

# Measuring resilience, performance anxiety and burnout in emergency medicine residents

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## Abstract

**Background:** Medical providers' ability to perform in acute care situations is dependent on a functional mix of background knowledge, procedural skills, and the mental ability to navigate complex matrices of diagnostic challenges. Medical training traditionally measures background knowledge and procedural skills, while the mental skills needed to implement these tools have been sparsely studied. The goal of this single center study is to assess aspects of mental performance including resilience, performance anxiety and burnout in emergency medicine (EM) residents. **Methods:** We conducted a single-site survey study of EM residents to assess resilience, performance anxiety, and burnout. We used three previously validated scores: Connor Davidson Resilience Scale (CDRISC10), Revised Competitive State Anxiety Inventory-2 (CSAI-2), and the two-question Maslach Burnout Inventory (2QMBI). Higher CDRISC10 scores are associated with greater resilience. The CASI-2 quantifies cognitive anxiety, somatic anxiety, and self-

confidence with a higher composite score indicating greater anxiety. A higher 2QMBI score is associated with greater burnout. Invitations to the survey were sent via RedCap. **Results:** Response rate was 36%. Mean CDRISC10 score was  $28 \pm 5$ , CSAI-2 was  $32 \pm 9$ , and 2QMBI was  $5.7 \pm 3$ . There was a negative correlation between CDRISC10 and CSAI-2 ( $r = -0.65$ ,  $p < 0.001$ ), and between CDRISC10 and 2QMBI ( $r = -0.538$ ,  $p < 0.001$ ). **Conclusion:** The study demonstrated a negative correlation between resilience and performance anxiety, and a negative correlation between resilience and burnout in a cohort of emergency medicine residents. This study adds to the existing literature that supports integrating resilience training into medical residency training to both improve resilience and reduce performance anxiety and burnout in residents.

**Key Words:** Physician mental performance, physician resilience, physician performance anxiety, physician burnout

**Date submitted:** 31-March-2025

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## Background

Medical providers' ability to perform in acute care situations is dependent on a functional mix of background knowledge, procedural skills, and the mental ability to navigate complex matrices of diagnostic challenges. During residency medical training the focus has historically been on teaching technical skills and medical knowledge. For emergency medicine (EM) residents, the ability to apply these skills and knowledge to patient care may be affected by their mental performance skills.

Core mental performance skills in athletic realms have been defined as the following: fundamental skills (motivation, confidence, resilience),

Citation: Daniels L, Roosevelt G, Chadwick D, and Tomberg S. Measuring resilience, performance anxiety and burnout in emergency medicine residents. *Educ Health* 2025;38:210-217

**Online access:** [www.educationforhealthjournal.org](http://www.educationforhealthjournal.org)

DOI: 10.62694/efh.2025.310

Published by The Network: Towards Unity for Health

interpersonal skills (relationships, leadership, teamwork, communication), self-regulation skills (self-awareness, stress management, emotional regulation, attention control).<sup>1</sup> The authors' experience within athletic realms has led them to hypothesize that teaching the mental performance skills coached in sporting endeavors can also make an impact on these key elements of physician well-being.

Emergency medicine (EM) is a fast-paced, high-stress medical specialty, and physicians are not immune to workplace pressures. It has been shown that depression, burnout, and stress are prevalent among physicians in the Emergency Department,

leading to lower job satisfaction, worse quality of life, and thoughts of leaving the specialty entirely.<sup>2</sup> The rate of burnout in EM physicians has been reported to be 60%, one in eight EM physicians screen positive for depression, and female physicians have a higher rate of suicide than the general population (relative risk 1.88).<sup>3,4</sup> Previous studies have demonstrated physiologic markers of stress (e.g. elevated cortisol levels) and increased stress, measured by surveys, in physicians during trauma resuscitations (both attending and resident surgeons) and during intubations (postgraduate year 1 (PGY1) EM residents).<sup>5,6,7,8, 9,10,11,12,13</sup> Martens et al. explained that pre-performance somatic anxiety is thought to have an inverted U-shaped relationship to performance (initially increasing performance to a tipping point, after which performance declines), while cognitive anxiety has a negative linear relationship to performance, and self-confidence has a positive linear relationship to performance.<sup>14</sup> While not formally studied, the authors believe that these measures of pre-performance mental states will have a similar impact on the performance of physicians working in an acute care setting. There are a variety of measures of mental and physiological stress. These include: validated questionnaires (e.g. Competitive State Anxiety Inventory, the NASA Task Load Index, the Connor-Davidson Resilience Scales); heart rate variation (HRV); videos of facial muscle response to stress; measurement of nasal perspiration; and measurements of DHEA/Cortisol.<sup>8,10,15,16,17,18</sup> Validated questionnaires are considered reliable measures, can be done in a variety of professional settings, have low technical/financial barriers, and have been used in a multitude of studies examining mental performance.

The goal of this study was to measure resilience, performance anxiety and burnout in residents in a four-year EM residency. Our hypothesis was that measures of resilience would be inversely related to measures of both performance anxiety and burnout. In addition, we compared resilience in EM residents to the general US population.

## Methods

### *Study Population*

We conducted a single-site survey of EM residents in a four-year training program, with 17 residents in each year of training, to assess resilience, anxiety, and burnout. The participants included residents across all years of residency training.

### *Study Design*

The survey measured resilience, performance anxiety, and burnout using three previously validated scores: Connor Davidson Resilience Scale (CDRISC10),<sup>19</sup> Revised Competitive State Anxiety Inventory-2 (CSAI-2),<sup>20</sup> and the two-question Maslach Burnout Inventory (2QMBI).<sup>21</sup> CDRISC10 uses a Likert scale from 0–4, with a higher score indicating greater resilience. Versions of the CDRISC have been widely used to study resiliency both in medical settings and in multiple other professions. The CSAI-2 explores three components of anxiety: cognitive anxiety, somatic anxiety, and self-confidence. Each of these components is scored individually, and a composite CSAI-2 score is calculated by adding cognitive anxiety, somatic anxiety, and an inverted self-confidence score, with a higher score indicating greater anxiety. The 2QMBI uses a Likert scale from 1–6 with a higher score representing a higher level of burnout. The 2QMBI has been found to correlate well with the full Maslach Burnout Inventory, which is the most widely used survey to monitor burnout. To focus the survey into a shorter inventory, which has been shown to increase participation and focus of the target group,<sup>22</sup> we chose to use the abbreviated and validated shorter survey tools when they were available.

Invitations to the RedCap (Vanderbilt, Nashville, TN) survey were sent out by automated email. If there was no response, two more reminder emails were sent out. To incentivize participation in the survey, each survey respondent was enrolled in a draw for a restaurant gift certificate. The study was granted exempt status by the Colorado Multiple Institutional Review Board.

### *Outcome Measures*

Our primary outcome measure was the correlation between CDRISC10 and 2QMBI. Our secondary outcome measure was the correlation between CDRISC10 and CSAI-2.

### *Statistical Analysis*

Means and standard deviations (sd) for continuous variables were presented as their distributions were normal. ANOVA was used to compare CDRISC10, CSAI-2, and 2QMBI between years with Tukey HSD for post-hoc analysis. Pearson correlation coefficients were calculated to describe the relationship between scores. Sample size calculations were performed using a power of 0.8 and  $\alpha$  of 0.05. We estimated that resilience and burnout would be moderately inversely correlated with a  $r = -0.5$ . Therefore, we would need to enroll

29 residents to detect this correlation. All analyses were performed using IBM SPSS Statistics, Version 28.0 (Armonk, New York, USA).

**Results**

Survey invitations were sent out to 68 residents and 36 (53%) completed the survey. Demographics and year of training are presented in Table 1. Mean CDRISC10 score was 28±5, CSAI-2 was 32±9, and 2QMBI was 5.7±3. Mean components for the CSAI-2 were 11±4 for somatic anxiety, 13±3 for cognitive anxiety and 13±3 for self-confidence.

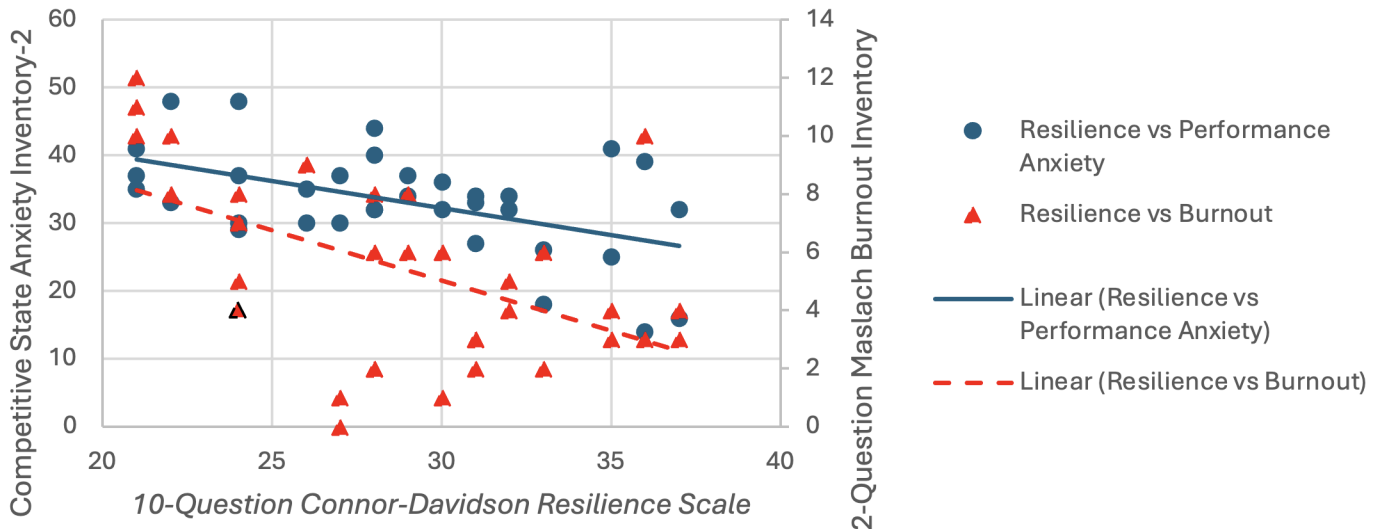
The CDRISC10 did not differ across years of training (p=0.22). CSAI-2 scores decreased from

PGY1 (36±8) to PGY4 (22±6, p=0.003), and decreased from PGY2 (36±10) to PGY4 (22±6, p=0.017). The 2QMBI were significantly higher in PGY3 (8±3) compared to PGY1 (4±3, p=0.005). The 2QMBI score trended downward in the PGY4 residents, although not significantly lower than PGY3 (5±3, p=0.08)

There was a negative correlation between CDRISC10 and CSAI-2 (r= -0.65, p<0.001), and there was a negative correlation between CDRISC10 and 2QMBI (r= -0.538, p<0.001) (Figure I). There was no correlation between CSAI-2 and 2QMBI (p=0.10).

**Discussion**

**Figure 1: Resilience vs Performance Anxiety and Burnout**



**Table 1: Demographics and Year in Training**

<b>Variable</b>	<b>n =36</b>
<b>Mean Age in Years (sd)</b>	<b>31 (2.2)</b>
<b>Female Gender (%)</b>	<b>22 (61)</b>
<b>Year of Training</b>	
PGY*1 (%)	<b>13 (36)</b>
PGY*2 (%)	<b>6 (17)</b>
PGY*3 (%)	<b>10 (28)</b>
PGY*4 (%)	<b>7 (19)</b>

**\*Postgraduate Year**

We found an inverse relationship between EM residents’ resilience and performance anxiety, and an inverse relationship between resilience and burnout. Our mean CDRISC10 of 28 (measure of self-scored resilience with a maximum value of 40) was in the fourth quartile and lower than the mean of the general population (32), and neuro-critical

care providers (31).<sup>23</sup> While we used the validated shorter CDRISC10, other studies of healthcare providers have used the longer CDRISC25 survey (general population mean 81 and maximum score of 100).<sup>24</sup> Values for the CDRISC25 ranged from 73 for surgery residents, 74 for internal medicine residents, 75 for orthopedic physicians to 76 for

operating room nurses.<sup>22,25,26</sup> Similar to our EM residents, surgery residents were in the fourth quartile compared to the general population, and the other healthcare providers ranked in the third quartile.

In these studies, medical professionals in acute care settings demonstrated lower levels of resilience compared to the general population. In contrast, Navy SEAL school students had a mean CDRISC25 of 83, which falls in the second quartile.<sup>27</sup> The lower levels of resilience seen in our EM residents may suggest that residents would benefit from focused mental skills training to improve resilience during high-stress/high-risk situations and through the longitudinal challenges of medical residency training.

In our study there was a negative correlation between resilience and performance anxiety. Performance anxiety was measured using the CSAI-2, which has been used in multiple studies of high-level athletes. We chose this measure because EM physicians frequently manage disease processes in a time-constrained manner that mirrors the strain placed on athletes around the time of competition. CSAI-2 scores were significantly lower in our senior residents compared to junior residents. While this may be a natural progression of residency training, it may be a representation of focused training on how to manage performance anxiety. We believe that a future study can explore how attending physicians currently focus on teaching skills to improve performance anxiety (utilization of visualization, structuring resuscitations, addressing team dynamics, and breathing techniques). Our EM residents had average somatic anxiety scores of 11, cognitive anxiety scores of 13, and self-confidence scores of 13. Overall comparison to athletes in other contexts is challenging because of the significant variability in CSAI-2 scores between different sports, competitors with different skill levels, different ages, and from distinct cultures. Studies that use the CSAI-2 in Olympic-level BMX racers, high level European volleyball athletes, Spanish basketball and handball athletes, and Korean basketball athletes had a wide range of scores. The mean cognitive anxiety ranged from 8.3-24.8, somatic anxiety ranged from 11.0–20.2 and self-confidence 15.1–27.7.<sup>10,28,29,30,31</sup> CSAI-2 score variability may limit the comparison between the sports context and the acute care medical setting. This does not limit the utility of the CSAI-2 in comparing its measures between groups in this

resident cohort, or between providers in various medical settings.

The negative correlation between burnout and resilience could suggest that resilience may provide a buffer to burnout. In a study of internal medicine residents by Bird et al.,<sup>2</sup> there was a trend towards residents with higher resilience having less burnout ( $p < 0.08$ ).<sup>25</sup> In contrast, a study across multiple resident specialties at the University of Georgia found no relation between resilience and burnout.<sup>32</sup> Given the possibility of a relationship, we recommend further exploration of whether greater resilience is associated with lower physician burnout.

Finally, there was a peak in burnout levels in the PGY-3 residents in the study. When compared to PGY1 residents, who had the lowest level of burnout in this study, the PGY-3 residents reported significantly more burnout. This is the year when residents tend to have the highest burden of direct patient care responsibilities. This is similar to findings from the 2022 American Medical Association survey of residents across the nation and across specialties that found burnout rates climbed 10% between PGY1 and PGY2 residents. The authors of the study equated the changes in burnout to increasing resident responsibility.<sup>33</sup> The PGY4 residents in our study are in the last year of residency, and they reported less burnout than the PGY3 residents, although this was not a significant difference. This trend downwards could be a result of decreased direct patient care responsibilities, as well as job security, as many residents find post-residency jobs during the first half of their final year.

There is a substantial base of research that demonstrates a high level of burnout, suicidal thoughts and attrition in emergency physicians.<sup>3,34,35</sup> There is also a nascent group of researchers who are exploring if teaching resiliency early in training can have an impact on burnout, anxiety, and resiliency during graduate and residency training, and into the subsequent phases of emergency medicine careers. Berger and Waidyaratne-Wijerante define resiliency as the ability, “To thrive in the face of adversity, rather than to merely survive.” They proposed the following steps to build resiliency within medical residency training: engage and reflect on components of the challenge, recognize opportunities for change and recovery, seek help when appropriate, improve skills, and reintegrate into work after reflection and skill building.<sup>36</sup> Other

studies have demonstrated that resiliency training is valuable to the participants, fits practically within residency training schedules, can provide skills that are durable for at least a year after the training, and can both improve resilience and decrease depression.<sup>37,38,39</sup> A review of resiliency training programs in medical education found that there was a trend toward improving resilience when the programs focused on "leveraging mindfulness, cognitive behavioral therapy, and positive psychology principles."<sup>40,41</sup> The current study is another piece of the foundational research that supports the development of resiliency during residency to both buffer against burnout and performance anxiety.

Our EM residency program has begun incorporating specific activities and services to bolster resilience and decrease burnout amongst our trainees using the current available evidence. We partnered with a local professional sports team's mental skills development coach who meets with our residents to provide techniques for responding and refocusing during high stress situations. Approximately four times per year, the residents and faculty dedicate an afternoon to community service (e.g. cleaning up a nearby park, walking tours of local outdoor art installations, spending a day at the state legislature) to help residents connect with the community they live in and care for. Other programs include a formal intern mentorship program, a residency funded ride-share account, free hospital gym access for residents, pre-loaded cafeteria cards for each resident so they have free food at work, a bereavement leave policy, and a scheduling policy for pregnant residents that allows them to opt out of overnight shifts during their first and third trimesters. In addition, the residency program was able to increase salaries and provide an additional week of paid time off. Anecdotally, the residents

believe this has improved resiliency and reduced burnout, although we have not formally assessed these changes.

There are limitations to this study. This is a single center study with a small sample size done in a four-year EM residency. These factors may limit its external validity and generalizability. This study evaluated some residents who trained throughout the COVID pandemic, while others were entering training after the pandemic. This may have an impact on our measures of mental performance. We plan on continuing this survey annually for the next four years to investigate if there are temporal changes in these metrics. All metrics in this study were self-reported, and measuring physiological parameters like HVR or cortisol may provide additional data on how residents manage the stress of emergency medicine training. Further research can focus both on resiliency, burnout, and performance anxiety across multiple training sites and in multiple medical specialties. Future studies can also investigate the long-term outcomes of resiliency training undertaken during residency.

### Conclusion

In this single center study of EM residents, there was a negative correlation between resilience and performance anxiety, and between resilience and burnout. Emergency medicine providers work in high-stress environments and are faced with complex decisions each shift. This study supports the findings of previous studies and society guidelines that encourage the incorporation of mental skills training to improve resilience into EM residency educational program curricula with a goal of also reducing performance anxiety and burnout in residents.

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