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## Feature Article

# Cognitive Appraisal and Stress Performance: The Threat/Challenge Matrix and Its Implications on Performance

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## A B S T R A C T

**Background:** Stress has the potential to improve performance through increased focus and strength or negatively impact performance through distraction and decreased fine motor control. The first step in the distinction between success or failure in a stressful situation is making the decision to engage in the process or withdraw. Cognitive appraisal describes the process of evaluating a stimulus as either a challenge to be met or an overwhelming obstacle from which to retreat.

**Objective:** Providers in the air medical community are required to perform in inherently stressful and unpredictable situations that may threaten to devastate personal resources. This paper is a literary meta-analysis of existing literature on stress performance, threat assessment, and cognitive appraisal in the medical environment.

**Findings:** Preparing for stressful situations is not only accomplished through the practice of skills and rehearsal of knowledge, but also cognitive readiness, mindfulness, and encouragement of team members. Positive cognitive appraisals is practiced through simulation, case study, and purposeful mental practice. Deciding to actively engage in problem solving through the lens of overcoming obstacles and meeting challenges with confidence provides the mental framework that recruits the inevitable sympathetic surge for benefit rather than impairment.

**Implication:** Cognitive appraisal describes the decision to focus on the challenge rather than threat of the situation based on the skills, knowledge, and experience of the team. Establishing a positive narrative and actively engaging in challenges increased confidence and improves performance of medical providers.

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Sometimes the first step in reaching a goal is the most difficult; however, even the longest journey must begin with the decision to start. In the helicopter emergency medical services industry, we are not provided the opportunity to choose our mission; rather, we respond to the call for assistance as long as it is safe to do so. This leads to an inevitable encounter with a situation for which we may not feel entirely prepared, whether it is an uncontrolled gastrointestinal bleed in need of airway management in the intensive care unit or a perimortem gravid mother who is entrapped in a vehicle on the side of the road. When we arrive at the patient's side, the act of deciding to engage in cognitive involvement and physical commitment is a significant first step. The decision to engage in a process rather than experience it passively is a significant initial stage for an appropriate response in a potentially stressful scenario.

## Experiential Blindness

Experiential blindness is the exposure to a stimulus that has not previously been practiced. The human mind is constantly seeking to connect current experiences with previous experiences, thereby producing accurate predictions of what is to come.<sup>1</sup> This is a normal occurrence in our everyday life, from conversations with friends to driving to work. The same cognitive process is used with patient care. The prefrontal cortex attempts to predict outcomes based on understood pathology, previous experience with interventions, and educational understandings.<sup>2</sup> Unfortunately, the dynamic nature of medicine prevents the accurate prediction of every clinical presentation or every mission. The mind attempts to identify the closest approximation of a situation in the absence of an exact match. The closest match can be drawn from the pool of virtually experienced patients as well as those for whom the clinician was present.

It is not unusual to find the off-going crew and oncoming crew gathered around the kitchen table at a base at shift change to discuss calls from the previous 12 hours. Sharing stories can provide valuable

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debrief time and can also create shared cognitive models of specific pathologies or scenarios. Memories bring to mind particular events, people, and emotions based on previous experiences. Hippocampal activation is generalizable to both lived and imagined experiences, using similar neural pathways with overlapping physiologic responses.<sup>3</sup> Engagement in the story being told not only helps the storyteller work through possible improvements but also provides a framework of experience for the listener to rely on the memory even though he or she was not physically present. The ability of the mind to recall specifics from our past and construct future possibilities reminds us that the most powerful simulation is freely available to each of us. Additionally, the recovery of seemingly innocuous memories shapes the anticipation of an outcome and impacts the likelihood of success.

Mental practice recruits neural pathways among and between the hippocampus, amygdala, and prefrontal cortex through Hebbian neural plasticity.<sup>4</sup> The more a task or process is rehearsed, the more concrete and predictable the performance becomes. Imagery created through our imagination is just as powerful as actual happenings.<sup>5</sup> In this way, mental practice and positive self-talk create a foundation upon which further education can be built and performance can improve. Sharing clinical stories that are unique provides the opportunity to learn, develop plans for other potential situations, and prepare for action in ways that yield action-oriented engagement and quicker responses. Virtually experiencing events in a nonthreatening environment creates a mental walk-through or preplan upon which clinicians can rely if they are ever in a similar situation. Being able to participate in a call, create treatment plans, and discuss outcomes inspires productive and confident action even if the only involvement was virtual.<sup>6</sup> It is imperative that this learning occurs in an honest and cooperative environment. The introduction of judgment and negativity distracts attention from end goals and focuses instead on the creation of defense and clarification of intent.

### Threat Matrix

Regardless of the stimulus causing stress, the emotional response is the same.<sup>7</sup> Humans have a predictable reaction to stress that is designed to provide assistance when needed in the form of increased attention, visual and auditory acuity, and increased strength. Unfortunately, stress can also be detrimental. When our perception of stress overwhelms our perceived ability to handle the circumstances, we retreat. It is not the stressor that is most important in managing fear but rather our perception.<sup>8</sup> Independent of the lessons learned, the environment must establish open communication, trust, and honesty in order to create the opportunity for growth.

The threat matrix describes our mental model of expectation related to our anticipated performance in the face of a challenge. A situation that requires an individual to recruit the entirety of their experience, knowledge, and skill elicits improved performance, whereas a situation that requires more than an individual has to offer is perceived as a threat.<sup>9</sup> Challenges improve performance and result in growth, whereas threats create fear, anxiety, and frustration. Our mental ability to frame a situation as either a challenge or a threat can determine our performance, significantly impacting the quality of care provided.

The distinction between knowledge and performance is the ability to apply what is known to what needs to be done. There has been increasing attention paid to performance under stress and methods of increasing efficiency in stressful environments, but the most important step is recognition of a situation as either worrisome or not. Cognitive appraisal is the first step in directing the inevitable release of catecholamines in preparation for demanding series of events.

If an individual anticipates a scenario to surpass his or her level of experience, knowledge, or skill, the stimulus is likely to be labeled stressful and result in the withdrawal of efforts.<sup>3</sup> Conversely, if a

situation is anticipated to be within the realm of possible performance, the individual will respond with increased attention, focus, and positivity. This cognitive appraisal is the part of the threat matrix that results in the label of either threat or challenge. A threat uses the sympathetic surge to prepare to remove the self from the situation or facilitate the removal of the stimulus as quickly as possible. A challenge results in increased performance, even when the demands are beyond what has been previously accomplished. Flow state is only achieved when the participant actively decides to engage in a challenging activity with full anticipation of success.<sup>10</sup>

### Mindfulness

Self-awareness facilitates the conscious decision to transition from threat to challenge, promoting positive mental imagery and upregulating coping mechanisms. Cognitive appraisal is the key to all education, including simulation. Creating an atmosphere in which those involved feel supported but challenged promotes cognitive engagement, encourages critical thinking, and facilitates the realization of flow state. Training the mind to attack a problem rather than retreat from it increases the likelihood of success.<sup>11</sup> The next time crews encounter a challenging patient, they will appraise the situation and engage. The decision point hinges on the ability to self-identify a stimulus and choose the path of engagement. The human body's natural response to stress includes increased heart rate, increased blood pressure, and decreased attention to multiple sources of informational input.<sup>6</sup> Physiologically, this is caused by increased levels of glucocorticoids and hormones, such as epinephrine, norepinephrine, and cortisol.<sup>12</sup> There are also changes in specific parts of the brain depending on the perception of stress levels and potential danger.<sup>4,13</sup>

### Adaptive Neuroplasticity

The untrained response to stress decreases the performance of high-intensity tasks but is adaptable based on training and attention.<sup>14,15</sup> Individuals are able to alter the body's response to stress, both emotionally and physiologically, with purposeful training or meditation,<sup>16</sup> purposeful exposure to controlled levels of stress,<sup>7</sup> and simulation.<sup>5</sup>

Adaptive neuroplasticity is the basis for changes in the perception of stress and resulting performance. Anticipation of success based on previous success is a lynchpin of cognitive neuropsychology.<sup>17</sup> General adaptive syndrome describes the physiologic response to stress and the subjective interpretation of stimuli.<sup>14</sup> Experience-driven, controlled exposures to stress can regulate stress and develop resilience as measured by hormone levels and biofeedback markers.<sup>7,18</sup> Furthermore, establishing successful narratives through training and case study creates a positive cognitive space for the appraisal of stimuli.

### Application

A key component of performance under stress is not the absence of stress but rather the recognition of its effects.<sup>15</sup> Purposeful mental training of engaged individuals and groups has proven to increase resilience, decrease fatigue, and protect against mental lapses, even in high-demand situations.<sup>14</sup> Resilience enables professionals to continue to work in stressful situations despite distractions and emotional distress.<sup>19</sup>

Training focuses on knowledge, skills, and attitude, facilitating a transition in the perception of stress from a threat to a challenge.<sup>20</sup> Training must be purposeful and controlled, not overwhelming the abilities of participants but eliciting stressful responses during which they are able to develop coping strategies. Training may take the form of online or in person via simulation, guided mental model, or actual human patient interaction.<sup>16</sup>

The application of cognitive appraisal comes in many forms in the air medical environment. Crews are able to share stories with one

another at shift change, creating spontaneous learning opportunities on an almost daily basis. Additionally, educators can use case studies as concrete and meaningful examples, design realistic simulations, and review performance of actual missions. The first step in establishing high performance in stressful environments is ensuring the cognitive engagement based on the initial assessment of the stimulus. Remembering previous situations, including those that were only discussed or considered and not actually experienced, promotes cognitive engagement and positive self-talk that establishes a healthy narrative leading to successful outcomes. Memories impact mind-set, and mind-set influences performance.<sup>13</sup> Participants must label their situation as a challenge, recruiting the potentially beneficial sympathetic activation and improving performance.

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