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Safety and the Brain

In this white paper, we explore the most critical (and arguably overlooked) piece of personal protective equipment that each worker has in their toolkit —their brain.

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The current economic realities we face are more brutal than most of us can ever remember. Every day we are being asked to do more with less while the demand for safer workplaces and the scrutiny from regulatory bodies has never been more intense. At the same time dissatisfaction with safety performance by workers unions, employees, business stakeholders and governments grows stronger. In this climate, any investment we make in safety simply must deliver results.

It's under these circumstances that high performing organisations are looking for new ways of doing business. They are seeking more than just short term interventions. It is time for an entirely new way to deliver products in a safer, healthier, more environmentally responsible and efficient manner. Neuropsychology, the science of mind and brain, holds the answers. The marketplace demands change and this is where the solution lies.

Worker safety and its impact are critical issues for production mangers; injury and incidents have direct effects on cost, schedule, quality and company brand. In this context, considerable energy and effort over the past 20 years has been dedicated to researching and investing in workplace safety.

What Makes People Tick?

Although a highly complex organ, we only need to understand a few key functional areas of the human brain to begin to influence the way it works. These three core functions are: the Conscious, the Subconscious and the brain's filter. In combination, these three systems are responsible for regulating and sorting all of the stimuli that the brain receives, generating responses in the form of thought, emotion and behaviour, and establishing habitual responses over time.

It is the activity of these three systems that determines the behaviour of a worker when encountering a known roof collapse hazard—whether he notices the hazard, if he believes it to be a genuine hazard, what feelings he has about being placed at risk, and then, what he does about it at the time, and in the future. By developing an understanding of this relatively simple model of the human brain in combination with some known brain facts, we can begin to create successful strategies for improving industrial safety performance, even in the face of increasing complexity in the workforce.

Brain Fact #1: The Human Brain is Suited to Simple Environments

At its core, the human brain is hardwired to keep us safe from harm. Looking back to earlier times in the human history book, times when threats to our lives mostly came in the form of physical threats to our survival, the main concern of man was to distinguish what he could eat from what could eat him. We originally adapted and thrived in very simple environments where achieving the basics of finding food, shelter and negotiating relatively simple social interactions were all that was required. Fast-forward to the present: we now live and work in very complex environments, but the brain has not evolved as fast as the industrial or technical revolution.

In today's workplace, we are regularly exposed to complex energies (e.g. mechanical, electrical, thermal, chemical) and are expected to negotiate increasingly complex social situations (e.g. government, organisational hierarchies, authority and social power). We have arranged ourselves in complex communities where demands on time, energy and mental resources have significantly increased. With advancements in technology we are increasingly expanding our expectations on the human brain. The challenge is that in our fast paced and changing world of today, our brain is still hardwired for the relatively simple environments of our ancestors.

As such, our brain is often dangerously overloaded and overwhelmed, resulting in simple processing mistakes, inaccurate evaluation of risk and emotionally charged decision making. You don't have to look much further than your daily commute to work to see modern technology collide head on with the limitations of the basic human brain and the consequential effect on safety as drivers attempt to interact with in-vehicle entertainment devices, navigation systems, passengers and mobile phones, all whilst executing the complex task of driving.

Brain Fact #2: The Human Brain is Designed to Conserve Energy

Physical brain weight accounts for only about 2% of overall body weight, yet the brain consumes up to 20% of the body's energy resources, in the form of oxygen, water and glucose, for basic functioning. Complex decision making, data analysis, forward planning, concentration, sustained attention and the activities of the modern workplace draw on more energy. This is like asking the brain to run a marathon on a daily basis.

Due to the large draw on brain resources for basic survival, humans are genetically programmed to get the most possible rewards for the least amount of energy expenditure (a system developed and relied upon to assist during times of potential famine, times known well to our forefathers). In the workplace this energy saving mechanism can look like complacency, inattention, habituation and taking short-cuts—perhaps a great survival mechanism from the brain's perspective, but no help to our overall safety, especially when we are working in modern day high-risk environments.

Brain Fact #3: The Human Brain Pays Attention to Very Few Things

Our brains are constantly processing millions of bits of data every single second. This data floods in to the brain via our senses, from both our internal and external environment. As extraordinary as that is to contemplate, consider that in order to conserve energy, we are only designed with the ability to consciously focus on a tiny fraction of that data, less than 1% any given time.[1] That means humans fail to detect over 99% of information. The safety implication for this fact is immediately evident; most risk management systems are designed with the underlying assumption that risks are relatively easy to identify, and most incident investigation outcomes recommend a 'blame and train' approach when hazards preceding an incident were not identified, both ignoring the natural limitations of the human brain, and in so doing, potentially causing more harm than good (see Brain Fact #5).

Like a security guard outside the Pentagon, it is the job of the brain's filter to determine what data gets let in and sent to our conscious awareness and what gets shut out and ignored. The filter is responsible for sorting the data between the Conscious and the Subconscious through a specific set of criteria.

Anything that threatens our survival, supports our goal attainment, is pleasurable, or is simply peculiar, is worthy of energy expenditure, and therefore receives our attention. In simple terms, humans pay attention to that which they find Dangerous, Important, Pleasurable or Interesting (DIPI™), in that order, and nothing else. In context, when a worker perceives he has never been hurt on the job, believes change initiatives are driven solely by statistics, experiences his PPE as uncomfortable and observes that each toolbox talk sounds the same, his energy saving brain takes over and he switches off.

Any information that the brain receives which falls outside of that sorting criteria gets processed at the Subconscious level. It receives little to no energy and we pay it no attention at all. This fact goes on to explain why we have little difficulty remembering the details of the birth of our first child, but not the specific events in the days preceding it.

Understanding the hierarchical nature of selective attention, organisations, safety professionals and team leaders can begin to examine their safety inductions, safety management system, posters, leadership presence, meeting content and safety compliance training by asking "Is this important, enjoyable and unique to our audience?" In most instances, the answer is "no", meaning these initiatives are likely to be ineffective at best.

Brain Fact #4: The Human Brain Seeks Pleasure Over Pain

According to Lieberman and Eisenberger (2009), the most primitive of our habits relates to our drive to minimise threats and maximise rewards.[2] Everything we see or experience is classified in accordance to its potential for pleasure, or potential for harm ('Danger'). When something is classified as a potential reward, dopamine (a 'feel good' chemical in the brain) is released. Releases of dopamine assist us to focus, think clearly, process complex information, make rational decisions, and even have greater peripheral vision—a significant survival advantage, particularly in the modern workplace.

However, research shows that we tend to adapt to consistent rewards or pleasant conditions over time, and as such, unexpected pleasant events (rewards) tend to have a much bigger impact than expected ones.[3] To be effective therefore, reward and recognition safety programs need to offer rewards that are personally meaningful and retain an element of surprise.

On the other hand, when an incoming stimulus is classified as a threat, the body is immediately energised for action. The response to threatening information is much more dramatic than that for gains, with information only needing to be very mildly threatening to produce a significant impact on performance.[4]

Threats trigger the automatic Flight or Fight stress response in the brain which means that cortisol and adrenaline are released into the bloodstream, readying the muscles for attack or escape. In so doing, energy is drawn away from the brain, reducing the ability to think clearly, process information well, problem solve or identify potential hazards in the workplace (due to the reduced peripheral vision). Under these conditions individuals are less safe and less likely to be able to respond well to any unexpected hazards in the workplace. Fear or shock-based safety campaigns should therefore be used extremely carefully (if at all), and always include a focus on the positive consequences of changing behaviors. Overly punitive consequences and authoritarian leadership styles also create a similar undesired effect.

Brain Fact #5: The Human Brain is a Social Organ

The primary purpose of our threat response is to help us perceive and respond to threats to life as quickly as possible (thereby increasing the probability of survival). Just as some animals have relied on their acute sense of sight or smell to survive, human beings have relied on other people. Newborns are incapable of securing the basic necessities for survival without a caregiver. Hunter gatherers depended on their group for protection, assistance with core tasks and hunting. Therefore, social isolation and rejection signals a threat to survival, and so humans have become particularly adept at understanding and adapting to the emotions of others.

Whether the threat is physical or social in nature, our brain seems to react just as strongly.[2] Recent MRI brain imagining research shows identical activation in the brain regions during social rejection as when experiencing physical pain.[5] This means that from your brain's point of view, slipping and hurting your leg is as 'painful' as being offered feedback on a project that is not going well, or being ignored in a meeting, or receiving corrective instruction from a supervisor in front of your peers. Social threats in the form of criticism, such as the traditional safety observation or feedback conversation, can produce particularly strong Flight or Fight threat responses, which means that one's ability to process, think rationally and learn from the experience is minimised.[6]

Why would we use the same neural system for physical pain to deal with social pain? From an evolutionary perspective, neuroscientists suggest we may have created internal mechanisms that register being ostracised as painful and being socially cooperative as pleasurable in order to promote the maintenance of group bonds and ensure survival. In the safety context, an increase in the sense of social inclusion, autonomy, social status, social justice and ability to predict the future, increases an individual's ability to perceive, attend to, judge, plan and communicate about risk.[6]

Implications and Recommendations

Consider the brain as a simple system, built for simple environments. An organ with limitations on its energy budget and concentration capacity, with strict criteria for attention regulation. A pleasure-seeking organ built with the most primitive of 'attack or run' survival responses. A system that must function in a complex social network and successfully navigate the intricate nuances of day-to-day interpersonal communication. Taking this perspective, recommendations for industry include:

- Simplify safety communication into 'bite size' chunks. Be prepared to repeat them.
- Use multiple means of easy information transfer (e.g. verbal and written instructions; pictures/graphics over words; on the job versus in the classroom).
- Brand safety as personally relevant and important at the individual level.
- Introduce novelty or think of ways to stimulate interest and energy in safety.
- Ensure tangible reward programs. Give rewards that are individual (or small group based), personally meaningful and unexpected, to achieve maximum reinforcement value.
- Search for opportunities to provide genuine praise and use this to shape future behaviour.
- Make safety interventions meaningful to people and supported by the organisation to promote change. Provide frequent opportunities for repetition, refreshers, reminders, refocusing and coaching.
- Take a comprehensive approach to safety culture change which includes consideration of general employee wellbeing, stress management and emotion regulation skills training. From a physiological perspective, a content and emotionally skilful workforce is more likely to be able to see and manage hazards, communicate more effectively, solve problems and process information well.
- Increase engagement in safety observations through collaborative interactions toward the goal of going home safely every day.
- Take a long-term approach in the investment of interpersonal skill development of emerging, existing and future leaders.

Conclusion

Armenekis, Harris and Mossholder (2009) state that readiness to change "is reflected in organisational members' beliefs, attitudes and intentions regarding the extent to which changes are needed".[7] These attitudes and beliefs begin with our thoughts about change and our thoughts about safety. We are in a unique position as human beings to influence our own outcomes through influencing the things we think about and pay attention to. In order to establish effective and enduring organisational change, and to break through the safety plateau, we need first to look differently at what we are doing, and turn to the most resourceful of our protective equipment on hand—the brain. It is in looking to the area of neuropsychology and its revealing studies of motivation, engagement, attention and culture that the stage will be set for the future, and safety taken to the next level.

Sentis specialises in safety culture measurement and transformation. Experts in applied psychology and neuroscience, Sentis helps organisations to enhance and move beyond compliance to empower employees to work safely—not because they have to, but because they want to. Offering training, coaching and consulting, Sentis has helped more than 300 companies and 150,000 people think differently about safety since 2003.

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