JSOU Quick Look

Stress: Understanding its Mechanisms and Impacts

Introduction

Stress is constant for Special Operations Forces (SOF). Although there is some evidence SOF are more resilient than the general population, even they can be impacted by stress. Stress can affect their physical and cognitive performance, team interactions, and well-being.[1]

Additionally, SOF professionals must recognize how stress affects individuals who are not members of a unit but whose behavior intrinsically impacts operations—e.g., a local asset, a rescued hostage, or a frightened witness. These individuals' encounters with SOF likely occur on the most stressful days of their lives, and they can't be expected to have the training and resources necessary to overcome the profound distress they're experiencing.

To date, most scholarship relating to military stress has focused on service members; it has neglected to consider the effect of stress on these other types of individuals. However, a few studies offer valuable insights in this direction.

For example, in studies of interrogations done during Survival, Evasion, Resistance, and Escape (SERE) school, students were less able to learn visual information, were slower to pay attention, and had worse working memories.[2] In a 2020 study, U.S. Army SERE students (many of whom were SOF) didn't trust the little they did remember, so they changed true statements to match the false information they were given. These researchers warned that common interrogation techniques, such as feeding someone a hypothesized version of events, may need to be adjusted in light of these findings.[3]

That same year, a study of U.S. soldiers in Afghanistan revealed that almost half of those surveyed reported witnessing a team member who panicked, dissociated, or was disoriented following a traumatic event. Of these, more than a third of these stressed teammates couldn't function and were a danger to themselves or their unit.[4]

From leaders engaged in strategic planning to operators and enablers downrange, SOF must be as proficient in perceiving how stress shapes others' actions as they are in recognizing how it affects their own behavior.

What is Stress?

Stress is *a physiological response to a perceived threat in the environment, and that physiological change impacts behavior*. The operative word in this definition is *perceived*. What might trigger paralyzing fear in one person may be dismissed as a trifling inconvenience by another.[5]

Further, many conflate the terms "stress" and "distress," but the terms are not synonyms. *Distress* is negative—sorrow, anxiety, or pain. *Stress* can involve negative emotions, but it can also produce positive responses (e.g., excitement).[6]

SOF should strive for a "Goldilocks" amount of stress.[7] Short-term moderate stress can enhance cognitive and physical performance, while too little stress can lead people to underperform. Too much stress can overwhelm. But the ideal amount of stress is different for each individual.[8] It's determined by genetics, life history, and more.[9]

What Are the Physiological Mechanisms of Stress?

When an individual does perceive a threat, their brain's amygdala and hypothalamus activate the adrenal glands to produce hormones. The sympathetic adrenal medullary (SAM) system activates, increasing production of epinephrine (a.k.a. adrenaline) and norepinephrine (a.k.a. noradrenaline). The hypothalamic-pituitary-adrenal axis may activate, producing cortisol.[10]

SAM activation leads to physiological changes such as increased cardiac output, increased glucose levels, increases in oxygen consumption, and increased testosterone, while cortisol catalyzes the freeing of glucose for energy and triggers short-term immune responses.[11]

Whether a stressor is physical or psychological, the metabolic reactions are essentially the same.[12] Psychological stressors can take more of a physiological toll than physical acts: In a 2018 study of Navy SERE interrogations, students' cortisol skyrocketed more than 525 percent, a greater increase than observed after flying military planes or skydiving.[13]

How Can Stress Affect SOF Performance?

Short-term moderate stress leads to increased responsiveness, alertness, and focused attention. That burst of epinephrine improves gross motor skills like running, punching, and kicking—but increases in heart rate and respiration can impede fine motor skills, coordination, and accuracy.[14] In a 2022 study of Norwegian special forces, snipers shooting in a prone position fired five rounds 15 seconds faster *after* they'd run 200 meters uphill in full kit than before they had run, and their probability of hitting the target was the same (92%). But the dispersion of their shots across the target increased by 194 percent, and their vertical range was larger.[15]

However, too much stress, or intense stress of a longer duration, hinders performance.[16] Whether a stressor is physiological, physical, environmental, or cognitive, it impacts cognition. Reasoning degrades. Decision-making becomes more driven by time pressure than methodical analysis. Stress harms working memory.[17]

During missions, SOF need to pursue their objectives, but they must also be able to adjust their plans based on the realities of a situation. In neurological terms, this describes a needed balance between *goal-directed behavior*—a "top-down" process led by the dorsolateral prefrontal cortex—and *stimulus-directed behavior*, which is "bottom-up," with the amygdala and hypothalamus taking charge.[18]

Under extreme stress, individuals can become more stimulus-driven and less goal-oriented. They cannot ignore irrelevant distractions or focus on a single—often threatening—stimulus (e.g., a gun) and tune out everything else.[19]

Field-of-vision narrows, sometimes resulting in tunnel vision. Stressed individuals scan the environment in a rapid, random fashion, with shorter gaze-fixation rates along the way. Situational awareness declines to the point that they may miss new threats or even the solutions to a problem. Stressed individuals may be subject to dissociation, auditory limitations, and altered perception of time.[20]

In one study, researchers gave U.S. Army Rangers a battery of psychological tests before and at the conclusion of a 53-hour training exercise that included a parachute drop, sustained physical activity, limited food rations, and little sleep. At the exercise's end, the exhausted and hungry Rangers made twice as many mistakes in motor learning and short-term memory, and their time to complete a cognitive task increased by 40 percent. They were less able to process verbal information and make logical deductions based on that information. Their reaction time to visual stimuli declined by 20 percent—a greater effect than if they had been legally drunk (an expected decrease of 6 percent).[21]

A 2021 experiment with U.S. conventional soldiers had similar findings. After two days of strenuous activity, restricted sleep, and limited food, vigilance response time rose by 6 percent while accuracy dropped 11 percent. Visual object learning, line orientation, and motor skills all declined, while risk-taking increased by 17 percent.[22]

How May Stress Affect Team Dynamics?

Teamwork itself is a stressor, as teammates exchange information, coordinate actions, and execute tasks—and the stakes are high as they don't want to fail each other.[23]

Stress is also a social contagion. People can "catch" someone's stress much like they can catch a virus from another person. While all the mechanisms of stress's social transmission aren't known, the phenomenon is partly due to *mirror neurons*. When an individual watches someone else act, their brain processes the event as if they themselves complete the action. Most people have a change in cortisol just by watching a stranger perform a mildly stressful task.[24]

At the same time, stress can weaken a team's performance.[25] Just as stress decreases visual perspective, it reduces one's ability to perceive situations from others' perspectives.[26] Stressed teammates communicate less, as they concentrate more on themselves and forget to check in on others. They don't relay information they assume others already have.[27]

What Are Some Differences between Acute Stress and Chronic Stress?

Acute stress occurs during a short experience or sequence of events, while *chronic stress* persists over time—weeks or months.[28] Chronic stress may arise out of a single stressor (e.g., financial strain) or the cumulative effect of many acute stressors.[29]

When faced with an acute stressor, the chronically stressed show less cognitive flexibility and more rigid decision-making.[30] Walking a tightrope of emotion, the chronically stressed experience more major life stressors and more daily hassles—and they rate small annoyances as more aggravating than someone who isn't chronically stressed. Their low-stress day is more tension-filled than another's high-stress day.[31]

What Are Some Examples of the Health Impacts of Chronic Distress?

Most people recover from an acute stressor within days, if not hours, and the physiological responses to that type of stressor are often beneficial. For instance, a stress-related boost of the immune system reduces the likelihood of an injury.[32]

By contrast, chronic distress can dysregulate cortisol production, resulting in either elevated levels—sometimes associated with chronic vigilance—or blunted cortisol, as if the stress circuitry has been blown. Lifelong chronic stress may lead to ulcers, hypertension, coronary artery calcification, obesity, musculoskeletal pain, lower bone density, depression, anxiety, and suicide ideation. Chronic distress disrupts immune functioning, leading to increased risk of disease. There is a dose–response relationship between stress and the risk of getting a cold—the more stress you have, the more likely you'll get sick.[33]

Furthermore, stress may indirectly impact well-being by triggering behaviors (e.g., alcohol abuse) that have serious health consequences.[34]

Conclusion

Just as the SOF truth acknowledges that "humans are more important than hardware," it should be equally accepted that SOF must recognize how stress and other psychological factors impact them. Understanding how people function is as essential to operational success as understanding how to use the equipment they bring on that operation.

As an example, appreciating stress's impact on fine motor skills may mean a team rethinks the gear it plans to carry downrange. Meanwhile, headquarters-based commanders may take steps to ensure that instructions are clearly understood. (Orders that make sense at the beginning of a mission may be too complex for a fatigued team at the mission's end.)

For too long, conversations have focused on the debilitating impact of chronic stress. But a closer examination of the science reveals that stress can both impede and facilitate SOF performance. A better understanding of stress should help SOF at the policy, strategic, and tactical levels.

Notes

[1]. Marc Vincent Jones et al., "A Systematic Review of Resilient Performance in Defence and Security Settings," *Plos One* 17, no. 10 (2022): e0273015, https://doi.org/10.1371/journal.pone.0273015. *See also* Andrew Flood and Richard J. Keegan, "Cognitive Resilience to Psychological Stress in Military Personnel," *Frontiers in Psychology* 13 (2022): 809003, https://doi.org/10.3389/fpsyg.2022.809003. The initial scientific research into stress was in large part catalyzed by concerns over the psychological impact of combat during WWII.

[2]. Oshin Vartanian et al., "Changes in Mood, Fatigue, Sleep, Cognitive Performance and Stress Hormones among Instructors Conducting Stressful Military Captivity Survival Training," *Physiology & Behavior* 194 (2018): 137–43 (*Canadian SOF instructors*); Tunde K. Szivak et al., "Adrenal Stress and Physical Performance during Military Survival Training," *Aerospace Medicine and Human Performance* 89, no. 2 (2018): 99–107 (*U.S. Sailors and Marines at U.S. Navy SERE*); Charles A. Morgan III et al. "Stress-Induced Deficits in Working Memory and Visuo-Constructive Abilities in Special Operations Soldiers," *Biological Psychiatry* 60, no. 7 (2006): 722–29 (*U.S. Navy and Marine Corp pilots and support staff*); Harris R. Lieberman et al., "Cognitive Function, Stress Hormones, Heart Rate and Nutritional Status During Simulated Captivity in Military Survival Training," *Physiology & Behavior* 165 (2016): 86–97 (*U.S. Army Special Forces students in SERE School*); Harris R. Lieberman et al., "The Catecholamine Neurotransmitter Precursor Tyrosine Increases Anger During Exposure to Severe Psychological Stress," *Psychopharmacology* 232, no. 5 (2015): 943–51 (*U.S. Army Special Forces in SERE School*); John Taverniers et al., "High-Intensity Stress Elicits Robust Cortisol Increases, and Impairs Working Memory and Visuo-Spatial Declarative Memory in Special Forces Candidates," *Stress* 13, no. 4 (2010): 324–34 (*Belgian SOF candidates*).

[3]. C. A. Morgan III, J. Dule, and Y. G. Rabinowitz, "The Impact of Interrogation Stress on Compliance and Suggestibility in U.S. Military Special Operations Personnel," *Ethics, Medicine, and Public Health* 14 (2020): 100499, https://doi.org/10.1016/j.jemep.2020.100499.

[4]. Amy B. Adler, Vlad Svetlitzky, and Ian A. Gutierrez, "Post-Traumatic Stress Disorder Risk and Witnessing Team Members in Acute Psychological Stress during Combat," *Bjpsych Open* 6, no. 5 (2020): E98, https://doi.org/10.1192/bjo.2020.81.

[5]. See Flood and Keegan, "Cognitive Resistance"; Laura Giessing et al., "Effects of Coping-Related Traits and Psychophysiological Stress Responses on Police Recruits' Shooting Behavior in Reality-Based Scenarios," *Frontiers in Psychology* 10 (2019): 1523; Christopher J. Kilby and Kerry A. Sherman, "Delineating the Relationship between Stress Mindset and Primary Appraisals," *Springerplus* 5, no. 1 (2016): 1–8.

[6]. Alison Wood Brooks, "Get Excited: Reappraising Pre-performance Anxiety as Excitement," *Journal of Experimental Psychology: General* 143, no. 3 (2014): 1144–58; Jeremy P. Jamieson et al., "Reappraising Stress Arousal Improves Affective, Neuroendocrine, and Academic Performance Outcomes in Community College Classrooms," *Journal of Experimental Psychology: General* 151, no. 1 (2022): 197–212; Alexandra D. Crosswell et al., "Improving the Language Specificity of Stress in Psychological and Population Health Science," *Psychosomatic Medicine* 84, no. 5 (2022): 643–44.

[7]. Anne I. Turner et al., "Psychological Stress Reactivity and Future Health and Disease Outcomes," *Psychoneuroendocrinology* 114 (2020): 104599, https://doi.org/10.1016/j.psyneuen.2020.104599; Gerald Matthews, Ryan W. Wohleber, and J. Lin, "Stress, Skilled Performance, and Expertise: Overload and Beyond," in *The Oxford Handbook of Expertise*, ed. Paul Ward et al., 490–524. Oxford: Oxford University Press, 2020.

[8]. Po Bronson and Ashley Merryman, *Top Dog: The Science of Winning and Losing* (New York: Twelve, 2013); Matthews, Wohleber, and Lin, "Stress," 490–524.

[9]. Meaghan E. Beckner et al., "Circulating Biomarkers Associated with Performance and Resilience during Military Operational Stress," *European Journal of Sport Science* 22, no. 1 (2022): 72–86; Marcus K. Taylor et al., "Genetic, Physiologic, and Behavioral Predictors of Cardiorespiratory Fitness in Specialized Military Men," *Military Medicine* 184, no. 9–10 (2019): e474–81.

[10]. Daryl B. O'Connor, Julian F. Thayer, and Kavita Vedhara, "Stress and Health: A Review of Psychobiological Processes," *Annual Review of Psychology* 72 (2021): 663–88. *See also* Laura Giessing et al., "Effects of Coping-Related Traits and Psychophysiological Stress Responses on Police Recruits' Shooting Behavior in Reality-Based Scenarios," *Frontiers in Psychology* 10 (2019): 1523, https://doi.org/10.3389/fpsyg.2019.01523.

[11]. O'Connor, Thayer, and Vedhara, "Stress and Health."

[12]. Claudio Nieto Jimenez et al., "Impact of Hypothermic Stress during Special Operations Training of Chilean Military Forces," *Military Medicine* 183, no. 7–8 (2018): e193–99. *See also* Bronson and Merryman, *Top Dog*, note 12. For example, cortisol increases due to environmental stressors such as prolonged cold water exposure and psychological stressors encountered during SERE interrogations.

[13]. Szivak et al., "Adrenal Stress" and Beckner et al., "Circulating Biomarkers."

[14]. Matthews, Wohleber, and Lin, "Stress." *See also* Kelly A. Hine et al., "Exploring Police Use of Force Decision-making Processes and Impairments Using a Naturalistic Decision-making Approach," *Criminal Justice and Behavior* 45, no. 11 (2018): 1782–801; G. S. Anderson et al., "The Impact of Acute Stress Physiology on Skilled Motor Performance," *Frontiers in Psychology* 10 (2019): 2501, https://doi.org/10.3389/fpsyg.2019.02501; Giessing et al., "Effects of Coping-Related Traits."

[15]. Jan Erik Buskerud, Frank Eirik Abrahamsen, and Paul André Solberg, "Physical Stress and Determinants of Shooting Performance Among Norwegian Special Forces Operators," *Frontiers in Psychology* 13 (2022), https://doi.org/10.3389/fpsyg.2022.894169.

[16]. Kristy Martin et al., "The Impact of Cognitive, Physical, and Psychological Stressors on Subsequent Cognitive Performance," *Human Factors* (2021): 00187208211065548, https://doi.org/10.1177/00187208211065548.

[17]. Martin et al., "The Impact of Stressors." *See also* Jamieson et al., "Reappraising Stress"; Flood and Keegan, "Cognitive Resistance"; Lieberman et al., "Cognitive Function"; John Taverniers, Marcus K. Taylor, and Tom Smeets, "Delayed Memory Effects after Intense Stress in Special Forces Candidates," *Stress* 16, no. 3 (2013): 311–20.

[18]. Samuel J. Vine, Lee J. Moore, and Mark R. Wilson, "An Integrative Framework of Stress, Attention, and Visuomotor Performance," *Frontiers in Psychology* 7 (2016): 1671, https://doi.org/10.3389/fpsyg.2016.01671; Taverniers et al., "Delayed Memory Effects," 311–20.
[19]. Vine, Moore, and Wilson, "An Integrative Framework."
[20]. Vine, Moore, and Wilson, "An Integrative Framework."
[21]. Harris R. Lieberman et al., "Severe Decrements in Cognition Function and Mood Induced by Sleep Loss, Heat, Dehydration, and Undernutrition during Simulated Combat," *Biological psychiatry* 57, no. 4 (2005): 422–29; Harris R. Lieberman et al., "Acute Effects of Battlefield-Like Stress on Cognitive and Endocrine Function of Officers from an Elite Army Unit," in *Human Dimensions in Military Operations—Military Leaders' Strategies for Addressing Stress and Psychological Support*, Meeting Proceedings RTO-MP-HFM-134, Paper 33, North Atlantic Treaty Organization, Research and Technology Organization, Neuilly-sur-Seine, France, 2006, https://apps.dtic.mil/sti/pdfs/ADA472706.pdf.
[22]. Meaghan E. Beckner et al., "Impact of Simulated Military Operational Stress on Executive Function Relative to Trait Resilience, Aerobic Fitness, and Neuroendocrine Biomarkers," *Physiology & Behavior* 236 (2021): 113413, https://doi.org/10.1016/j.physbeh.2021.113413.
[23]. Christopher Oveis et al., "Emotion Regulation Contagion," *Journal of Experimental Psychology: General* 149, no. 11 (2020): 2187–205.
[24]. Veronika Engert, Roman Linz, and Joshua A. Grant, "Embodied Stress: The Physiological Resonance of Psychosocial Stress," *Psychoneuroendocrinology* 105 (2019): 138–46.
[25]. R. Key Dismukes, Timothy E. Goldsmith, and Janeen A. Kochan, "Effects of Acute Stress on Aircrew Performance," (2015). (NASA/TM-2015-218930), Moffett Field, CA: National Aeronautics and Space Administration, https://human-factors.arc.nasa.gov/publications/NASA_TM_2015_218930-2.pdf.
[26]. Andrew R. Todd et al., "Anxious and Egocentric: How Specific Emotions Influence Perspective Taking," *Journal of Experimental Psychology: General* 144, no. 2 (2015): 374–91.
[27]. Dismukes, Goldsmith, and Kochan, "Effects of Acute Stress."
[28]. Firdaus S. Dhabhar, "The Short-Term Stress Response–Mother Nature's Mechanism for Enhancing Protection and Performance under Conditions of Threat, Challenge, and Opportunity," *Frontiers in Neuroendocrinology* 49 (2018): 175–92.
[29]. Johan Bertilsson et al., "Stress Levels Escalate When Repeatedly Performing Tasks Involving Threats," *Frontiers in Psychology* 10 (2019): 1562, https://doi.org/10.3389/fpsyg.2019.01562. In a study of police officers, researchers found that repeatedly doing the same stressful task triggered its own cumulative stress.
[30]. Katherine Knauft et al., "Perceived Chronic Stress Influences the Effect of Acute Stress on Cognitive Flexibility," *Scientific Reports* 11, no. 1 (2021): 1–14.
[31]. Elissa S. Epel et al., "More than a Feeling: A Unified View of Stress Measurement for Population Science," *Frontiers in Neuroendocrinology* 49 (2018): 146–69.
[32]. Dhabhar, "The Short-Term Stress Response"; Jeremy P. Jamieson, Wendy Berry Mendes, and Matthew K. Nock, "Improving Acute Stress Responses: The Power of Reappraisal," *Current Directions in Psychological Science* 22, no. 1 (2013): 51–56.
[33]. O'Connor, Thayer, and Vedhara, "Stress and Health"; Turner, "Psychological Stress."
[34]. O'Connor, Thayer, and Vedhara, "Stress and Health."

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