

# Recovery from Technostress

How to Prevent Psychosocial Hazards That Extend Beyond the Workplace

BY JENNIFER RAGSDALE

THE SYNERGIST® | SEPTEMBER 2024



### **Working from Home but Missing Your Synergist? Update Your Address**

If you've been working from home, please consider updating your address with ALHA. You can change your address by editing your profile through [ALHA.org](https://www.alha.org). To ensure uninterrupted delivery of *The Synergist*, designate your home address as "preferred" on your profile. [Update your address now.](#)

Call it what you like—the digital era, Industry 4.0, or the fourth industrial revolution—but rapidly evolving technology continues to impact how people do their work. Robots have advanced from human-operated machines into collaborative autonomous robotic coworkers, or co-bots, that can stand in for workers in hazardous situations, take over repetitive work that contributes to fatigue, and improve efficiency. Artificial intelligence and algorithms help power these co-bots while also streamlining personnel management processes and simplifying the synthesis and visualization of high-volume organizational data. Digitalization of work and information and communication technologies (ICTs), such as email, video conferencing, and cloud-based collaboration tools, make it easier than ever for people to work from anywhere at any time, to the benefit of multinational enterprises and working parents alike.

Despite these benefits, technology can introduce psychosocial hazards, too. Often more difficult to observe than physical hazards, psychosocial hazards are the detrimental psychological working conditions or stressors associated with the design, management, organization, and socioeconomic context of work. Introducing new technologies, like co-bots, AI, and ICTs, can sometimes worsen existing psychosocial hazards or create new ones, which can exacerbate workers' stress, challenge their ability to cope, and increase risks for poor health and well-being.

ADVERTISEMENT

**SAVE ON SKC Disposable PPI Samplers** NOW THROUGH 9.30.2024

- Listed in OSHA and MSHA Final Silica Rules
- No tipping issues
- Easiest compliance sampling

Visit [skcinc.com/ppi-sampler](http://skcinc.com/ppi-sampler)

**SKC** skcorderskinc.com  
SCIENCE. SERVING PEOPLE.



### RECOVERY FROM WORK STRESS

A worker's stress response can be activated or "turned on" when the demands or pressures of their job exceed their capabilities, resources, and needs. Stress-related activation can be normal and adaptive: it helps fuel effort and energy across different situations, like responding to a serious physical threat or approaching a mentally challenging work task. Much like an incandescent light bulb, however, you have to "turn off" the stress response if you don't want it to prematurely break down and burn out. When the stressor is gone, psychophysiological systems can return to their pre-stressor state, allowing people to rest and recharge. This is known as recovery from work stress. Successful recovery requires that people get a break from their stressors or demands, whether from a lunch break or a two-day weekend, so they can rebuild the resources or reserves that they used up to meet their demands. When people recover successfully, they feel rested or energized, their mood improves, they experience higher work engagement, and they have greater safety awareness. Problems arise, however, when workers can't recover fully.

Because people exert effort and use up energy to deal with workplace hazards and stressors, it isn't unusual to experience fatigue, feel angry or irritable, and struggle to pay attention to safety hazards. However, the stress response to some hazards or stressors can persist over longer periods of time, hindering workers' ability to turn it off and recover fully. An uninterrupted stress response that stays turned on for long periods of time extends exposure to stress hormones, wearing down psychophysiological systems. This increases the risk for short-term symptoms like fatigue or elevated blood pressure to develop into harmful psychological and physical health outcomes over time, such as burnout or cardiovascular disease. It's important to keep in mind that psychosocial hazards may not occur in isolation and that cumulative exposure can be even more damaging than a single exposure. Preventing these negative outcomes requires participating in frequent and routine efforts that support successful recovery; however, many workers don't get sufficient breaks from work. According to the 2023 Work in America Survey from the American Psychological Association (APA), fewer than 40 percent of workers reported working in recovery-promoting cultures that support taking breaks and have respect for time off.

Successful recovery is a multipronged process involving different strategies to help shut down the stress response and replenish workers' physical and psychological resources. These strategies fall

into three categories:

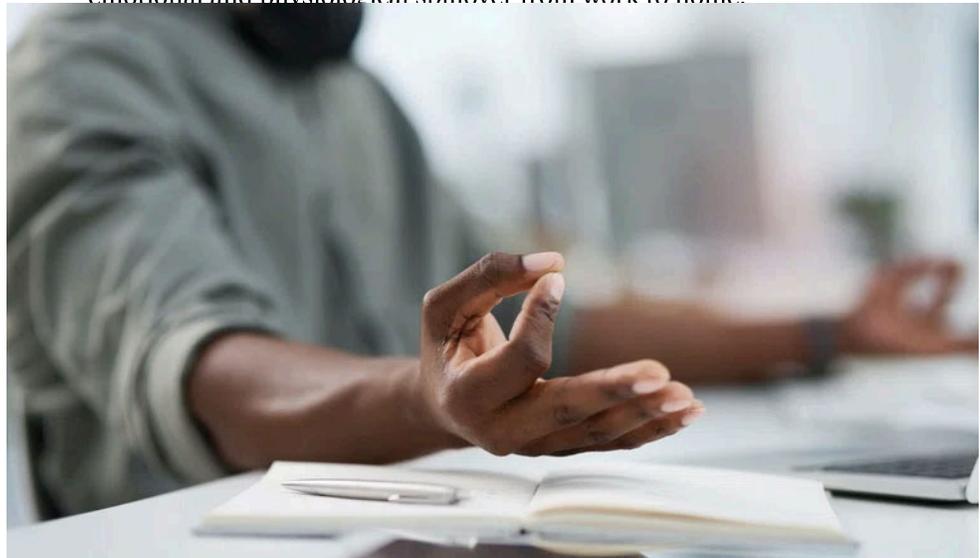
- *Recovery time* is when people take time away from work and its associated stressors or hazards. This includes work breaks, job rotation, work schedules with multiple days off, work arrangements that provide adequate time for sleep, and access to vacation and leave for longer time away from work.
- *Recovery behaviors* are what people do to help wind down the stress response (for example, reading, watching a funny video, or napping) and restore resources (for example, through sleep, exercise, or socializing).
- *Recovery experiences* are how people feel during recovery activities and recovery time. Complex feelings and subjective states of psychological detachment (mentally switching off from work), relaxation (a state of calm, low activation), and mastery (positive challenge, growth, or achievement) accompany recovery behaviors and help drive positive outcomes.

Successful recovery is not just left up to the workers. Organizations play an important role in cultivating working conditions that help workers recover from work stress. Industrial hygienists can work with organizations and their employees to identify workplace hazards and practices that impact worker recovery. IHs can further help employers develop workplace programs, policies, and practices in the workplace that provide recovery time and support recovery behaviors and recovery experiences.

#### TECHNOSTRESS: HOW TECHNOLOGY IMPEDES RECOVERY

Technological advancements can result in technostress, or the experience of stress from using technology that intensifies workload and uncertainty, increases job complexity, introduces job insecurity, and invades workers' personal lives. These techno-stressors can adversely affect workers' health and well-being by interfering with recovery. For IHs to identify and remediate these technology-driven psychosocial hazards, it is important to understand the different pathways through which technology can prevent or interrupt recovery processes:

- **Stressor creation:** work-related technology can create or worsen stressors that are too difficult to recover from.
- **Extended exposure:** work-related technology can extend how long workers are exposed to work demands or stressors while at home.
- **Negative spillover:** work-related technology can induce negative emotional and physiological spillover from work to home.



As workers try to balance their extended work time with family demands, they “borrow” from sleep time instead.

#### *Stressor Creation*

Technology can introduce new types of workloads or intensify existing workloads by increasing the amount, difficulty, or complexity of job tasks. This places additional demands on workers' mental, physical,

and attentional resources. As a result, workers are too depleted to recover effectively. This is known as the recovery paradox: workers with the highest recovery needs face the most difficulty recovering.

One way that robots, AI, and ICTs have the potential to intensify work is by increasing or creating new information processing demands. Certain types of robots can increase workers' cognitive burden because the design of the robot, the type of handling required, and the number of robots being monitored can increase demands on sensory systems, attentional resources, and information processing. AI relies on complex algorithms with wide-ranging applications that include governing co-bot behaviors and analyzing big data for organizational decision-making. Workers engaging with these complex and evolving algorithms will face continuous learning requirements to understand them. ICTs have increased the communication channels workers use to coordinate with each other, which has resulted in a greater number of e-mails and other text-based messages to respond to, more frequent interruptions from notifications across different communication channels, and more divided attention, task switching, or multi-tasking. As workers are more depleted from intensified work, they struggle to engage in active recovery behaviors like exercise and have difficulty achieving recovery experiences like relaxing or psychologically detaching from work.

#### *Extended Exposure*

Work-related use of ICTs can prolong exposure to job demands and increase work hours. AI has also enhanced the capabilities of ICTs, like email and Microsoft Teams, to improve remote access to work, which makes it easier for workers to stay connected when they are away from the physical workplace. While improved access has many advantages for workers who need or want flexibility to manage personal needs or those who perform better outside "traditional" work hours, extended connectivity and availability to work beyond scheduled working time can lead to working more hours and longer exposures to work stressors.

As workers stay technologically tethered to work for extended periods of time, the less recovery time they have, which may contribute to cumulative stress burden. Ongoing monitoring of and responding to emails are at odds with recovery experiences that promote well-being, including psychologically detaching from work, relaxing, or having the time and energy to engage in behaviors that pose positive challenges or promote growth to create a sense of mastery; examples of these behaviors include do-it-yourself home repairs and practicing a new language. A 2012 analysis of data from the Bureau of Labor Statistics' American Time Use Survey published in *Personnel Psychology* found that as workers try to balance their extended work time with family demands, they "borrow" from sleep time instead, reducing yet another critical recovery opportunity.

#### *Negative Spillover*

Workers carry the residue of work—negative moods and continued physiological activation—home with them. These residual psychophysiological states spill over the work-home boundary and impact how well workers can recover. This stress residue can crossover to family and friends, acting as a source of distress for them as well.

Robots and AI are both believed to be threats to jobs and entire careers. APA's 2023 Work in America Survey showed that 75 percent of workers who are worried about AI believed that new forms of technology will take over some or all work duties within the next ten years. This job insecurity is experienced as feelings of powerlessness and perceptions that one's current job or career are under threat of elimination. Job security is a source of important resources for workers and their families, not the least of which are financial. When jobs are insecure, workers may experience persistent worry about when—not if—their job is on the chopping block. Workers bring that stressful thinking pattern home with them, which directly opposes recovery experiences like psychological detachment and interferes with sleep.

In the end, workplace technology creates a paradox. Robots, AI, and ICTs can introduce hazards that interfere with recovery processes, but they can also be leveraged to help enhance recovery. Researchers have developed a variety of digitalized interventions that include livestreaming or virtual-reality breaks that promote recovery. A recent review published in *Advanced Intelligent Systems* in 2022 described how wearables are used for stress management. Wearables can track physiological indicators of stress, like electrodermal activity or respiration, and the associated software can identify corresponding emotional states, such as feeling fatigued, stressed, or relaxed.

Workers can use this real-time feedback to aid in stress reduction and recovery.

#### WHAT CAN INDUSTRIAL HYGIENISTS DO?

Because recovery is the opposite of the stress process, many of the preventive solutions that IHs might use for removing, reducing, or replacing psychosocial hazards will be helpful for recovery, too. Preventing the stress response from turning on or staying on too long will reduce recovery needs. Likewise, organizational policies, practices, and supports that help workers deal with work stress may also help with recovery. For example, fatigue is a symptom that a worker is depleted and needs recovery, and so a starting point might be modifying an existing fatigue management solution to incorporate some additional recovery-promotion.

A recovery-supportive workplace in Industry 4.0 engages workers in the process to describe technology-induced hazards and address how they interfere with recovery. IHs can consider job redesign efforts, training, and managerial support to help prepare workers for robot and AI integration, which can address the associated stressor creation and spillover effects. Policies, practices, and explicit expectations for ICT use can reduce technology overload, minimize extended connectivity during off-work time, and encourage recovery time away from technology-mediated work. Additional educational opportunities can also help workers and managers learn about recovery-enhancing behaviors and experiences that are effective at work and outside work. While implementing these changes, it's important for workers to have ongoing opportunities to provide feedback to identify any unintended hazards or concerns.

Since much of the recovery process happens during time away from work, it is easy to dismiss recovery as being solely in the purview of the worker. However, the work environment, and the ways in which technology has been integrated into it, can introduce psychosocial hazards that extend beyond the work environment and interfere with recovery. IHs have an opportunity to help create recovery-supportive workplace cultures in the face of persistent technological change.

***JENNIFER RAGSDALE, PhD***, is a research psychologist at NIOSH and the assistant coordinator of the Center for Work and Fatigue Research.

*Disclaimer:* The findings and conclusions in this report are those of the author and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention.

Send feedback to [The Sumeraist](#).

## RESOURCES

Advanced Intelligent Systems: "[Trends in Workplace Wearable Technologies and Connected-Worker Solutions for Next-Generation Occupational Safety, Health, and Productivity](#)" (January 2022).

American Journal of Industrial Medicine: "Algorithms and the Future of Work" (December 2022).

American Journal of Industrial Medicine: "[Envisioning the Future of Work to Safeguard the Safety, Health, and Well-Being of the Workforce: A Perspective from the CDC's National Institute for Occupational Safety and Health](#)" (December 2020).

American Psychological Association: "[2023 Work in America Survey: Artificial Intelligence, Monitoring Technology, and Psychological Well-Being](#)" (2023).

Annual Review of Organizational Psychology and Organizational Behavior: "[How Technology Is Changing Work and Organizations](#)" (2016).

Annual Review of Organizational Psychology and Organizational Behavior: "[Job Insecurity and the Changing Workplace: Recent Developments and the Future Trends in Job Insecurity Research](#)" (2018).

Annual Review of Organizational Psychology and Organizational Behavior: "[Recovery from Work: Advancing the Field Toward the Future](#)" (2022).

Cambridge University Press: "Information Communication Technology and Employee Well-Being: Understanding the 'iParadox Triad' at Work" in *The Cambridge Handbook of Technology and Employee Behavior* (2019).

*Frontiers in Psychology*: "[Strain, Loss of Time, or Even Gain? A Systematic Review of Technology-Based Work Extending and its Ambiguous Impact on Wellbeing, Considering its Frequency and Duration](#)" (July 2023).

*Human Behavior and Emerging Technologies*: "[A Review on Intelligent Wearables: Uses and Risks](#)" (October 2019).

*International Archives of Occupational and Environmental Health*: "Definition, Symptoms and Risk of Techno-Stress: A Systematic Review" (January 2019).

*International Journal of Human-Computer Interaction*: "Mental Workload and Human-Robot Interaction in Collaborative Tasks: A Scoping Review" (2023).

*Journal of Management*: "Leaving Work at Work: A Meta-Analysis on Employee Recovery from Work" (April 2021).

*Journal of Mental Health*: "[Virtual Reality and Immersive Technologies to Promote Workplace Wellbeing](#): A Systematic Review" (2024).

*Journal of Occupational Health Psychology*: "Interventions for Improving Psychological Detachment from Work: A Meta-Analysis" (June 2021).

*Journal of Occupational Health Psychology*: "Role of Work Breaks in Well-Being and Performance: A Systematic Review and Future Research Agenda" (October 2022).

*Journal of Organizational Behavior*: "[A Multilevel Review of Artificial Intelligence in Organizations: Implications for Organizational Behavior Research and Practice](#)" (February 2024).

NIOSH: "[Hierarchy of Controls.](#)"

NIOSH: "[Reducing Fatigue in the Workplace.](#)"

NIOSH: "[Stress...At Work.](#)"

NIOSH Science Blog: "[Algorithms and the Future of Work](#)" (September 2022).

Oxford Academic: "Cumulative Stress and Health" in *The Oxford Handbook of Integrative Health Science* (October 2018).

*Personnel Psychology*: "Borrowing from Sleep to Pay Work and Family: Expanding Time-Based Conflict to the Broader Nonwork Domain" (2012).

*Scandinavian Journal of Work, Environment & Health*: "Recovery as an Explanatory Mechanism in the Relation Between Acute Stress Reactions and Chronic Health Impairment" (December 2006).

*Work & Stress*: "[Is Work Intensification Bad for Employees? A Review of Outcomes for Employees Over the Last Two Decades](#)" (2023).