

Mind over Safety Matters: The Science of Human Error Elimination

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Introduction

The following paper will describe a successful human error elimination program used to help workers stay focused. In recent years, neurobehavioral research has bolstered society's understanding of the complexities of human error prevention and the role of the brain, most notably the amygdala, in mistakes. For example, studies have shown that a worker's ability to recognize patterns decreases during the course of a shift, which increases the potential for error. Yet workers can maintain on-the-job focus and prevent errors by proactively identifying potential dangers and distractions, using techniques that stimulate and motivate the brain.

Error Elimination and the Science of Focus

Ted Williams made teaching people the science of hitting his life's calling, but the Red Sox legend's well-honed powers of concentration and attention to detail also can teach employers how to make the workplace safer. Consider the first time Williams approached the plate, after returning to Fenway Park following a two-season absence due to service during the Korean War. As the slugger eyed home plate, he promptly declared its angle to first base was off, a contention later proven right by two inches. Renowned for eyesight measured at 20-10 by Navy doctors, Williams said he could see the seams on a baseball as it spun toward him, and observe the precise moment when his bat connected with the ball (Price 1996). He was known for reading the labels of records spinning on a turntable. And, even with his vision failing at age 78, he proclaimed a pitch to be a slider at a 1998 spring training game. "I didn't see the pitch," he told the Associated Press at the time, "just the way the hitter swung" (Goldstein and McGill Thomas Jr. 2002). Few people are born with "The Splendid Splinter's" remarkable visual acuity, but everyone can be trained to exercise the same focus as Williams, and apply it to reducing errors, promoting a safe work environment.

When Williams, the last player to bat .400, focused intensely on each at-bat, and trained his eyes to follow the baseball, remarkable success followed. Asked to explain exceptional performances, athletes, such as the Red Sox players speak of the ability to "slow the ball down" during at-bats. In essence, the players are paying such close attention to each pitch that they seemingly see more of the ball. The same premise holds true for workers. They can foster success and reduce errors by focusing intensely on each task at hand. Estimates vary, but generally 90 percent of all accidents occurring in industry, 70 percent of airplane crashes, and 90 percent car wrecks are attributable to human errors (Hallinan 2009). But workplace mistakes need not be inevitable. Working extensively with clients in a number of industries, from petrochemical companies to electric and gas utilities, successfully reduced human errors between 40 percent and 60 percent a year after conducting one three-hour training program. Results are achieved in three steps. First, workers identify the thoughts and circumstances that are most likely to distract them and the tasks that require the greatest attention. Then, workers are educated about how the brain

works, and why they're not immune to mistakes even after years of working at a company. Finally, a series of psychological techniques are administered, designed to motivate and empower employees by making them feel as though being safe is their choice rather than a top-down mandate.

Before explaining the success of motivational workplace safety training, it's important to examine why the results of other employee safety programs are sometimes short-lived, and how the science behind human error works. It is common practice for many workplace safety programs to repetitiously state safety protocols and work to enforce a strong safety culture by creating strict repercussions for workers who don't follow rules. However, there is another path to promote close attention to the proper execution of workplace tasks. Employers can facilitate sustained behavioral changes among employees and long-term compliance with workplace safety programs when safety instructors teach lessons about the amygdala (uh mig' dull uh) portion of the human brain. This tiny, almond-shaped area is located far inside the medial temporal lobes or the lower side areas of the brain (University of Idaho College of Science 2004). Known for its involvement in processing fear, recent research by the neuroeconomist Benedetto De Martino suggests the amygdala may "control a very general biological mechanism for inhibiting risky behavior outcomes that are potentially negative" (Moisse 2010). In the work setting, the amygdala likely plays a role in employees' decisions about whether the potential risk of taking a shortcut outweighs transient convenient benefits.

Given that it is well-established that worker shortcuts commonly cause dangerous mistakes, effective workplace safety lessons remind employees not to overrule the fear and aversion to dangerous tasks instilled by the amygdala (Moisse 2010). Workplace safety educators also must contend with the belief among some employees that they're infallible. Such workers, who are often veterans of a company, can become complacent in maintaining the focus needed to avoid physical and mental distractions. The first challenge for any workplace safety educator is to educate workers about the skills needed to maintain respect for the inherent dangers of the job. If a worker experiences no consequences from choosing not to use safety glasses or has success standing on a chair instead of a ladder, that employee may become more susceptible to making other bad choices, and taking more shortcuts in the future. As workers become overconfident, they adopt an "it won't happen to me" attitude. Meanwhile, a supervisor's scolding and safety courses won't necessarily fix an employee's skewed conception of the potential losses from work shortcuts versus the rewards of safe behavior. Yet, most workers aren't aware of the circumstances and natural biases that make humans mistake-prone, according to Joseph Hallinan, author of *Why We Make Mistakes* (2009).

Hallinan, a journalist who has researched the science of human error, summarized some of the most interesting findings of researchers; as Hallinan puts it, "when we multitask, we get stupid," "we see, but we don't see," "we notice on a need-to-know basis," "we skim when we shouldn't" and "we think we're better than we are" (Hallinan 2009). Researchers, such as Earl Miller, an MIT neuroscience professor, have found that the human brain mostly cannot focus on more than one task at once despite the overconfidence of people who think they can (NPR 2008). Many of the same areas of the brain are involved in completing similar tasks. For example, when an individual writes an e-mail and speaks on the phone at the same time, the brain does not literally handle both assignments simultaneously. Instead, the brain quickly shifts between the tasks, but such switching can overload people's short-term working memories, leading them to forget ideas, disregard what they heard, or ignore steps in a process. University of Michigan professors demonstrated this phenomenon by testing the ability of individuals to recall shapes and colors shown. Test participants took considerably longer, and were less accurate, at identifying the images when they were shown both simultaneously rather than viewing one at a time (NPR 2008). The researchers found that the brain "pauses before responding" to each new task "to

round up all the information” to accomplish it while “pushing aside information” from the previous task (NPR 2008). As a result, the short-term “working memory” involved in multitasking can “evaporate” like water after only two seconds or make an old thought disappear within 15 seconds of considering a new problem (Hallinan 2009).

When people do concentrate—even if their ill-placed focus imperils their lives—they have a remarkable ability to tune out obvious external stimuli. To illustrate this point, the human error expert Hallinan has cited the 2004 story of a 44-year-old charter bus driver taking students for a trip to George Washington’s home in Mount Vernon. The driver, who was using his cell phone to discuss his bad day, failed to see a large sign that warned of an impending bridge and instructed the operators of tall vehicles to switch lanes and drive under the higher, middle portion of the structure. By the time the driver noticed the bridge itself and realized his mistake, the collision sheered off the right top of the bus and seriously injured a student passenger (Hallinan 2009). Similarly, Cornell researchers illustrated the human penchant to pay attention only on a “need-to-know basis,” according to Hallinan. The researchers had pedestrians ask directions of strangers on the campus. During each interaction, another stranger, carrying a door, would walk between the individuals, trade places with the first stranger, and continue the conversation as though nothing had happened. In the end, just seven of 15 pedestrians noticed a new person had jumped into the conversation to give directions.

Few error-inducing temptations are as great among employees as the false, overconfident assumption that workers know their jobs so well that they need not read instructions or follow safety procedures. Consider the experience of laundry detergent and washing machine manufacturers chronicled in a recent business column in *The Wall Street Journal*. For years, the manufacturers have noticed the majority of consumers believe highly in their laundry cleaning abilities, thanks to the hundreds loads they wash annually. These same “experts” or “master chemists” often use too much detergent (Byron 2010). The practice, exacerbated by water-efficient washers and concentrated detergent, “leaves residue on clothing that fades colors and attracts more dirt,” wears out the machines faster, and coats their insides with soap that promotes bacteria growth (Byron 2010). In the same vein, veteran workers sometimes attempt to read newspapers in the middle of company meetings instead of paying attention. These employees trust their knowledge and instincts so thoroughly that they sometimes neglect to follow instructions.

As Hallinan puts it humans “walk around with this private conceit that we’re above average, and therein lies the seed of many of our mistakes” (Hallinan 2009). This inclination is behind the same psychological tendencies observed by Wesleyan University researchers, who found 79 percent of college students incorrectly remembered their grades and inflated them when asked to recall marks they’d received just a few years ago in high school (Hallinan 2009). These human traits also were on display when Princeton University researchers asked test subjects to compare their susceptibility to judgmental biases to that of the “average person” (Hallinan 2009). Not surprisingly, most people claimed they were more objective than others. “Nearly everyone is overconfident,” University of California economics professor Stefano DellaVigna told Hallinan. “Except for the people who are depressed, they tend to be realists.” DellaVigna himself has identified this overconfidence as the same trait that leads individuals to sign up for gym memberships and buy time-shares they hardly ever use (Hallinan 2009).

During safety training sessions, safety educators explain such human personality quirks and define how the brain works to convince workers of their fallibility, and the steps they must take to be safe each day. In this regard, the findings of sports psychologist Roland Carlstedt are instructive. Carlstedt has studied the intense focus—or what he dubs “subliminal attention”—it takes athletes to perform tasks, such as a hitting a baseball in a high pressure situation (Soshnick 2006). To paraphrase Carlstedt, the most successful athletes have greater abilities to hypnotize

themselves to tune out distractions, stay positive, and keep past failures from influencing them (Carlstedt 2004). To understand Carlstedt's point, consider a scene in the baseball movie "Bull Durham," where Kevin Costner's catcher character, Crash Davis, implores Tim Robbins's pitcher character, Ebby Calvin LaLoosh, to tune out distractions, "Don't think," Davis tells LaLoosh. "You can only hurt the ball club" (IMDB.com 2010). Similarly, once workers identify potential distractions and the daily tasks during which they might arise, they can avoid contemplating these unrelated thoughts while performing potentially dangerous tasks. That's why effective safety educators ask workers to visualize themselves correctly and safely accomplishing their most challenging tasks each day. As a result, safety educators can bolster awareness of the inherent dangers involved in so many daily work tasks.

Besides using tales of some of baseball's greatest hitters to illustrate the importance of focus to eliminate errors, workplace safety instructors like to conjure the image of Sylvester Stallone's iconic Rocky character to motivate their students. Rocky always relied on his strong personal values to find the inspiration to overcome opponents. He motivated himself by proving he was not washed up, tapping his patriotism, and demonstrating his commitment to family members, such as his lover for Adrian and his son. Safety educators ask the workers they train to take as much pride in an anticipating and safely performing risky tasks as Rocky felt for each of his fights. The goal of the exercise is to get workers to "own responsibility" for their actions, commit to being safer, and increase focus on the need to concentrate each day. Once workers are motivated to be safe, they need only to learn the skills required to enhance their focus.

Good workplace safety instructors also must recognize the reality of just how ingrained bad habits can become in humans. As Janet Rae-Dupree wrote in a 2008 column in *The New York Times*, research reveals humans are strong creatures of habit, "Habits are a funny thing. We reach for them mindlessly, setting our brains on auto-pilot and relaxing into the unconscious comfort of familiar routine" (Rae-Dupree 2008). Habits literally become part of the brain via the formation of synaptic paths. But Rae-Dupree chronicled how researchers have found that changes to habits can create new brain cells and parallel synaptic paths that help people think new and innovative thoughts (Rae-Dupree 2008). Taking all of this into account, effective workplace safety instructors ask workers to sharpen their ability to focus through constant repetition. To illustrate the importance of such practice, workplace safety teachers also should ask workers to envision themselves performing work tasks safely. Ask workers to picture themselves as drivers slowing down their cars *before* they reach a narrow, icy stretch of road.

This vital concept of remembering to stay focused on the present moment is one the underpinnings of author and naturalist Henry David Thoreau's writings. To encourage people to be attentive to their surroundings, Thoreau spoke of how an individual can be *in* the woods but not *of* the woods. As Thoreau put it, "You must live in the present, launch yourself on every wave, find your eternity in each moment" (ThinkExist.com 2010). For his part, Ted Williams, who some experts consider the greatest hitter of all time, was always in the moment when it came time for him to bat. But the baseball legend was quick to downplay the role his keen eyesight played in his success in hitting the baseball, according to his biographer Leigh Montville. Williams thought such talk overlooked the immense amount of time and effort he spent focusing on seeing his target and maintaining proper mechanics throughout his swing. Few people can ever bash 521 homeruns in the major leagues. Yet, with encouragement, lessons on the mechanics of the mind and enough practice, everyone should be able to focus just as intently on daily workplace safety.

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