Reinforcing the *Human Infrastructure* of our Nation's Transportation System

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In April, 2024, the U.S. Federal Railroad Administration (FRA) announced $2.4 billion of funding available for its Consolidated Rail Infrastructure and Safety Improvement (CRISI) program. CRISI—like the $1 trillion Biden administration infrastructure bill that encompasses it—largely aims to rebuild our nation's crumbling physical transportation infrastructure (roads, bridges, rails).

But we have *another* crumbling infrastructure—equally, if not more, important—that the infrastructure bill and the CRISI program in particular can help address: the *human infrastructure* of our nation's transportation safety systems.

A recent panel discussion among renowned researchers from Yale and Harvard, world-class mindfulness practitioners, and national transportation safety experts underscored the need for greater attention to mindfulness, psychological safety, and emotional well-being in our workplaces.

The experts' reflections on these topics make it clear: To attend to this human infrastructure is to attend to the health, well-being, and safety of the thousands of employees spread across our national transportation system and—beyond that—of the public at large. Neglect of this infrastructure has a serious negative impact on our nation's safety security, and economic viability.

In the wake of the Francis Scott Key bridge collapse, the East Palestine train derailment, and numerous other incidents whose root causes may lie in failed human infrastructures, these expert voices merit our careful attention. Together, their input has the potential to lead to a transformation in the way we conceive of and promote transportation safety.

The Panel: MINDFULNESS, PSYCHOLOGICAL SAFETY, EMOTIONAL WELL-BEING, AND SAFETY

In 2019, after more than 20 years conducting human factors research, I left the U.S. Department of Transportation and began focusing my attention on the converging research areas of mindfulness, positive psychology, and emotional intelligence, and how innovations from these research domains might help improve transportation safety.

In 2023, the American Mindfulness Association asked me to curate a panel discussion on the topic of mindfulness for the American Psychological Association's (APA's) Work, Stress, and Health (WSH) conference. I was curious to know what the experts had to say about the real and potential applications of these research domains to transportation safety.

We held the resulting plenary panel discussion, entitled "Mindfulness, Psychological Safety, Emotional Well-Being, and Safety in the Workplace," online on November 10, 2023. Each panelist had 10 minutes to address four core questions:

- How do mindfulness, emotional intelligence, and psychological safety influence stress, health, and well-being in the workplace?
- How do these factors influence transportation accidents and industrial safety?
- Based on what we currently know, what can you recommend for policymakers (federal, state, local, and business leaders) on the role of mindfulness, emotional well-being, and psychological safety to help improve public health and safety?
- What future research questions need to be addressed in these converging research domains?

An open discussion among all panelists followed, along with responses to audience questions. From this active discussion, six key themes emerged, each worth considering to advance a safe, reliable, and efficient human infrastructure for our national transportation system:

- mindfulness,
- emotional intelligence,
- emotional contagion,
- toxic work environments,
- psychological safety, and
- mindfulness-based interventions.

The following pages, organized according to those themes, summarize the 90-minute session. Following the summary, I comment on the implications for further action and research.

Mindfulness

Panelist Michael Carroll, a 40-year mindfulness practitioner and global executive coach, made the case that **mindfulness meditation cultivates the skills and qualities that workplaces most urgently need**:

> *Most problems corporations experience these days are not technical or functional aspects of the job. They have to do with human interaction. How we listen, how we deal with conflict, and how we engage with one another.*

Every organization has challenges, difficulties, and misunderstandings, so solving human problems is the name of the game. “Teaching people how to skillfully influence others, how to coordinate complex team-based work assignments, all while creating an atmosphere of trust is a highly valued skill and resource for any organization,” Carroll said.

He pointed out a study of more than 50,000 workers from dozens of companies published in the October 28, 2023, issue of *The Economist*, which **identified social intelligence skills among the most sought-after skills for new leaders**.

And **the foundations of these social and emotional skills are self-awareness and self-regulation, which mindfulness meditation cultivates.** Mindfulness, at its most fundamental level, is the ability to stabilize one's attention on the present moment. When practiced regularly, it unleashes our natural awareness and curiosity about ourselves and things happening around us. Classically, the discipline is called mindfulness/awareness. Mindfulness is the practice of meditation, or attention training. Awareness is an attuned, empathic presence that naturally emerges from the practice of meditation. Carroll said:

> *Within the first three minutes of sitting meditation, you become more self-aware. With continued practice self-awareness skyrockets.*

It takes time to train the mind, but with continued practice transformative changes in how we relate to ourselves and to one another can and do occur. Training the mind to escort the attention from the thoughts to the breath stimulates neuropathways that help regulate emotions, growing cells in that region of the brain.

"It's not that we are learning new skills as much as we are uncluttering the mind to allow our inherent human qualities to naturally emerge," Carroll said. He continued:

> *A whole range of social intelligence skills begin to emerge while sitting still focusing solely on your breath, qualities such as openness, kindness, compassion, empathy, and authentic self-confidence. The more we sit like this, and for extended periods, the more aware we become of our conditioned biases. Mindfulness trains the mind to drop our biases, to be more agile and fluid in our thinking, creating a sense of both agility and resilience when we are confronted with diverse opinions and points of view. We also become less impressed, less reactive, to the emotional tantrums of others.*

Further, **meditation in the workplace is no longer considered woo-woo.** Backed by the latest neuroscience research and applied psychology, attention training and mindfulness techniques are being integrated into the work structure and have become increasingly common practices in schools, businesses, law firms, clinical settings—almost everywhere—with the effect of reducing stress and distraction, increasing creativity and productivity, and unleashing social intelligence skills.

Emotional Intelligence

Panelist Dr. Marc Brackett, founder and director of the Yale Center for Emotional Intelligence, underscored the importance of one type of skill that meditation cultivates—emotional intelligence (that is, the ability to recognize, understand, label, express, and regulate emotions)—and its profound connection to workplace safety, saying:

> *Emotional intelligence skills are essential skills in the workplace.*

Some of Brackett's own research demonstrates how heavily feelings influence workplaces. In one recent study, his team asked 1,000 people across the workforce what they were thinking about that day. The top five concerns reported were all related to emotions: mental health, equity (race, gender, pay), loneliness (connection), burnout, and imbalance. Apparently, Brackett argued, **most of us rarely tune in to our feelings**; rather, we shut them out. He asked:

> *What conditions do we need to create—at home, at school, at work—to deal with these [emotional] issues? Do we give ourselves permission to feel? My research shows that most of us do not really get an emotion education.*

One individual-level solution, according to Brackett, is **improving emotional self-awareness by periodically checking in with one's feelings in the moment:** "Is my energy level high or low? Are my feelings pleasant or unpleasant?" Such awareness can pave the way to emotional intelligence. Brackett, in collaboration with Pinterest co-founder Ben Silbermann and their respective teams, has created a free, easy-to-use app, How We Feel, to support this practice.

Brackett's research also shows the tremendous positive effects of emotional intelligence in the workplace. He's found **that having a "feelings mentor" (someone at work to share feelings with) literally predicts job satisfaction, turnover intentions, and other life outcomes** such as better sleep, greater mental and physical health, and life satisfaction in general:

> *People who give us permission to feel [who are non-judgmental, good listeners, and show empathy] create the space for us to be our true fulfilling selves.*

But when people are asked if there is someone at work with whom they feel comfortable sharing their feelings, only about 44% say yes. That means **most people (56%) don't have someone at work they can talk to about their emotions.**

Of those who responded affirmatively about having a feelings mentor, the top three characteristics of that person were being a good listener, being empathetic, and having a non-judgmental attitude. "No one said anything about that person being brilliant, smart, wise, or charismatic," he said. "They're talking about emotional intelligence, how well that person relates and resonates with others."

By cultivating and sharing emotional intelligence, leaders and supervisors can revolutionize workplace dynamics. Mastering the regulation of our own emotions, especially in the face of others' emotional turbulence, enables us to foster an environment where persistence and resilience thrive. Leaders who demonstrate high emotional intelligence—through empathy, active listening, and non-judgmental attitudes—become invaluable resources, promoting engagement and perseverance among their teams. In contrast, emotionally harsh leaders who disregard their employees' emotional experiences can deplete their teams' emotional resources, leading to exhaustion and burnout (Levitats et al., 2022).

Expressing one's true self within a psychologically safe, high-hazard work environment epitomizes safety at its highest level, as supported by research on High Reliability Organizations (HROs). These organizations, which operate in complex, high-risk environments, consistently achieve exceptional safety records by institutionalizing a collective mindfulness where employees are able to swiftly detect and respond to weak signals and unexpected events, ensuring the utmost safety and reliability in their operations (Weick & Sutcliffe, 2007).

Emotional Contagion

Dr. Karen Philbrick, executive director of the Mineta Transportation Institute, detailed a dynamic that can either confound or support efforts toward emotional well-being in the workplace:

> *Emotional contagion is a powerful force.*

Emotional contagion refers to the quick spreading of one person's emotional responses to others within a group (Barsade et al., 2018). Just as emotions spread and activate within a person's own nervous system, affecting the individual's health and well-being, emotions can also spread to other people. The effect of emotional contagion can be either positive or negative, but it's more often studied as a maladaptive behavior pattern. Philbrick said:

> *When a boss expresses negative emotions toward others—like anger, for example—the typical response is a narrowing of attention and situational awareness.*

When a boss expresses anger, others in the group may literally lose sight of what's in front of them. Anger, when perceived as threatening, activates the sympathetic nervous system and prepares the body's natural defense systems, causing a freeze, fight, or flight response.

The emotions that linger after that experience are likely to be taken out on others. Workers may be able to restrain themselves from yelling at their fellow employees, only to find themselves yelling at their kids when they get home.

The research, Philbrick said, is quite clear: **emotions are contagious.** Meta-analytic research, she explained, shows that **emotion-related job demands such as strained work relationships may trigger sleep loss and sleep disturbances that affect not only health and well-being but also safety.**

Toxic Work Environments

Dr. Philbrick went on to explain the consequences of negative emotional contagion, i.e., toxic work environments that are detrimental to transportation safety:

> *Toxic work environments are characterized by unsafe working conditions, unrealistic workloads, lack of respect and accountability, lack of honesty, and damaging behavior like bullying and microaggressions, as well as a general atmosphere of chronic negativity. (Brown et al., 2021)*

She explained that toxic work environments are so real and so prevalent in the U.S. workforce that on October 20, 2022, the U.S. Surgeon General released a *new framework for mental health and well-being in the workplace*. That release cites recent survey research with some startling statistics:

- 76% of U.S workers reported at least one symptom of a mental health condition,
- 84% of respondents said their workplace conditions had contributed to at least one mental health challenge, and
- 81% of workers reported that they will be looking for workplaces that support mental health in the future.

Even in the short term, toxic work environments and negative emotional contagion can be devastating to mental health, physical health, job performance, and safety. **Over the long term, they can create a culture of such pervasive toxicity that it may affect public safety and the economic viability of our transportation systems.**

Panelist Charles Austin, an industrial hygienist with the Teamsters Union with over 30 years of labor union experience, gave a specific example of these dynamics:

> *Our just-in-time economy is creating a toxic work culture for thousands of transportation employees.*

Austin noted that the daily pressures on truck, bus, and delivery drivers to get goods and services delivered within limited time windows create tremendous stress in all modes of transportation. Workers are working longer hours, taking fewer breaks, and interacting more frequently with their customers and employers than ever before. They face a host of difficulties, including communication problems, inclement weather, navigation issues, and the pressure of electronic supervision. **"This kind of combined chronic stress all adds up,"** Austin said.

Transportation, by its very nature, is a high-hazard environment. **Even the smallest errors during a just-in-time delivery route can get someone killed, if not create a public safety or economic disaster.** Austin proposed the following response:

> *We need to view toxic work cultures like any other hazard. First, we need to recognize it as a hazard, and then we need to develop measures to reduce or mitigate that hazard, just as we would do with a physical hazard.*

Only then can we reduce or minimize the psychological stress, the physical stress, and the potential impact that hazardous work cultures can have on individuals and public safety.

Psychological Safety

Panelist Amy Edmondson, Novartis professor of leadership and management at Harvard Business School, introduced the antithesis of negative emotional contagion and toxic work environments: psychological safety.

Edmondson has pioneered concepts in psychological safety for over 20 years. She defines psychological safety **as "a belief that [the] work environment is safe for interpersonal risk taking"**—a safe place to speak up not only with ideas, questions, and concerns, but also about mistakes and failures.

At the organizational level, psychological safety is embodied as a culture where people feel comfortable about speaking up. But it is also much more than that, Dr. Edmondson says:

> *Psychological safety must be built. It's an emergent property of a group, or a group of people working together in some way. There will be risks and failures in the group discussions and decision making, but people need to feel that their colleagues are there for them, that they've got their back, so to speak.*

Edmondson highlighted research with frontline caregivers in hospitals from one of her colleagues, Michaela Kerrissey, that shows **an inverse relationship between psychological safety and burnout.**

Moreover, she said, "**Psychological safety is a tremendous predictor and enabler of high performance in teams**, but it also varies substantially across teams."

How that sense of psychological safety is built, how individuals, teams, and organizations develop more collaborative and more mindful work practices that reduce stress, improve health, performance, productivity, and safety is increasingly being explored and applied in organizational settings as mindfulness-based interventions. Dr. Edmondson said:

> *Psychological safety is not easy to cultivate. In fact, it's better described as rare than common—but it can be built. Psychological safety is not about harmony. It's uncomfortable. It's OK to be uncomfortable. We will disagree. We must disagree. If you can create an environment where openness and candor is expected, for example—where people feel permission to bring up difficult topics for discussion, such as challenging unsafe working conditions with your superiors—organizations begin to thrive.*

She noted three types of behaviors that can lead to a sense of psychological safety in organizations:

1. **Framing the work** is about getting everyone all on the same page—about the uncertainty, the complexity, the interdependence, the challenges, the novelty, whatever it is—and letting people share a deep appreciation that the work needing to get done *requires* everyone to speak up, to speak their mind.

2. **Inviting participation** means asking good questions. It's about creating the conditions whereby people know their voices are welcome, because their opinions have been requested directly: "What are you noticing? What are you seeing out there? What ideas do you have? Who has a different view?" Explicit requests for input like this need to be made—openly and honestly.

3. **Responding thoughtfully** means acting mindfully when someone points out an error, or when someone asks for help or expresses a dissenting point of view. The thoughtful response, while not easy, needs to be appreciative and forward-looking.

Dr. Edmondson detailed what this entails: "*Appreciative* means an immediate response that shows your appreciation for their willingness to share, saying things like 'Thank you for that thoughtful comment. I'm glad you asked'; 'Wow. I hadn't thought about it that way'; or 'Oh, that must be disappointing. Let's take a look.' *Forward-looking* means responding with forward-looking questions. Questions like 'How can I help? Where do we go next? What ideas do you have?' It's simply responding in a positive manner rather than framing it negatively like 'How the heck did that happen?' Or avoiding difficult comments altogether with comments like 'We'll deal with that later.'"

Developing habitual responses like these can build a climate of trust where people believe their voices are welcome. "We must train ourselves," she said, "to take a deep breath and be mindful of how our response might impact others before we respond."

"We can do many amazing things together," she said, "when we feel we're in it together, when we feel safe to use our voices. It's burdensome when we feel that we don't have anyone to whom we can bring our authentic voices forward."

Edmondson's own research also shows that **new hires start with a significantly higher level of perceived psychological safety than the average employee, but they lose it quickly.** It then takes years, sometimes decades to rebuild:

The onboarding process is critical. It's important to help HR and training professionals understand that cultivating a belief in psychological safety, where the organizational context is safe for taking interpersonal risks, is a robust approach for minimizing mental health stress, burnout, and increasing organizational performance.

Mindfulness-Based Interventions

Panelist Jackie Gallo is executive vice president of operations at Pursuit Aerospace, the largest privately held aircraft engine component manufacturer in the world, with over 3,000 employees. She spoke about her passion for applied mindfulness at work; the significant amount of time she has spent over the last couple of decades developing these qualities in the people around her, as well as herself; and how mindfulness training and mindfulness practices have impacted her performance and decision-making, as well as her team's.

"There are four primary ways that mindfulness has influenced me, my decision-making, and also my team," she said:

1. **Awareness.** Developing awareness, specifically awareness of our impact on the decisions of others, is key. Being aware of our own bias or others' bias, and how to uncouple from that, is critical. We develop awareness through mindfulness practices.

   Gallo's team introduces employees to sitting meditation practice, as well as to small practices like "moment to arrive" (taking a moment at the start of a meeting to allow people to transition from whatever they were doing last to what they're about to do).

They teach employees to be aware of little things—to notice small actions and sensations, take a moment to notice the feeling of touching a door handle.

They infuse such practices into their organization at all levels, teaching the practices in classroom instruction, then encouraging employees to bring mindfulness techniques with them into discussion groups, meetings, and other regularly occurring situations so they become a habitual part of the workplace.

2. **Empathy.** Empathy directly reduces conflict and stress, and one of the main ways that we develop empathy, aside from mindfulness, is connecting with people's individual career development desires.

   Gallo and colleagues move people into different seats in the organization so that they can more easily empathize with those in other roles. Over time, this is quite powerful. Someone who typically sees themself as a welder, for example, may move into the seat of an inspector; when they do, they are less frustrated with welders' defects, because they understand the challenges of a welder's job at that operation.

3. **Openness.** Openness, or gentleness, leads to creativity and innovation.

   Gallo's organization practices Kaizen—a concept based on Toyota's production system. Kai means change, and zen, in this context, means the betterment of others. The focus is on the people—not on the outcomes, necessarily, but on how to ease the job of the person doing the manufacturing.

4. **Humility.** Gallo said:

   We have a very strong commitment to servant leadership. I know a lot of companies might say that, but we try to embody and practice. And what I mean by that is, my job is to remove obstacles and support those people that are making parts on the floor. And so, we strive to do everything that we can using Kaizen, which is a practice of pulling people together to observe a process and innovate. And that way we can make it easier.

A final lesson, Gallo said, is that they get better results by focusing more of their energy on the people who are naturally positive toward mindfulness, toward Kaizen, and toward their culture of servant leadership instead of the naysayers:

> *When we invest in people who are positive toward our efforts, they multiply their energy by creating processes that respect humanity. I've learned early on that trying to convince negative people that this is the right thing to do can be a major challenge. So, I focus on the people who are naturally positive so that we can shift the curve of naysayers. Over time we will see the benefits, and the noise of those who are against our efforts becomes smaller in magnitude.*

How we focus our energy is very important in this entire endeavor.

Implications for Transportation Policymakers and Safety Leaders

During the concluding discussion the panel recommended the following topics for consideration by policymakers and safety leaders:

1. **Peer-to-peer skill development**. Organizations could prioritize training employees in peer-to-peer influencing skills to improve social intelligence and conflict management.

2. **Leadership emotional intelligence training**. Companies can enhance leaders' ability to foster psychologically safe work environments through emotional intelligence training, ensuring employees feel comfortable contributing and speaking up.

3. **Promoting and training in mindfulness practices.** Mindfulness practices can be integrated into the workplace by design to support employee's awareness, empathy, openness, and humility, and are crucial for reducing stress, fostering innovation, and strengthening safety culture.

4. **Psychologically safe onboarding processes.** Newcomers can be onboarded by welcoming them into an environment that supports speaking up and interpersonal risk-taking, with a clear message from senior leaders that their voice is welcome.

5. **Team building**. The research on team science, mindfulness, and emotional intelligence can be applied to help foster agile self-improvement-oriented teams for improved organizational functioning, especially in high-hazard environments.

6. **Continuous learning and development**. Leaders can encourage ongoing development of ways to weave psychological safety and emotional intelligence into the fabric of the organization across time. Educational institutions can create curricula that view toxic work environments as hazards and teach how to identify them and mitigate their risks.

Mindfulness, emotional intelligence, and psychological safety can play a critical role in enhancing employee well-being and public safety and can be infused in various ways into established safety management systems. An integrative safety management system approach is needed where employees are supported through mindfulness training, empathetic leadership, and a corporate culture that values the psychological safety, emotional health, and well-being of its employees.

Conclusion

Reporting on the investigation of the East Palestine train derailment, ABC News quoted National Transportation Safety Board (NTSB) Chair Jennifer Homedy as saying, “I can tell you this much: This was 100% preventable” (Sweeney & Maile, 2023).

One need not look very far to find numerous other examples of preventable harm in our nation’s transportation systems, from the deleterious effects of toxic work environments to technology-induced distraction to failed safety communications to poor crew resource management.

We have close call and near miss reporting systems, risk reduction programs, and an increasing emphasis on building stronger safety cultures. But, despite the decades of research and pilot demonstrations to improve industry safety culture (Ranney et al., 2013), significant human problems remain—and may be worsening. We’d be wise to heed the recommendations of this multidisciplinary expert panel who offer innovative, evidence-based solutions to pressing issues in our industry.

Systematic reviews of the current research literature are needed that summarize and document the potential safety impacts of mindfulness, psychological safety, and emotional intelligence on transportation safety. Rigorous evaluations of innovative mindfulness-based safety interventions and similar approaches are needed to demonstrate the potential impacts of these interventions in real-world settings and transforming safety culture.

We need to develop and embed mindful organizing, mindfulness practices, and mindfulness training as integral elements into the structural integrity of our safety management systems. We need to infuse micro-practices and routine mechanisms into manager’s daily check-ins and regularly occurring meetings in ways that cultivate and reinforce safety leaders’ emotional intelligence, characterized by curiosity, compassion, and empathy. These practices will help foster a felt sense of psychological safety among employees, empowering them to perform their roles effectively, efficiently, and safely. Only then can we build collective mindfulness and organizational wisdom that maximizes the safety potential in our nation’s transportation infrastructure. The benefits of this approach extend *far beyond safety, offering transformative impacts on communities, industries, and society at large*.

NOTES

This perspectives paper was based on the plenary panel session entitled “Mindfulness, Psychological Safety, Emotional Well-Being, and Safety in the Workplace,” held online for the American Psychological Association Work, Stress & Health Conference 2023, November 10, 2023.

Organizer: Beth Schwartz, Ph.D. (she/her), Associate Director, Office of Applied Psychology; Science Directorate, CAGAP Staff Liaison, American Psychological Association

Moderator: Holly Duckworth, Executive Director, American Mindfulness Association

Chair: Michael Coplen, M.A., Founder & President, TrueSafety Evaluation, LLC.

Panelists:

- Michael Carroll, COO, Global Coaching Alliance, and author of *Awake at Work*, *The Mindful Leader*, and *Fearless at Work*
- Marc Brackett, Ph.D., Founder & Director, Yale Center for Emotional Intelligence, and author of *Permission to Feel*
- Charles Austin, Industrial Hygienist, Teamsters Safety & Health Department, International Brotherhood of Teamsters
- Karen Philbrick, Ph.D. Executive Director, Mineta Transportation Institute, San José State University
- Amy Edmondson, Ph.D., Novartis Professor of Leadership and Management, Harvard Business School
- Jacqueline Gallo, M.S., Executive Vice President of Operations, Pursuit Aerospace

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About the Author

Michael Coplen conducted human factors research for more than 20 years at the U.S. Department of Transportation, holding positions as Senior Evaluator and Manager, Safety Culture Initiatives for the Federal Railroad Administration; and Division Chief, Safety Policy & Promotion at the Federal Transit Administration. His demonstration projects and rigorous evaluations have resulted in dramatic safety improvements at pilot demonstration sites, regulatory changes at the highest levels in government and industry, and industry-wide improvements in safety and safety culture. His accomplishments have been twice recognized by the American Evaluation Association, which awarded Mike the 2009 Gunnar Myrdal Government Award and the 2012 Outstanding Evaluation Award. He is a research associate for the Mineta Transportation Institute and is founder and president of TrueSafety Evaluation (https://truesafetyeval.com/), a company that helps transform organizational culture to improve employee safety, health, and well-being by infusing Key Impact Skills℠ and a Mindfulness-Based Risk Reduction® (MBRR®) approach to organizational safety. He has a master's degree in management and organizational behavior and holds certifications as a mindfulness meditation teacher trainer from Dharma Moon and The Tibet House, and as a mindfulness workplace facilitator from The Mindful Leader.

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