause of occupational incidents to any single event or set of research is likely impossible. However, early efforts to understand occupational safety often revolved around the need to control human behavior, suggesting that this belief has deep roots in Western culture (Dekker, 2014). One of the most important early indications of this belief is the work of Heinrich (1931), who reviewed incident reports and identified that in 88% of cases, the proximate cause was an "unsafe act," in 10%, the proximate cause was "unsafe conditions" and in 2% of cases the cause was an "act of God."

This belief that the overwhelming majority of incidents are caused by "unsafe acts," "unsafe behavior," "at-risk behavior," "human failings" or "human error" is found in other sources as well. DuPont (2009) famously identified that 90% of all incidents are caused by "unsafe acts" and Difford (2011) states that essentially all incidents are caused by behavior.

These data appear to be consistent with media reports following incidents or other mishaps. A narrative analysis of media reports by Gantt and Shorrock (2016) found that most discussions of human factors involved discussions of the human error contribution to an incident or mishap. Typi-

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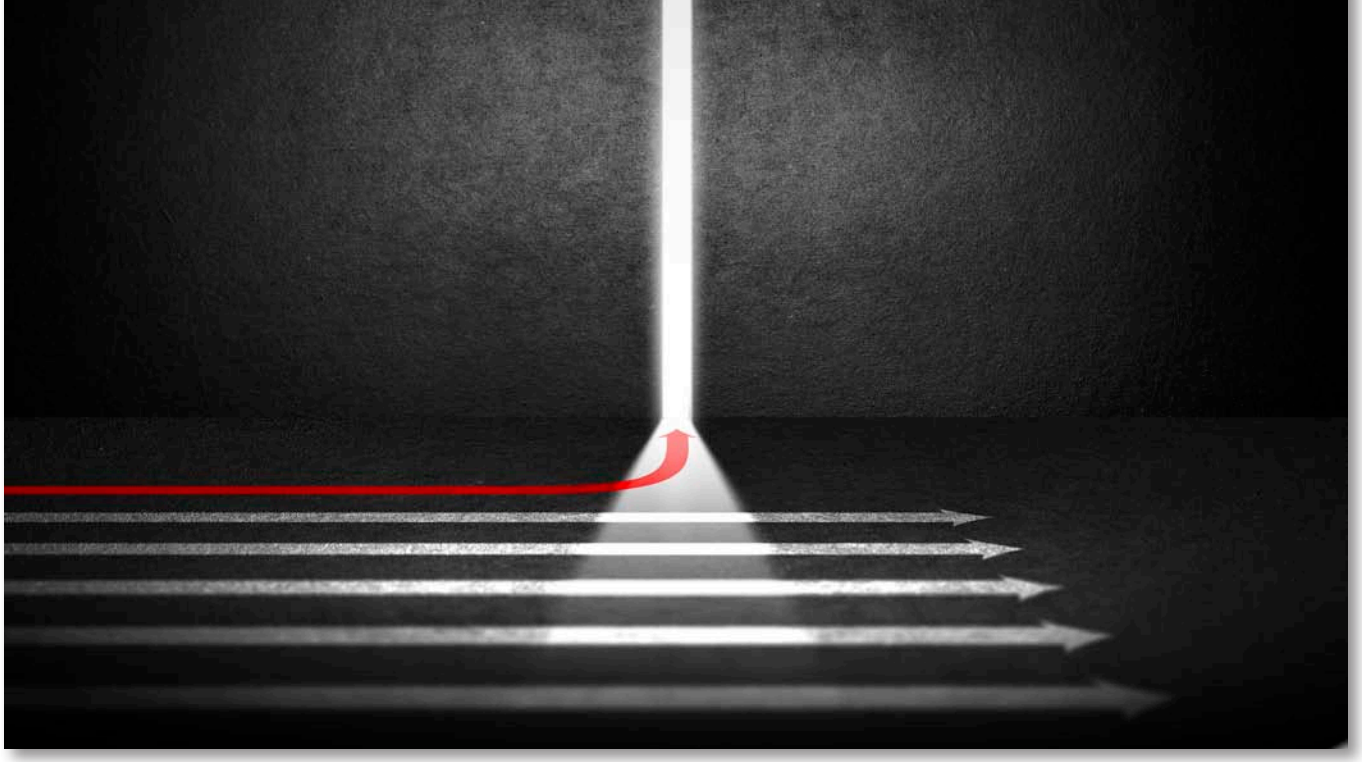

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cally, once a mechanical failure is evaluated and eliminated as a potential cause (i.e., nothing tangibly broke), human error is determined to be the cause (Gantt & Shorrock, 2016).

All of this information works to create a mental model of incident causes in which the majority of incidents are caused by people doing something unsafe or in error, with a smaller proportion caused by conditions. These conditions, by necessity, are objectively separable from behavior, in that one does not have a significant influence over the other. After all, if conditions had a significant influence on behaviors, or vice versa, then any analysis that separates them becomes problematic because they would no longer be discrete categories. How would an analyst know where one category ends and another begins?

As a result of this separation between unsafe acts and unsafe conditions, many OSH professionals have developed tools to address each category. Some tools are designed to deal with conditions, typically falling within the engineering discipline (e.g., prevention through design). These tools focus on the elimination or control of hazards within an environment. Note that prevention through design has been advocated for addressing so-called error-provocative environments by some (see Manuele, 2008). This shows that some OSH professionals see the inherent overlap between behaviors and conditions.

To deal with behaviors, however, a separate set of interventions has emerged such as developing standard operating procedures, training employees on those procedures and creating reinforcement processes to entice employees to follow those procedures. This model of defining the best way to perform a task, then developing means to enforce that one best method for employees completing the task is a classic model known as scientific management (Taylor, 1911), or Taylorism. The underlying assumption in this approach is that workers cannot be trusted to do the job correctly on their own. Therefore, organizations need to intervene by creating social controls to force workers to do the right things (Dekker, 2014).

This line of thinking presents an appealing solution to the unsafe behavior problem. Given the data from Heinrich and others, it is seemingly apparent that workers cannot be trusted to work safely on their own. This need for distrust is particularly obvious in situations in which workers appear to choose to do something unsafe. It stands to reason, then, that something may be wrong with workers' risk management decision making. Consequently, the organization must intervene in the risk calculus of the workers to help them make better, safer decisions.

An Alternative Explanation

The data from Heinrich and others have face validity. It fits with the model that many have of the world and human behavior, and, therefore, is readily accepted (Dekker, 2014). However, the fact that this model fits so nicely into what many safety professionals expect to find should be alarming rather than comforting. Confirmation bias is well-known in the social science literature and describes the tendency to seek out information that confirms a person's existing beliefs (e.g., that people are the primary cause of most incidents) and downgrade information that contradicts those beliefs (Kahneman, 2011). Hollnagel uses the acronym WYLFWYF to describe this: what you look for is what you find (Lundberg, Rollenhagen & Hollnagel, 2009).

OSH professionals must not dismiss the effect of these biases on practice. A famous example of the effect that expectations can have is seen in the so-called Pygmalion Effect study (Ellison, 2015). In this research, teacher expectations of whether a student was "ready to bloom" intellectually (despite being based on false information supplied by the researchers) measurably influenced the intellectual growth of the children over the school year (Ellison, 2015). The students who were considered "ready to bloom" by teachers showed increases in IQ scores much greater than those in control

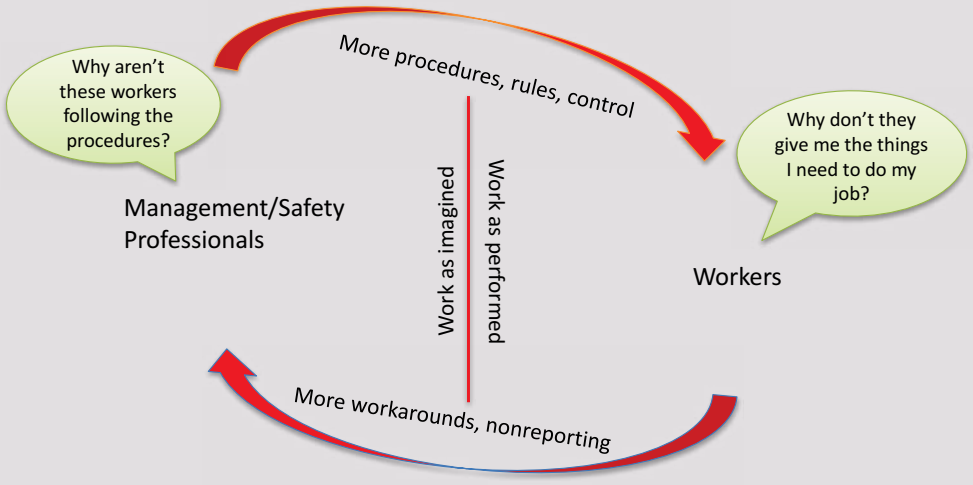
groups. The explanation: teachers' expectations caused them to create the environment that allowed for the student growth.

Another explanation for this effect is self-fulfilling prophecy. Self-fulfilling prophecy describes a situation in which an individual makes a prediction that creates the conditions that make it true (Weick, 1995). In a cycle similar to Gergen's (2013) Cycle of Progressive Infirmity, the belief that unsafe behavior is a distinguishable category and, indeed, a hazard to be mitigated may create the conditions that lead to a vicious cycle.

As discussed, the belief that unsafe behavior is the primary cause of incidents leads to interventions based on Taylorism. If the problem is not mere behavior, but inadequacies in the work environment or in the human-environment interface, the workers will not see this influx of rules and social controls as help, but rather as a hindrance. As a result, workers will have to find ways to work around the controls put in place. In turn, management and safety professionals see these violations as unsafe behavior, thus reinforcing the underlying belief that workers cannot be trusted. More effort is put into controlling worker behavior by adding more threats of punishment or promises of reward, which further exacerbates the problem. The whole process is a reinforcing vicious cycle (Figure 1).

This discussion, in itself, is not evidence that the belief in unsafe behavior is misguided. Instead, the discussion merely offers an alternative explanation for the so-called evidence that unsafe behavior is a distinguishable category of incident causal factors and is the most significant category. Those who believe this may suffer from confirmation bias and may be creating self-fulfilling prophecies by not reflecting on the effect these beliefs regarding unsafe behavior have on workers. This may have inadvertently created a world that not only separates safety professionals who hold this belief from those they are meant to protect, but also blinds the OSH professional to this reality. In all cases, the safety profession must step back and take an honest look at its fundamental beliefs and assumptions to test their validity. The next section does this with the concept of human error, an element of unsafe behavior.

FIGURE 1
Unsafe Behavior Self-Fulfilling Prophecy



Understanding Error

In recent years, many popular books on human behavior have presented research explaining biases people hold and showing how these biases lead to predictable errors in performance. Although well-intentioned, these books may inadvertently contribute to misguided beliefs regarding human performance (Gigerenzer, 2008). For example, Kahneman (2011) accessibly presents a large body of research on human decision making and biases. One such example is found in the "Linda, the bank teller" experiment. In this experiment participants are given the following information:

> Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.

Participants are then asked which of the following is more likely:

- Linda is a bank teller;
- Linda is a bank teller and is active in the feminist movement.

Most participants agree with the second statement (Kahneman, 2011). However, as Kahneman points out, this is an error. From a strict probability perspective, the probability of two events occurring (Linda is a bank teller and Linda is active in the feminist movement) can never be greater than the probability of either event occurring.

Given that most people make this error, one is left with only two interpretations. Either people are just poor at math and have an intellectual blind spot, or making this error makes people more successful overall. As Gigerenzer (2008) points out, this error is not really an error at all. In conversation, people interpret what a person is currently saying in light of the information s/he has previously stated. People typically do not provide random, useless pieces of information that have no bearing on the overall conversation. Therefore, making this error in a laboratory is a trade-off against the probability of enabling efficient communication with others in the real world. In this way, understanding the error in question is inseparable from the context in which the behavior is used.

Another example comes from a founder of human fac-

tors engineering, Alphonse Chapanis. Chapanis (as cited in Dekker, 2014) was called to help the U.S. military combat a pilot error issue in which bomber pilots would inadvertently raise the landing gear after landing. This was not a serious safety issue but it caused significant damage to the aircraft. In investigating the error, Chapanis found that the switch for the landing gear looked the same as and was adjacent to the switch for the flaps. During landing protocols, pilots must engage the switch for the flaps but in the rush to complete the landing procedure, would inadvertently engage the switch to raise the landing gear. Chapanis recommended the military put different shaped knobs on the switches: a round one resembling a wheel for the landing gear switch and a wing-shaped knob for the flap switch. After implementing this fix, the instances of this error occurring were largely eliminated (Dekker, 2014).

In each example, the errors made were inseparable from the environments of those involved. In the pilot case, the switches did not fail in their primary purpose; they worked exactly as designed. However, the failure that resulted in the error was in the interaction between the switches and pilots (Dekker, 2014). The switches did not enable the performance of the pilots in the context of executing a busy landing routine. In the same way, in the Linda the bank teller experiment, the narrator did not fail to provide people with the information needed to make the proper choice. Rather, the failure came in the interaction between how the information was provided and how people make sense of their social world in conversation with others (Gigerenzer, 2008).

In each case the failure was not in the conditions themselves. However, the failures were not in the individuals involved either. To identify each of these examples as human error or, in the context of safety, unsafe behavior is an oversimplification and may lead to a false assumption that the problem is in the individuals involved and the potential solutions revolve around fixing those individuals.

What About Violations?

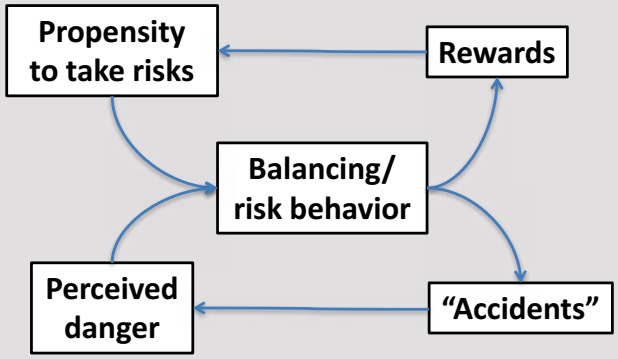
The previous discussion specifically deals with unintentional acts that led to mishaps. However, in the safety profession significant effort is spent dealing with intentional acts (i.e., violations). Because of this intentionality, violations are often considered separate from typical human errors (Reason, 1997). However, one must admit that regardless of whether the action was intended, the consequence in the context of safety and accidents is never intended (otherwise, it would not be an *accident*). Therefore, distinguishing violations from human error seems somewhat arbitrary and depends on how one defines *intention*.

Even still, when one looks closely at violations and other risky behaviors, the distinction between *behavior* and *conditions* becomes fuzzy. Slovic's (2010) research into risk-taking behaviors identified that risk perception is inherently related to contextual factors, such as perceived benefits, economic status and other social conditions (e.g., culture). In this model, reductions in the perception of benefits corresponded with an increase of the perceived risk of an activity or technology (Slovic, 1987).

Adams (1995) developed a model of risk-taking behavior that identified multiple influences on such behaviors (Figure 2). In this model, risk-taking behavior is simultaneously influenced by a person's inherent propensity to take risks and the perceived danger of the activity. Each factor is, in turn, influenced by incentives in the environment and known consequences that have resulted from the activity, respectively (Adams, 1995).

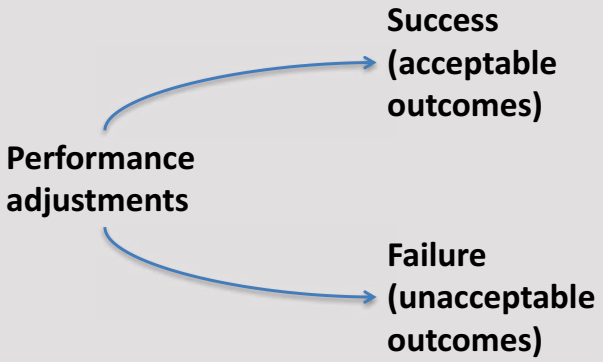
When applied to a workplace, this model can lead to startling results. For example, this model would predict that initiatives designed to make workplaces safer would decrease the perceived danger, thereby causing a balancing behavior toward increased risk taking. This model, based on the Risk Homeostasis Theory and the idea of risk compensation (Adams, 1995), has not been widely investigated in an OSH context, but has found some support in the literature on road safety (Glen-

FIGURE 2
Risk-Balancing Behavior Model

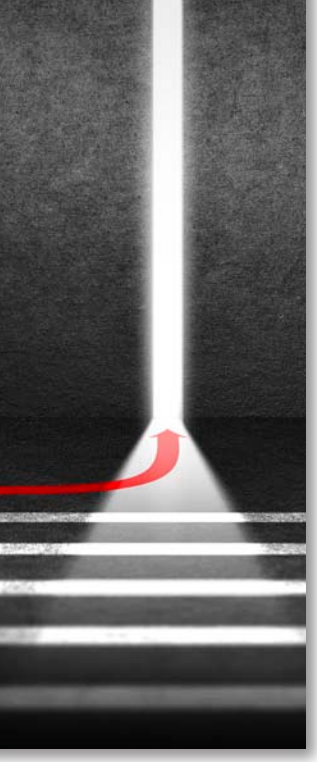


Note. *Adapted from* Risk, *by J. Adams, 1995, London, England: Routledge.*

FIGURE 3
Performance Variability



Note. *Adapted from* Safety-I and Safety-II: The Past and Future of Safety Management, *by E. Hollnagel, 2014, Farnham, England: Ashgate.*



Human behavior always exists within a context or set of conditions, and these conditions have an effect on behavior.

don, Hoyes, Haigney, et al., 1996; Hoyes, Stanton & Taylor, 1996; Sharfi & Shinar, 2014).

However, the model is somewhat intuitive in that lower perceived risk leads to fewer actions designed to protect a person. This could at least partially explain the classic argument that safety professionals often hear against further safety interventions: "This is the way we have always done this job." After all, if risks are low, as evidenced by little or no history of problems, why are additional interventions necessary? Lower risk means that less vigilance is necessary to avoid failures.

For example, in road transportation, one study found that drivers in a vehicle with an installed visibility enhancement system (a safety feature designed to highlight road edges for the driver) reported less stress and more confidence than drivers without the system. The drivers with the system drove faster, experienced more collisions with unexpected objects and had longer reaction times than those driving without the visual enhancement system (Sharfi & Shinar, 2014).

Adams's (1995) model and the idea of risk compensation does not mean that the safety profession should abandon safety interventions, but it implies that risk-taking behavior (i.e., violations) is intimately influenced by external factors. This not only includes reward structures, but also initiatives designed to make the workplace safer. So even in the case of so-called intentional violations, external factors influence the violator's behavior, making the separation between behavior and condition impossible.

The Relationship Between Behaviors & Conditions

Based on the previous discussion, one must conclude that behaviors and conditions exist in a mutually dependent relationship. Human behavior always exists within a context or set of conditions, and these conditions have an effect on behavior (Hollnagel & Woods, 2005). One way to understand this relationship is through the local rationality principle, which is based on the idea that people do not act intending to fail (Woods & Cook, 1999). Most of the time, people do not intend to get hurt or hurt others, nor do they intend to do a bad job. Instead, people act in ways that make sense to them at the time, based on the information available, the focus of their attention, the goals they perceive to be important and the resources at hand (Woods & Cook, 1999).

Applying this concept to the workplace, an employee does not intend to be unsafe when s/he violates a safety rule. After all, most employees do not intend to get hurt or hurt others. Instead, they act in a way they believe will help them be most successful in their environment, which includes both the social and physical world. If that behavior is taken out of its context, the behavior can easily seem nonsensical to outsiders (Hollnagel & Woods, 2005). But within the local context, it is rational to those involved (Woods & Cook, 1999).

At a minimum, this makes problematic any research that suggests a proportion of incidents is caused by behavior and another proportion is caused by conditions. If behavior and conditions exist in a reciprocal relationship, then dividing them into separate categories for analysis is no longer an objective process, but a subjective and arbitrary choice made by the researcher (Dekker, 2014). In fact, it is impossible to describe an unsafe behavior without making reference to a contextual feature. This is because all behaviors are designed to be successful in most environments in which people find themselves (Hollnagel & Woods, 2005). So, a given behavior can be either good or bad, safe or unsafe, depending on the context. This makes the term *unsafe behavior* confusing and misleading. The behavior itself cannot be unsafe. More information is needed to know what about the situation is unsafe and what can be done to intervene to make it safe.

Further, this reciprocal relationship between behaviors and conditions means that even if a separation between the two was determinable, a safety professional seeking to change behavior may do so by changing the context in which the behavior takes place. Behavioral problems do not merely imply that behavioral interventions (e.g., training, procedures, incentives, discipline) are necessary (Dekker, 2014).

Defining *Unsafe*

A further problem with the language of unsafe behavior comes when one seeks to operationalize the term *unsafe*. Using any definition of *safety* that is in common use, defining *unsafe behavior* is problematic. For example, if *safety* is defined as freedom from harm or incident, as is common in dictionary definitions, anyone who has performed any task without experiencing harm or incident must conclude that anything s/he did was safe.

If one uses the definition of safety as freedom from unacceptable risk, as is commonly seen in management system standards, such as ANSI/ASSE Z10 and the ISO standards, one must understand that risk is a socially constructed concept (Vaughan, 1996). Who determines what risks are acceptable is not an objective determination, but often a negotiation based on culture and power relationships (Slovic, 2010). What is acceptable in one culture may be unacceptable in another (Douglas & Wildavsky, 1982). Even at the individual level within an organization, risk acceptability is a variable concept. After all, if someone takes an action one would assume that s/he accepts the risks. Therefore, all actions must be considered safe using this definition. This makes objectively defining *unsafe behavior* impossible.

The point is not to assume that all behavior is good, that anything goes and that people can do whatever they want. Rather, it is just to say that the term *unsafe behavior* (and any of its derivatives) is similar to *beauty*: it is in the eye of the beholder.

Moving Beyond Unsafe Behavior: Looking for Success

Clearly the belief in unsafe behavior as the primary cause of incidents and as a meaningful category for analysis is problematic, at best.

The concept may blind safety professionals to alternative explanations and often leads to flawed understandings of human performance. The OSH profession should move beyond the term entirely, abandon its use and begin to look for alternative explanations and models for understanding and influencing behavior in organizations.

A starting point for alternative explanations is the local rationality principle. OSH professionals seeking to understand human performance should begin by seeking to understand why a person's behavior made sense in context. This process typically involves a healthy use of empathy and consultation with workers performing the task in question. The object of analysis is no longer merely hazards, risks or behaviors, but rather everyday work.

When engaging in learning about everyday work, a safety professional will likely begin to recognize a startling fact: success and failure often have the same causes (Figure 3, p. 53). This was noted in the discussion regarding Linda the bank teller. Hollnagel (2014) notes that people adjust their performance to a given environment in a way that they believe will optimize their ability to achieve success. This is remarkably successful in most environments most of the time. Occasionally, however, the wrong conditions come together and the same behavior that led to success now leads to failure. This model is particularly interesting because it suggests that to understand failure one must understand success. To illustrate, two examples of common descriptions of human behavior follow.

Example 1: Not Paying Attention

Many OSH professionals have seen incidents in which one contributing factor was an employee's inattention. Based on the author's experience, "not paying attention" is a commonly listed cause of incidents. However, it is striking that this is impossible and shows a misunderstanding of human performance.

Barring periods of unconsciousness, people are never not paying attention. The employee perceived to be not paying attention was paying attention to something that s/he determined would help achieve success (using his/her definition) in that environment. In many situations, this devotion of attention was something that the person had done before and was designed to help the person be more successful and/or avoid other potential failures. Humans have scarce attentional resources, with the ability to pay close, conscious attention to only one thing at a time (Kahneman, 2011).

In some cases, paying close attention may actually decrease performance (Gigerenzer, 2008). For example, as seen by the author, in an incident report about a tripping incident, the report notes that the employee needs to pay more attention to where s/he is walking. Those who write such reports should pay more attention to their steps as they walk and note how doing so often leads to a more awkward gait, to the inability to pay attention to what is a few feet ahead and to the inability to sustain such attention for more than a few seconds.

Determining what the employee was paying attention to and why s/he felt that it was worthy of devoting scarce attentional resources to will provide the OSH professional with the needed lines of inquiry to provide better, more sustainable interventions. At a minimum, it offers an additional approach. Instead of merely seeking ways to get employees to pay attention to a designated environmental feature, the employer may be able to remove whatever was distracting the employee. The organization may be able to conduct a job analysis and identify methods to efficiently alert employees to important features in the environment allowing enough time for the employee to respond appropriately. Alternatively, the organization may be able to prevent the consequences of missing an important detail by making the situation recoverable. An example from road safety is rumble strips, which make lapses in attention noticeable and recoverable before they become catastrophic.

Example 2: Complacency

One particularly troublesome aspect of human performance that some have termed "the silent killer" (Wilson, 2010) may be better understood using the performance adjustment model (Hollnagel, 2014) and local rationality (Woods & Cook, 1999). Complacency is often implicated postincident as a causal factor, usually in reference to a lack of concern or thought on the part of the worker (Dekker & Hollnagel, 2004).

However, understanding human performance, people acting without thought or concern is similar to the call from some people to make safety a habit. Habits are behaviors so ingrained that they are performed without care or thought. Often this is a feature of expert performance (Kahneman, 2011). Experts can chunk information or skills together so that actions can be performed without thinking (Ericsson, Krampe, & Tesch-Römer, 1993). This is similar to the way people drive cars, giving no conscious thought to how much pressure to apply to the gas pedal to achieve the appropriate speed. When this method works (i.e., no incidents occur), the driver is considered a good driver; when it does not work (i.e., an incident occurs), the driver is considered complacent.

Again, by understanding the behavior in context and how that behavior helps achieve success, the OSH professional has new opportunities to improve the system of work. Rather than placing blame on the worker, putting complacency into context forces the OSH professional to ask why the work processes were organized in such a way that achieving expert performance in one area increases the risk of an incident. Put another way, the task was designed so that to achieve success the worker became more vulnerable to specific modes of failure. Rather than attacking complacency at the individual level, the OSH professional can redesign work processes to eliminate or mitigate the consequences of this normal human response.

Conclusion

The belief that unsafe behavior is a legitimate, objective category for use in explaining incident causes is flawed. It is time that OSH professionals abandon the use of this term and similar ones (e.g., *unsafe acts*, *at-risk behaviors*, *human error*). These terms are confusing, misleading and unhelpful to the profession. They indicate more about an individual's limited understanding of social science research than about incident causes.

Instead, OSH professionals should look for opportunities to educate themselves on human performance, local rationality and the performance adjustments people make to achieve success in context. This will require a cross-disciplinary and cross-organizational hierarchy effort. But given the plateauing of safety performance in the industrialized world, a new approach is needed for addressing the complex human performance problems organizations face.

Some may object to eliminating *unsafe behavior* as a category on the grounds that personal responsibility is a necessary element within a safety management system. However, understanding how behavior is reciprocally related to context does not eliminate personal responsibility. Instead, accountability becomes forward-looking, where the focus is not merely on punishment but on improving the system of work (Dekker, 2012).

Paradoxically, by taking the focus off the individual and adopting a forward-looking accountability mind-set, voluntary acceptance of personal responsibility may increase. When the focus within an organization is on backward-looking accountability (i.e., a search for unsafe behavior), people are incentivized to push the focus onto other actors within the system to avoid punishment. When the focus is on forward-looking accountability and creating expert performance within the system, people are incentivized to take responsibility for their actions to improve their performance overall. **PS**

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