

Psychological Skills to Improve Emergency Care Providers' Performance Under Stress

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Stress experienced by emergency medical providers during the resuscitation of critically ill or injured patients can cause cognitive and technical performance to deteriorate. Psychological skills training offers a reasonable and easily implemented solution to this problem. In this article, a specific set of 4 performance-enhancing psychological skills is introduced: breathe, talk, see, and focus. These skills comprise breathing techniques, positive self-talk, visualization or mental practice, and implementing a focus “trigger word.” The evidence supporting these concepts in various domains is reviewed and specific methods for adapting them to the environment of resuscitation and emergency medicine are provided. [Ann Emerg Med. 2017;■:1-7.]

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INTRODUCTION

Psychological skills training is the systematic acquisition and practice of different psychological techniques to improve cognitive and technical performance.¹

Occupations including the performing arts, military, athletics, and astronautics have benefited from various forms of psychological skills training.²⁻⁴

This article describes 4 distinct, evidence-based performance-enhancing psychological skills (PEPS): breathe, talk, see, and focus.⁵ These 4 skills can be used as a form of psychological skills training adapted to emergency medicine. In this article, the individual components of PEPS will be discussed and the evidence to support their effectiveness will be reviewed.

STRESS, AROUSAL, AND PERFORMANCE IN EMERGENCY MEDICINE

Emergency care providers' jobs are stressful.⁶ A variety of factors—including unpredictable patient volume and acuity, circadian rhythm disruptions, and lack of previous relationship with the patient—contributes to this stress. Management of critically ill or injured patients demonstrates characteristics of “crisis” situations: circumstances rife with uncertainty, potential threat to life, necessity to take immediate action, and at least partial inability to control aspects of the situation.⁷ These are high-stress events with critical stakes; optimal performance in these situations is essential.

Two salient features in contemporary theories of stress apply to emergency medicine. First is the appraisal

mechanism: the idea that how one approaches a situation determines the thoughts, behaviors, and physical reactions that constitute the emotional response.⁸ In the words of Whitelock and Asken,⁹ stress is a result of “a perceived imbalance between the demands of the emergency situation and your ability to meet those demands where failure to do so has important consequences to you.” Second is the concept of compensation.¹⁰ Individuals apply various conscious and unconscious modalities to compensate for perceived inability to meet situational demands. The degree to which this compensation occurs, in turn, determines the nature and magnitude of one's stress response. In emergency medicine, then, the level of stress depends on the combination of how providers perceive their ability to control an emergency and their preexisting compensation mechanisms.

Excess stress is detrimental to task-performance cognitive faculties.¹¹⁻²⁰ “Time pressure” or “time urgency,” or the limited time available to think through different actions or potential outcomes, results in a decrease in quality and effectiveness of decisions.^{21,22} Other aspects of emergency medical practice such as uncertainty, vagueness, or incompleteness of information increase stress and limit the capacity of decisionmakers.²³ Other cognitive problems as a result of stress include a decrease in the number of pieces of information a person can process and short-term memory deficits.^{24,25} Although the research exploring the effects of acute stress on performance in the ED setting is limited,²⁶ the data we have demonstrate that performance suffers in acutely stressful conditions.^{27,28}

APPLICATIONS OF PSYCHOLOGICAL SKILLS TO MITIGATE STRESS AND IMPROVE RESUSCITATION PERFORMANCE

Recent studies show that certain psychological interventions, such as training in mindfulness (being aware of one's feelings, thoughts, and sensations in the moment) and meditation, can help individuals cope with stress and anxiety in different circumstances.²⁹⁻³³ PEPS is distinct from these concepts because it encompasses a variety of techniques for regulating arousal and improving performance just before or in moments of high stress. It has its foundation in other evidence-based psychological skills used to train elite performers in high-stakes occupations, many of which have similarities to emergency medicine.²⁻⁴

PEPS are specifically designed to empower people to actively address their emotional state and take steps to mitigate their stress response in real time. Controlling and managing responses to acutely stressful medical emergencies may allow providers to maintain situational awareness, think clearly, recall important information quickly, act decisively, and perform skills efficiently.

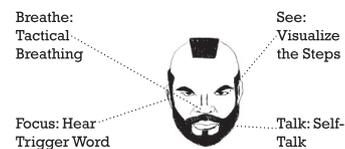
Successful performance is not solely contingent on the application of these psychological skills. In emergency medicine, therefore, extensive preparation, study, repetition of skills, and practice of the entire spectrum of emergency medicine procedures in part and whole are requisite. The application of PEPS is not designed as a replacement for traditional clinical training, but rather as a supplement to it. Just as we train on how to place a chest tube during trauma in discussion and then simulation so also PEPS can be incorporated into preparatory training and then actually used in high-fidelity simulation. The discussion and specifics of how to incorporate these psychological skills into existing emergency medicine training programs are beyond the scope of this introductory article.

The emergency medicine model for PEPS that the authors propose is represented by the initialism BTSF. It consists of 4 elements and can be remembered with the mnemonic "Beat the stress, fool" or a picture of the human face (Figure 1). The whimsical nature of these 2 mnemonics was intentional. If the mnemonics are capable of eliciting a smile, that facial expression alone may reduce stress.³⁴ These 4 PEPS were chosen because of their ease of use, the efficacy demonstrated in medicine or comparable high-stress fields, and their rapidity in actual situations.

BREATHE: USING PERFORMANCE-ENHANCING BREATHING

The first element, *breathe*, is the ability of providers to learn to control and focus their attention on their breathing. Stress often causes an immediate spike in

Beat the Stress Fool!



B - Breathe
T - Talk (Self)
S - See (Mental Rehearsal)
F - Focus with Trigger Word

Figure 1. Two representations of the "Beat the stress, fool" mnemonic, auditory and visual, for recall of the PEPS. The whimsical nature of the mnemonic may induce smiling, which helps to break the stress escalation cycle.

physiologic arousal; the application of breathing techniques offers a quick and effective means through which to decrease that response. Different breathing techniques have been used and developed during thousands of years to improve performance in various martial arts, meditative practices, and yoga.³⁵

Respiration is the only autonomic function that can be controlled and modified consciously. It can therefore be engaged as a means to control the effects of one's emotional response. There is a close, bidirectional relationship between respiration and emotional state.^{36,37} Using a slow, deep, controlled respiratory effort results in a reduction in pulse rate, an important physiologic marker of stress.³⁸ Arch and Craske³⁹ found that controlled breathing increased the emotional regulatory capability of young, healthy individuals. Seppälä et al⁴⁰ recently conducted a randomized controlled trial and demonstrated that breathing techniques can be used to decrease stress response, anxiety, and hyperarousal in combat veterans with posttraumatic stress disorder. Although these studies do not directly examine crisis-situation arousal, they bolster anecdotal and published experience in high-stress situations.²¹

Breathing techniques have been an important tool used by performance psychologists to help elite athletes improve their performance.^{41,42} In the setting of sports performance, these techniques have been used to reduce anxiety and control arousal.⁵ Usually, psychologists recommend deep breathing used during a break in play action; for example, before serving a tennis ball, just before a penalty kick in soccer, or while getting ready for a free throw in basketball.⁵ Similarly, conscious breathing techniques may be most effective just before procedures and during transition points in a resuscitation.

In emergency medicine, one method that can be used to control the respiratory cycle is the 4-second method of "tactical breathing," also known as *square* or *box*

breathing.^{9,17,18} The technique involves breathing in deeply for 4 seconds, engaging the diaphragm, and attempting to pull the breath down into the abdomen. Then the breath is held for 4 seconds and exhaled slowly during 4 seconds, after which the lungs are kept empty for 4 seconds (Figure 2). Precise timing is not essential; the intent is to slow down respiratory rate and force deep breathing. This specific method is used by psychologists to help military and law enforcement personnel manage their response during acutely stressful incidents.⁴³

In the middle of a busy shift, the charge nurse notifies you that emergency medical services (EMS) is 4 minutes out with a 35-year-old with a stab wound to the chest and that the patient just lost his pulses. You experience an immediate knot in your stomach and you can feel your heart pounding. You have not performed a thoracotomy in more than 10 years, and that time was merely assisting the trauma surgeons during residency. The nearest surgeon is 15 minutes away at home. You realize that the thoracotomy has to happen and your stress response will keep you from optimal performance. You imagine a Mohawked '80s TV character telling you to "Beat the stress, fool!" You can't help but smile. You begin slow, controlled breathing, imagining a square; you can no longer feel your heart pounding.

TALK: POSITIVE SELF-TALK

Positive self-talk consists of an internal monologue with specific content and structure of statements.⁴⁴ Self-talk plays a vital role in how individuals react to different situations, leading some psychologists to refer to it as "the key to cognitive control."^{15,45}

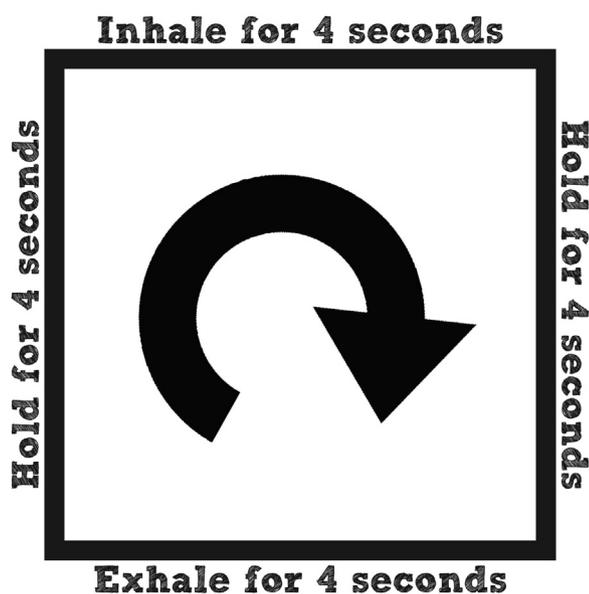


Figure 2. Method for tactical breathing, otherwise known as square or box breathing. Precise timing is not as essential as slow, deep inhalations and exhalations.

Elite athletes use self-talk to improve their performance. Training athletes to be able to feed themselves positive suggestions as part of an internal monologue is an important aspect of sports psychology.^{41,42} Research suggests self-talk can improve an individual's perception that he or she can successfully perform a task, otherwise known as self-efficacy.⁴⁶⁻⁴⁸

Psychologists have found that there are different kinds of positive self-talk. These include instructional, motivational, mood-related, and self-affirmative. Instructional self-talk, for example, may be statement like "Maintain a tight grip" or "Keep your knees bent." Motivational self-talk might consist of declarations as general as "I can do this." Some authors suggest that these different types can affect different aspects of performance to different degrees; for example, instructional self-talk may improve fine motor technical skills slightly more than gross motor function. However, all agree that positive self-talk's effects on performance are beneficial.^{46,49-51}

Guidelines have been developed on how to develop effective self-talk⁵²:

1. Keep phrases short and specific.
2. Use first person and present tense.
3. The phrases should be positive as opposed to negative.
4. When you recite a phrase to yourself, say it with intention.
5. Speak kindly to yourself.
6. Repeat phrases often.

Specific statements may be motivational. For example, "This person needs my help to survive and I can do it" or "I know I can do this; I have done it before." Alternatively, the self-talk could be instructional, such as "Focus on the needle angle going into the skin" or "Advance over the rib into the pleural cavity." Another good example is the mantra suggested by Levitan⁵³ when one is trying to provide effective oxygenation to a patient: "Sit them up, jaw forward, oxygen through the nose." Statements of this nature may bolster confidence and create a positive attitude during a stressful emergency.⁴⁵

You have the charge nurse call in your surgical colleague and then begin an internal dialogue. "This is an easy procedure. I have been trained to do this. I can get it done. The patient needs me to get it done. And I will do it. If I go slowly, this will be easy."

SEE: USE VISUALIZATION EXERCISES, IMAGERY, AND MENTAL PRACTICE

The third element, *see*, is the ability of providers to visualize the steps of a procedure or clinical skill they are preparing to perform. This process acts as a blueprint or

mental video of what an effective performance should look like. Visualizing a procedure, task, or scenario can serve as a practice run in the provider's mind before he or she actually performs the procedure. Rehearsing in one's mind activates the same neurologic network needed to successfully perform a task.⁵⁴

The idea of "imagery practice" was introduced in 1969.⁵⁵ This technique was defined as the "symbolic rehearsal of a motor skill in the absence of any gross muscular movement." It has been well described in the sports psychology literature and has become an important part of training elite athletes.^{56,57} It has been used successfully to achieve various performance goals, including improved concentration, enhanced motivation, strengthened confidence, better-controlled emotional responses, and overall preparation for performance.^{5,58}

The use of imagery to perform skills during critical law enforcement encounters was initially described in 1986. The technique was referred to as "crisis rehearsal." In *The Tactical Edge*, the author delineates the necessity of deliberate mental rehearsal for conflict.⁵⁹ In very stressful, potentially life-threatening situations that are not encountered with great frequency, visualizing your response to the situation can help enhance your ability to act. This was referred to as using one's "mental movie" to improve performance: "practicing of proper tactics, physical movements and firearms skills 'programs' your nerves and muscles to respond automatically...and lessens your susceptibility to stress inference."⁵⁹

The evidence supporting use of visualization and mental practice in medicine is increasing. As early as 2002, mental practice was being used to improve the acquisition of certain medical skills, such as surgical techniques.⁶⁰ In 2011, the first randomized controlled trial was conducted in regard to the use of mental practice. Although it was a relatively small, single-center investigation, the results demonstrated that practicing with structured mental imagery significantly improved the performance of virtual reality laparoscopic cholecystectomy.⁶¹ In terms of emergency medicine, mental imagery and visualization exercises may also be particularly helpful in situations that require a structured algorithm or sequenced skills, such as Advanced Cardiac Life Support (ACLS).⁶

Most recently, attempts to apply psychological skills training to the world of trauma resuscitation have shown substantial promise. In 2016, Lorello et al⁶² demonstrated that mental practice could be used to improve the performance of team-based skills in trauma resuscitation. They conducted a prospective, single-blinded, simulation-based study that randomly assigned anesthesia, emergency medicine, and surgery postgraduate trainees into teams of

2. Half of the teams were designated as controls (n=38). The control group received 20 minutes of face-to-face teaching on trauma algorithms and nontechnical aspects of teamwork in trauma care. The other half of the 2-person teams (n=40) spent 20 minutes conducting mental practice and rehearsing important aspects of teamwork and trauma management in their minds. Both groups were then evaluated on their performance in a trauma scenario and evaluated with the Mayo High Performance Teamwork Scale, a validated rating scale for teamwork skills. Their results demonstrated that the groups that executed the psychological skills of mental practice and rehearsal before the scenario performed significantly better than the teams that did not.

Research in medicine and other fields has defined important aspects of effective mental imagery.⁶³⁻⁶⁵ Imagery is most effective when specific, vivid details are incorporated. In the case of a technical procedure, the visualization exercise should include simulating the actual movements and steps involved in executing the task to further imprint on one's mind how to ideally respond in that scenario. The important, evidence-based elements for effective imagery can be summarized with the acronym PETTLEP⁶⁶:

- the physical nature of a task
- the specifics of the environment the task will be performed in
- the type of task
- the timing of individual steps or movements
- learning the content of the movement
- the emotion of task completion
- the perspective of the person

You picture each portion of the thoracotomy procedure. You start with the first skin incision and move to delivering the heart, looking for the expected hole and placing your finger on it. You then imagine the steps that must occur during the resuscitation while you are performing the procedure. You tell the charge nurse the equipment you will need and the assistance required from the rest of the team.

FOCUS: DEVELOP AND USE A "TRIGGER WORD"

Focus is the fourth element. In this step, the provider should use a trigger word before starting a procedure or resuscitation. The trigger word can be any one the provider chooses that brings his or her full attention to the task at hand. It can be subvocalized, whispered, or simply spoken aloud. The word acts as a cognitive signal flare, prompting the provider to shift his or her attention to a single, prioritized task. The key purpose of the trigger word or phrase is to activate the provider's selective attention and allow him or her to focus on the relevant environmental

cues necessary to complete the task at hand. A trigger can also be used to help the provider refocus after a period of intense narrow focus in a high-stress scenario. Using a cue word can be beneficial in helping reestablish situational awareness and protecting against fixation.

Understanding the concept of attention is central to why using a trigger word is important. Perhaps the most all-encompassing definition is “the concentration of mental effort on sensory or mental events.”⁶⁷ In an attempt to develop and better explain the concept of selective attention, the metaphor of a cognitive “spotlight” has been used. Selective attention is like a mental light that illuminates a certain part of the visual field. Information lying outside of this spotlight is deprioritized or ignored.⁶⁸ Using a trigger word focuses that light on important information to be analyzed or a critical task to be performed.

There are certain limitations to one's attention. First, like the finite diameter of a spotlight, attention is limited. Human beings can pay attention to only limited amounts of stimuli; in fact, they can truly apply a conscious thought process to only one item at a time.⁶⁹ Human beings do not analyze and process things in a parallel manner. Only automated, essentially unconscious tasks can be performed simultaneously with a single conscious process.⁷⁰ This also helps to explain why visualization and mental rehearsal, which can develop automatic responses, are so important in task completion under stress. Second, evidence suggests that novel or stressful stimuli can initiate a process of negative introspection and self-focus.^{8,71} This distraction and inadvertent internal focus causes performance to deteriorate.^{72,73}

The ability to hone one's attention and focus on important clinical tasks during emergencies is crucial. Maintaining awareness and paying attention to key cues from the environment has been explored in many fields.⁷⁴ In acute care, Gaba et al⁷⁵ and Howard and Gaba⁷⁶ explored the importance of vigilance and attention, as well as developed training methods to improve these abilities in anesthesia.

There is evidence that selective attention can be activated and concentration can be improved through use of a “cue word.”⁵ The word can be a motivational or instructional statement and encourages addressing the task at hand.^{77,78} Although this technique has not specifically been studied in medicine, the similarities between other high-stress fields in which it has been studied and resuscitation should allow a transfer of evidentiary backing.

In resuscitation, the trigger word would be instructional and provide a conscious reminder to “focus” or “concentrate” on the task at hand rather than on the situational stakes or one's own performance.

EMS arrives and the situation is just as they stated on the radio call. Your team is prepared; respiratory therapy starts the intubation and nursing is preparing to administer blood products. You pick up the number 10 blade from the thoracotomy tray. Just before you lay knife to skin, you take a deep breath and say the word smooth to yourself. The word has the same effect now as it has had in your previous mental simulations. You focus on slow, controlled performance of the thoracotomy procedure.

CONCLUSION

Emergency medicine providers are tasked with performing highly complex skills and assessments under dynamic conditions in which every second matters and the cost of failure is significant. Performing effectively amid these pressures, demands, and expectations involves more than clinical knowledge and skill. The internal state of the provider is also critical. There is a wealth of evidence in the medical literature and from research conducted in other high-pressure-performance settings that demonstrates how important human factors are in performance. Furthermore, researchers in the fields of peak human performance and neuroscience have observed strong correlations between one's performance state and the likeliness of performing optimally under duress.

Acutely stressful situations can cause heightened arousal, which by extension can impair vital cognitive functions such as situational awareness, decisionmaking, problem solving, and memory recall. All of these can contribute to increased medical error and poor outcomes. Learning how to prepare and respond more effectively in advance of potentially stressful situations, and how to refocus one's attention within those moments, would be of tremendous value.

The application of PEPS offers great potential in this regard. The skills are designed specifically to mitigate stress effects and help optimize psychological readiness and performance. Performing under pressure and responding to acute stressors will always be a challenge for emergency medicine providers. Evidence suggests, however, that there is more that can be done to equip providers to effectively deal with challenging medical emergencies. Training in PEPS helps people learn how to respond to acute stressors and, as a result, aids in accessing and translating all their knowledge and experience into performing in the moment. Rigorous research on the efficacy of PEPS training in emergency medicine is needed.

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