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Qualitative Insights on Stressors, Stress Mitigation, and Recovery Strategies in Air Traffic Control Training

Eric A. Day [1]
Piper Winsett [1]
Julia Beckel [2]
Tammy Ho [2]
Sophia J. Fischer [1]
Joshua Rice [1]
Dana Mahmoud [1]
James C. Lue [1]
Jamie Barrett [2]
Michael J Wenger [1]
Dingjing Shi [1]

[1]Department of Psychology
The University of Oklahoma (OU)
Norman, OK 73019

[2]Civil Aerospace Medical Institute (CAMI)
Federal Aviation Administration
Oklahoma City, OK 73125

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12. Abstract This report starts with an overview of a new, multi-phase interdisciplinary program of research. This program of research involves both lab and field studies to advance theory and practice on distress mitigation in high-performance, safety-critical occupations like air traffic control (ATC). This report summarizes a foundational qualitative study designed to extend prior stress research in ATC training via a qualitative approach involving semi-structured interviews with six subject matter experts (SMEs) with ATC instruction-related experience. We identify key stressors and stress mitigation and recovery strategies relevant to Federal Aviation Administration (FAA) Academy, college training initiative (CTI) students, and developmental controllers in field training. We framed our approach with a discrepancy-reduction, action theory perspective of stress and work performance. Findings provide foundational insight for interventions that address how trainees manage stress and how training environments can be structured to support their success, highlighting the importance of skill development through repeated practice opportunities with supportive instructors. Findings are discussed in terms of how they (1) extend and complement recent reports focused on reducing the physiological and emotional strain experienced in training and (2) point to the interpersonal dynamics between instructors and learners as vital to ensuring students and developmentals become active learners who are not afraid to take action and learn from mistakes.		
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Overview

This technical report summarizes an initial qualitative investigation as part of a multi-year, interdisciplinary effort that integrates psychological theory on self-regulated learning, training, and performance with a cognitive-neuroscience perspective to human attention and performance. The general purpose of this interdisciplinary effort is to provide insights to better understand and mitigate the adverse effects of stress (i.e., distress) across a range of learning- and performance-relevant stressors. The broad goal of this effort is twofold. The first goal is to demonstrate the viability of using biomarker measures, electroencephalographic (EEG) in particular, to capture the stress response across periods of skill acquisition (i.e., performance at baseline to the end of preliminary practice) as well as in response to acute stress involving "surprise" (Diarra et al., 2023). The second goal is to develop new interventions for mitigating the adverse effects of stress experienced by air traffic control (ATC) Academy students, College Training Initiative (CTI) students, and field-training controllers (i.e., developmental controllers).

In support of the second goal, this technical report summarizes findings from semi-structured interviews with ATC training SMEs aimed at identifying (a) common stressors experienced by Academy students, CTI students, and developmental controllers and (b) stress mitigation strategies for students and developmental controllers. We designed the interviews to capture stressful events in both simulations and in controlling live traffic, as well as stressors in the broader training environment. The lab investigation is summarized in a separate technical report (Day et al., under review), which was a pilot investigation involving a single-group time-series design with a period of acquisition followed by a surprise distress-response manipulation. We designed this protocol to give insight into EEG patterns associated with acquisition and adaptive performance after a surprise event. The qualitative and lab studies converge in showing the importance of advancing individually tailored training and instruction in future lab and field investigations with an emphasis on building emotion regulation capacity, along with the confidence and metacognitive skills needed to balance decisions regarding exploring new strategies in training versus exploiting those already known (Hardy et al., 2014, 2019a, 2019b, 2024).

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List of Abbreviations

Acronym	Abbreviation Explained
ATC	Air Traffic Control
ATCS	Air Traffic Control Specialist
CAMI	Civil Aerospace Medical Institute
CPC	Certified Professional Controller
CTI	Collegiate Training Initiative
E-CTI	Enhanced Collegiate Training Initiative
EEG	Electroencephalographic
FAA	Federal Aviation Administration
OJT	On-the-job training
OJTI	On-the-job Training Instructors
OU	University of Oklahoma
SME	Subject Matter Expert
TRACON	Terminal Radar Approach Control

1. Introduction

Air traffic control (ATC) has a longstanding reputation as a high-stress occupation (Costa, 1995). Numerous laboratory and field studies have sought to identify, describe, and explain the demands of controlling air traffic as well as the broader environmental factors that contribute to stress for air traffic control specialists (ATCS; e.g., Costa, 1996; Hilburn & Jorna, 2001; Melton, 1982; Smith, 1980). More recent attention has focused on the stress experienced by Federal Aviation Administration (FAA) Academy students and field trainees, with particular emphasis on mitigation strategies and incorporating stress management training alongside technical training at the Academy (Torrence et al., 2020; Torrence et al., 2023).

For the present work, we conducted semi-structured interviews with subject matter experts (SMEs) in ATC training with the aim of contributing to this rich body of literature. In particular, we provide new insights regarding the types of events that occur while controlling simulated and live traffic that are most likely to trigger trainees' stress responses, how to effectively manage those responses and recover from training mistakes, and the role of instructors, pre-briefs, and debriefs in helping Academy students and field trainees build the skills needed to manage and recover from stress. In doing so, our findings emphasize the importance of instructor-trainee relationships, particularly how stress in ATC training may be effectively managed when instructors utilize a mentor or coaching style to build rapport with students and trainees, providing both constructive criticism and recognition of progress and successes. Building strong instructor-trainee relationships is vital to ensuring students and trainees become active learners who are not afraid to take action and learn from mistakes. Before describing the methodology, explaining the results, and discussing the theoretical and practical implications of the study, we first review the broader literature on occupational stress and stress within the context of ATC. We also explain how our methodology and analyses are guided by a theoretical perspective that emphasizes the importance of technical skill development alongside stress mitigation and coping strategies.

1.1. The Nature of Stress

Stress may be conceptualized as a process through which environmental factors, termed *stressors*, provoke individual physical, affective, cognitive, and behavioral responses (Ganster & Rosen, 2012; Sonnetag & Frese, 2013; cf. Cacioppo & Berntson, 2006). These stress reactions are referred to as *strains.* In many cases, the word *stress* is used synonymously with strain—both referring to individual reactions to stressors.

Acutely, stress reactions are typically characterized as relating to a variety of unpleasant and potentially harmful experiences (Sonnetag & Frese, 2013) that reflect a discrepancy between a current and desired state that should be resolved (Lazarus, 1966; Lazarus & Folkman, 1984). Thus, the function of stress reactions is to stimulate effort to reduce the perceived discrepancies (Edwards, 1992; Edwards & Baglioni, 1993). Physiological changes arise to mobilize effort (Hockey, 1997) while individuals experience increases in negative emotions (Zohar, 1999; Zohar et al., 1993), attentional narrowing (Easterbrook, 1959), and reduced working memory capacity (Moran, 2016). These reactions may become more pronounced in situations involving high workload, aversive events, and high stakes (Ilies et al., 2010; Pekrun & Frese, 1992; Weiss & Cropanzano, 1996). In terms of *distress*, the negative construal of stress (Le Fevre et al., 2003), acute stress can significantly disrupt performance by shifting attention to anxiety-related thoughts, hindering task-focused attention and quick information processing, consequently hurting decision-making by reducing the number and quality of alternatives considered (Dismukes, 2015; Staal, 2004). However, the stress process

can be largely influenced by idiosyncratic differences in how individuals make sense of and cope with stressors (Lazarus & Folkman, 1984). Reactions may or may not compromise performance, depending on the type and severity of the stressor and individuals' relevant experience and expertise in managing events (LePine et al., 2005). In the long term, reactivity to acute stressors is a predictor of a variety of physical and mental health outcomes, such as cardiovascular disease, illness frequency, musculoskeletal pain, obesity, lower bone mass, depression, and anxiety (Turner et al., 2020).

1.2. Stress and Work

Despite many attempts to classify different stressors into various types or dimensions, there are few theory-based taxonomies of work stressors (Sonnentag & Frese, 2013). However, scholars emphasize those based on action theory, given their usefulness in empirical research and understanding stress in performance contexts (e.g., Greiner et al., 1997; Leitner & Resch, 2005; Zapf, 1993). Action theory describes three groups of stressors in terms of how they interfere with the regulation of goal-directed behavior: regulation obstacles, regulation uncertainty, and overtaxing regulations. *Regulation obstacles* refer to interruptions and constraints in the work environment. *Regulation uncertainty* refers to uncertainty regarding how goals are to be achieved. With respect to training and development, feedback is an especially important aspect of regulating uncertainty (Heimbeck et al., 2003; Windlinger, 2021). Although distinguished from regulation requirements such as task complexity and variety, *overtaxing regulations* refer to how time pressure (i.e., speed demands) and information overload (i.e., concentration demands) make goal accomplishment difficult even when goals are clear, and there are no obstacles from the broader environment.

With action theory, stress-performance relationships can be understood in terms of goal-setting and self-regulation. Defined as the modulation of affective, cognitive, and behavioral processes that guide goal-directed activities (Karoly, 1993; Sitzmann & Ely, 2011), self-regulation is part and parcel to how individuals allocate their attentional resources to manage perceived discrepancies between their current and desired performance.

1.2.1. Stress in Air Traffic Control

In ATC, stress reactions are generally regarded as detrimental to performance on the job and in training (Edwards et al., 2016; Torrence et al., 2020). Edwards et al. (2016) interview study of 22 en-route controllers provides a detailed account of how affective and cognitive stress reactions undermine performance in ATC. Indeed, the study of stressors in ATC has a long history. In a review of the results from 21 field studies and 2 laboratory studies examining the physiological symptoms of stress, Melton (1982) categorized stressors into three primary groups: workload, shift-rotation patterns, and automation. In a subsequent review of the research, Costa (1996) identified 24 sources of stress organized across six categories: demand, operating procedures, working times, working tools, working environment, and work organization.

More recently, research in ATC has focused on the stress experienced by Academy students and developmentals during field training. For example, in a survey sample of 40 successful Academy students, Barrett et al. (2018) identified low passing rates, the fast pace of training, potential job loss, and evaluations as major stress themes. Evaluations (60%) were the most frequently reported stressor, followed by potential job loss (33%), fast pace of training (13%), and low passing rates (8%). Barrett et al.'s (2023) follow-up study with 88 successful Academy students showed similar results. Other stressors reported across these two studies

included watching others fail, concerns about placement and relocation, the sheer amount of information to be learned, and concerns about instructors.

Further, Buck and Pierce's (2018) survey research asking developmentals about the factors affecting their chances of success in field training shed light on particular stressors. Participants included developmentals who were unsuccessful in field training and developmentals who successfully became certified professional controllers (CPCs). Questions predominantly asked about factors that contributed to the training outcome, the best and worst parts of field training, and satisfaction with specific components of training. Although the findings identified areas of difficulty, dissatisfaction, and need for improvement, both successful and unsuccessful trainees valued their field-training experiences, especially with respect to skill development in controlling traffic. Many of the findings pointed to factors involving on-the-job instructors (OJTIs). Successful trainees generally reported positive relationships with their OJTIs, especially regarding the training techniques that helped build their confidence. Issues involving instructors were the most frequently cited as being the worst part of training by unsuccessful trainees. Successful trainees also identified difficulties and areas for improvement with respect to OJTIs. In fact, issues with trainers and instructors were the most frequently cited difficult work-related factor by successful trainees. In discussing their findings, Buck and Pierce (2018) stated, "The interpersonal dynamic between trainers and developmentals appeared to be a primary source of stress and difficulty for many developmentals" (p. 70).

1.3. Stress Mitigation and Recovery

With negative connotations of stress as harmful to performance, health, and well-being in mind, we characterize interventions and strategies in terms of "stress mitigation" and "recovery." Similar to our use of stress management, "stress inoculation" is another term used by applied researchers (e.g., Saunders et al., 1996). However, the perspective of stress as a discrepancy-reduction, goal-directed process does not assume negative outcomes. Therefore, researchers will also use "stress management" and "stress interventions" in discussions of approaches that can be applied to leverage the mobilization and effort-promoting aspects of stress while keeping the harmful physiological, emotional, and cognitive reactions at bay. Stress mitigation and recovery strategies can be targeted to individuals, small groups, or even at the broader organizational level (Sonnentag & Frese, 2013).

Sonnentag and Frese (2013) provided a review of the literature, sorting both individual and organizational approaches into one of four categories: stressor reduction, resource increase, strain reduction, and lifestyle changes. Scholars outside the organizational literature have adopted a number of different classification and dimensional approaches. Lazarus and Folkman (1984) categorized coping strategies into two dimensions: problem-focused, targeted at managing stressors; and emotion-focused, targeted at managing physiological and emotional reactions. Others (e.g., Connor-Smith et al., 2000; Compas et al.,1996; Gaudreau & Blondin, 2004) grouped problem- and emotion-focused strategies as task-oriented, citing that some specific strategies serve both purposes, and that both types of coping involve attempts to master stressful situations (Nicholls et al., 2016). These scholars added disengagement- and distraction-oriented dimensions to emphasize different avoidance strategies.

The scientific literature is replete with primary studies and meta-analyses examining and showing support for the effectiveness of stress mitigation interventions and strategies. Early meta-analyses supported the effectiveness of strain-reduction approaches with larger effect sizes for cognitive-behavioral and stress inoculation approaches compared to relaxation techniques (e.g., Saunders et al., 1996; Van der Klink et al., 2001; Richardson & Rothstein, 2008). However, later meta-analytic research showed greater benefits for relaxation techniques (Maricuţoiu et al., 2016). More recently, research has supported mindfulness meditation

practices for strain reduction (Bartlett et al., 2019; Monzani et al., 2021). Sonnentag et al.'s (2023) review of 21 meta-analyses supported the overall positive effects of occupational stress interventions across a range of workplace and organizational factors, behavioral interventions, and individual stress management programs. Successful interventions often combine stressor reduction, strain reduction, and resource-increasing strategies (e.g., Bond & Bunce, 2000).

Meta-analyses (e.g., Bennett et al. 2018; Headrick et al., 2022; Steed et al., 2021) have also supported the effectiveness of stress recovery strategies and interventions. Recovery refers to feeling both rested and energized (Binnewies et al., 2009). Effort-recovery (e.g., Meijman & Mulder, 1998) and cognitive activation theories of stress (Meurs & Perrewé, 2011) point to the importance of breaks, rest, and nonwork life to recovery from work demands and maintaining health and well-being (Fritz, 2024). Sonnentag and Fritz's (2014) stressor-detachment theory emphasizes mental disengagement from work demands as a mechanism for recovery. Self-determination applications of recovery emphasize the importance of nonwork activities that fulfill basic needs for competence (i.e., mastery), autonomy (i.e., control), and belongingness (e.g., ten Brummelhuis & Trougakos, 2014).

From a broader health and well-being perspective, physical exercise (Calderwood et al., 2021) and sleep (Litwiller et al., 2017) are also important for recovery. Grant et al.'s (2025) recent meta-analysis highlighted the importance of vacations for work recovery and well-being, particularly for detachment and physical activity. Karabinski et al.'s (2021) meta-analysis further supported the effectiveness of detachment interventions, especially those that target emotion regulation and sleep. In general, research tends to support the effectiveness of organizational programs that promote healthy living habits and cessation of unhealthy habits, like tobacco and alcohol use, although the effects vary across studies and likely depend on a mix of specific intervention and person factors (Sonnentag & Frese, 2013).

1.3.1. Stress Management and Recovery in ATC

After multiple reports by FAA researchers (e.g., Barrett et al., 2018; Edwards et al., 2016; Pierce et al., 2018) demonstrating the need for stress mitigation and stress management training for ATC, Torrence et al. (2020) provided an initial evaluation of a newly developed stress management training program incorporated in Academy training for students. The objective was to improve fundamental knowledge of stress, stress management concepts, and stress management techniques. The content of the program was informed by the psychological literature on stress, stressors, stress reactions, and stress management techniques, as well as example cases and stories from past ATC students who successfully graduated from the Academy. Using a final sample of 118 students (en-route n = 98; tower n = 20) in a pretest-posttest design, including a 2-month follow-up posttest completed about 10 days before final performance evaluations. The results of a reaction survey given at the time of the immediate posttest showed that Academy students found the program engaging, informative, useful, and important to their success at the Academy. The results also showed gains in knowledge and perceived knowledge from pretest to the immediate posttest, and at the 2-month follow-up. However, gains in confidence on the immediate posttest were not sustained at follow-up. Despite the gains in confidence not being sustained, the majority of students reported on the follow-up that the stress management training had been and would continue to be important to their success. Students reported good sleep hygiene was the most used (70% of students) and helpful (64%) stress management technique followed by rational self-talk (53%; 36%), deep breathing (42%; 29%), mindfulness (38%; 30%), regular exercise (35%; 30%), and compartmentalization (37%; 19%). Meditation (13%; 7%), progressive muscle relaxation (6%; 2%), and journaling (3%; 2%) were not cited as often or as helpful as the other techniques.

Using the results of Torrence et al. (2020) for comparison, Torrence et al. (2023) conducted a similar evaluation of the stress management training program delivered online. In general, Torrence et al.'s (2023) online group showed a similar pattern of results, but without sustained gains in knowledge at the time of the 2-month follow-up. Dattel et al. (2024) showed the benefits of a similar version of Torrence et al.'s (2020) ATC stress management training generalized to students enrolled in TRACON, tower, and en-route classes at a CTI program, with sustained increases in knowledge of stress and mitigation techniques 3-4 weeks after training.

With respect to ATC, it is important to acknowledge that no amount of strain reduction, distraction, lifestyle changes, or recovery will help individuals control traffic in the absence of actual ATC knowledge and skill. In this respect, stress mitigation strategies and recovery experiences should be thought of as useful in combination with resource-increasing approaches that involve scaffolding lessons, action-based feedback, simulation training, and field training to give students and trainees the knowledge and skill to handle a variety of demands inherent in controlling traffic. Individuals with greater ATC experience and expertise are more likely to understand and use the actions needed to effectively handle the demands in controlling traffic alongside the stressors in the training and work environment (cf. Sonnentag, 2000).

1.4. Purpose

The purpose of the present field study was to identify the situations associated with experiencing stress and useful stress mitigation and recovery strategies among Academy students, CTI students, and developmental controllers. In practical terms, our goal was to provide recommendations for complementing and bolstering existing Academy, CTI, and field-training practices. We took a performance-based, discrepancy-reducing perspective, informed by action theory, to distinguish the present study from older approaches and recent reports on ATC stress experienced by students and developmentals. As mentioned above, action theory views stress in terms of the regulation of goal-directed behavior. In the present study, we asked about the situational events most likely to spur stress reactions, effective ways to mitigate any detrimental effects on learning and performance, and how to recover from these events. In doing so, our approach emphasized reducing the discrepancies between situational demands and near-term performance goals (e.g., controlling traffic in a simulation) in relation to distal achievement goals (e.g., graduating from the Academy; becoming a CPC). Accordingly, we sought to provide answers to two broad research questions.

> ***Research Question 1:*** What are the common stressors experienced by Academy students, CTI students, and developmental controllers?
>
> ***Research Question 2:*** What stress mitigation and recovery strategies are useful to Academy students, CTI students, and developmental controllers?

However, to make a novel contribution, we struck a balance between replicating previous work, older reviews, and recent FAA reports, with an eye on extending these works by explicitly focusing on specific details not directly examined in past research. We explicitly asked about:

1. The kinds of events or situations in simulations and controlling live traffic that are especially problematic and commonly associated with stress.
2. What can be done when stress ensues or situations start a downward spiral?
3. What can be done to recover from a stressful performance experience or after making mistakes?
4. How might pre-briefs and debriefs be leveraged to mitigate stress and help recovery?

We gave deference to recent FAA-CAMI reports by Barrett et al. (2018), Barrett et al. (2023), Buck and Pierce (2018), Torrence et al. (2020), and Torrence et al. (2023) when considering how our findings replicated past research yet provided novel insights. In newer research data, the extent to which novel findings are accompanied by findings that replicate previous research helps bolster the validity of any conclusions made about how the novel findings extend theory and practical recommendations.

2. Method

2.1. Participants

Interview data were collected with six SMEs. Two were recruited via email from the professional networks of the FAA-CAMI members of the research team. The other four were recruited by contacting a lead faculty member of an enhanced CTI (E-CTI) program who arranged a tour of their facilities for all members of the research team. Personnel from the CTI program were later recruited via email.

Subject matter experts represented a wide range of ATC-related careers and experience. Their roles included ATC operators, instructors, evaluators, lab technicians, and remote pilot operators. Specifically, SMEs reported experience working at towers and approach facilities, as en-route radar controllers, on-the-job training instructors (OJTIs), front-line managers, and training managers within the FAA. Several also served in military ATC roles at domestic and foreign military bases. Others held instructional positions at the FAA Academy and certified CTI schools. Subject matter experts' ATC experience ranged from about 4 to 43 years (M = 21.5, SD = 14.5), with most having decades of operational and instructional experience. About one-third received formal training at the FAA Academy, while others entered the ATC workforce through military training or lab technician roles that did not require attending the Academy as students. Subject matter experts reported working at various ATC facilities and locations, including major airports, TRACONs, and en-route centers. Overall, the sample provided valuable insights into ATC stressors and stress mitigation strategies, drawing from experience in operational, instructional, and supervisory roles across civilian and military sectors, as well as domestic, international, and collegiate ATC environments.

2.2. Procedure

Subject matter experts provided consent via the Qualtrics online survey platform before the interviews started. All interviews were conducted online via Zoom with both audio and video features turned on by members of the research team and participant SMEs. Interviews were not recorded to provide a more candid, relaxed atmosphere. Four members of the research team participated in five interviews. In one interview, five members of the research team participated. The principal investigator, Eric Day, led all six interviews. At least one FAA-CAMI member of the research team served as a co-interviewer, asking clarifying questions as needed. The same FAA-CAMI member of the research team also took notes. Two doctoral graduate student members of the research team also took notes. One graduate student in particular took notes for all six interviews. Thus, each interview involved at least three note-takers (four in one case) to ensure comprehensive and detailed coverage of the interview and the responses provided by the SMEs.

The interviews were semi-structured. After an explanation of the purpose of the research and questions asking SMEs about their professional experience and background in ATC, a priori scripted questions were asked of every participant. Table 1 shows the a priori scripted

questions. Subject matter experts were asked to describe examples in their responses. For Questions 2 and 4, SMEs were also asked: “To what extent can pre-briefs and debriefs (i.e., preparation and review meetings) be helpful in this regard?” We gave special attention to pre-briefs and debriefs, given that multiple meta-analyses support their effectiveness (e.g., Keiser & Arthur, 2021; Lines et al., 2021; Tannenbaum & Cerasoli, 2013).

The interview protocol also included a list of potential follow-up questions. However, to help create a candid, relaxed atmosphere, we wanted a more conversational tone in the interviews. Thus, the extent to which the scripted questions were asked depended on the natural flow of the conversation. In many cases, the lead interviewer asked unscripted follow-up questions to build rapport and ensure the key points expressed by the SMEs were salient and clear (e.g., “So, if I am understanding things correctly, what you are saying is . . .”). Pre-scripted follow-up questions are listed in Table 1.

Table 1
A Priori and Follow-Up Interview Questions

Category	A Priori	Follow Up
Stressors	• Are there certain types of scenarios/situations/events that are especially likely to cause problems for students and/or developmental controllers? What scenarios/situations/events are most likely to cause students and/or developmental controllers distress (i.e., to “stress out”)? • What components of the training environment do you think are a common source of stress for students and/or developmental controllers?	a) What do you think are the effective ways to handle such events? b) Are there clear “do’s and don’t’s” for handling these types of events.
Mitigations	• When someone starts to feel stressed and things start to downward spiral in ATC, what do you think needs to be done to handle things effectively? Are there any particular stress management techniques that are useful? • What do you think needs to be done to effectively recover from a stressful ATC performance experience, like bouncing back right away from a mistake or bad decision or sometime a little after the situation/event?	c) What is done in training to help students and/or developmental controllers handle these situations/events? d) How do you help students and/or developmental controllers figure this out? Is it a standard element emphasized in training?
General	• Is there anything else you would like to share with us today regarding performance stress and recovery?	

2.3. Coding

Members of the research team who took notes during the interviews documented responses using a combination of direct quotations and paraphrasing, with an emphasis on capturing participants' statements as verbatim as possible. Notes were combined for each SME by a priori interview question and follow-up questions such that each notetaker's notes for a particular question were stacked under each question. Stacking the different notes under the corresponding question provided coders with a sense of the agreement among the different notetakers for each question. Across all six interviewers, the qualitative data consisted of approximately 70 pages of single-spaced notes (1-inch margins; 12-point, Times New Roman font). Responses varied in length, ranging from a couple of sentences to a couple of paragraphs. Three members of the research team served as primary coders: the principal investigator, an FAA-CAMI member of the research team, and the graduate student (master's level in the industrial-organizational psychology doctoral program at the University of Oklahoma) who took notes for all six interviews.

A multi-step modified constant comparison approach was used, involving open and focused coding (Corbin & Strauss, 2008). Table 2 provides a detailed summary of our coding process.

Table 2

Summary of Coding Process

Step	Description
1	• Each coder independently reviewed notes from all interviews and generated an initial set of codes for stressors and mitigation strategies separately. • Coders applied multiple codes to a single question's response when distinct themes emerged within lengthier answers.
2	• Coders met to compare and discuss initial codes. • Initial code lists were consolidated into a smaller set of focused codes.
3	• Each coder returned to interview notes for a second review. • Coders applied new coding scheme and added or aggregated new codes as warranted.
4	• The coding team met again to compare and reconcile coding results and generated an initial hierarchical organization of codes for stressors and stress mitigation strategies. • Focused codes from Step 2 served as Level 1 code categories.
5	• Coders revisited the data to verify Level 1 code accuracy and refine hierarchical structure. • Each coder contributed input on code assignments, organization, and labeling.
6	• The graduate student coder compiled input from Step 5 into second-iteration tables displaying hierarchically organized codes with example data for each first-level code. • Separate tables were created for stressors and stress mitigation strategies.
7	• Two additional graduate students reviewed the Step 6 tables and collaborated with the graduate student coder to produce third-iteration tables. • These tables were then reviewed by the PI and FAA coding team member.

8	• The primary coding team members met to finalize the hierarchically organized codebooks for stressors and mitigation strategies. • Axial coding was used to examine how codes were related to research questions. • The finalized codebooks are visually depicted in Figures 1 and 2.

3. Results

We frame our results through the lens of action theory, incorporating evidence-based categorizations of stressors, stress-mitigation techniques, and stress-recovery experiences (Sonnentag & Frese, 2013). Responses were parsed by specific interview questions and organized into two hierarchical models, one for stressors (Figure 1) and the second for stress mitigation and recovery strategies (Figure 2). Each model included four levels of codes: factors (Level 4 [top]), sub-factors (Level 3), facets (Level 2), and sub-facets (Level 1 [bottom]).

In general, our findings replicated the findings from past research. In and of themselves, most of the specific codes in our models were not surprising. However, together through the lens of action theory, we derived novel insights from our findings. These novel insights were observed in the Gestalt of the codes rather than in the specific phenomenon each code reflected. In total, of the 41 Level 1 and 2 codes (sub-facets and facets), we deemed 19 (46%) to be novel points of emphasis. In our review of the findings below, we summarize the models and highlight novel points of emphasis. Then, in the following Discussion, we review the novel insights we derived from the Gestalt of the codes.

Figure 1

Model of Individual Operator and Environmental Stressors in Air Traffic Control Training. Dashed boxes with bolded, shaded font are novel points of emphasis.

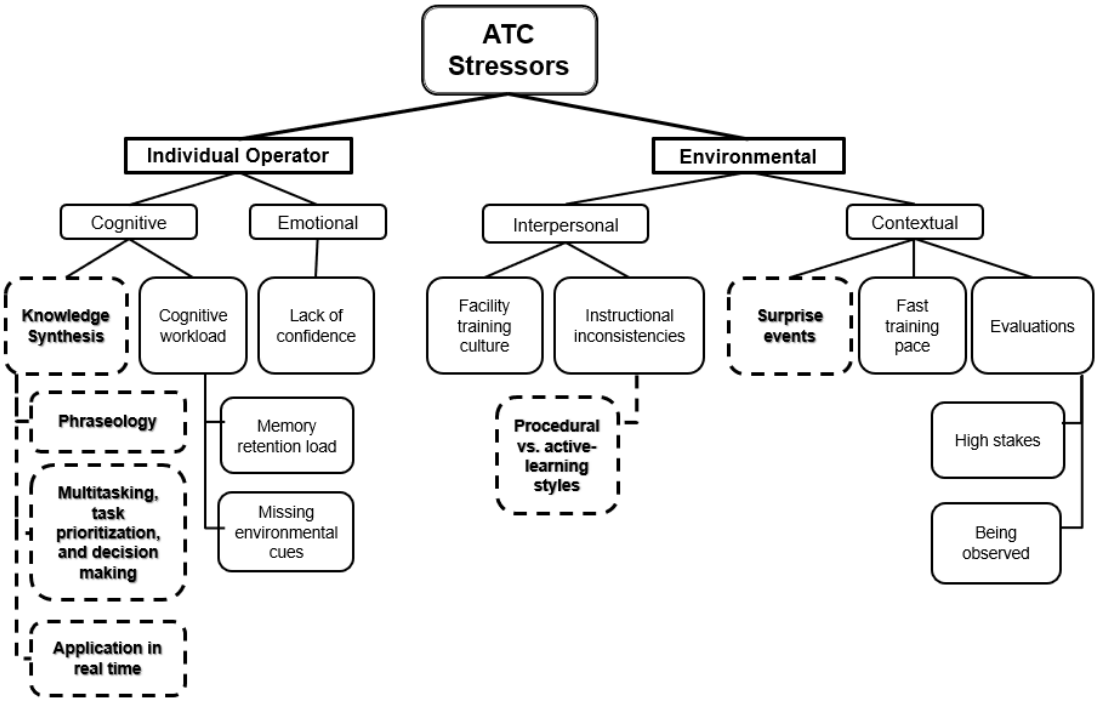
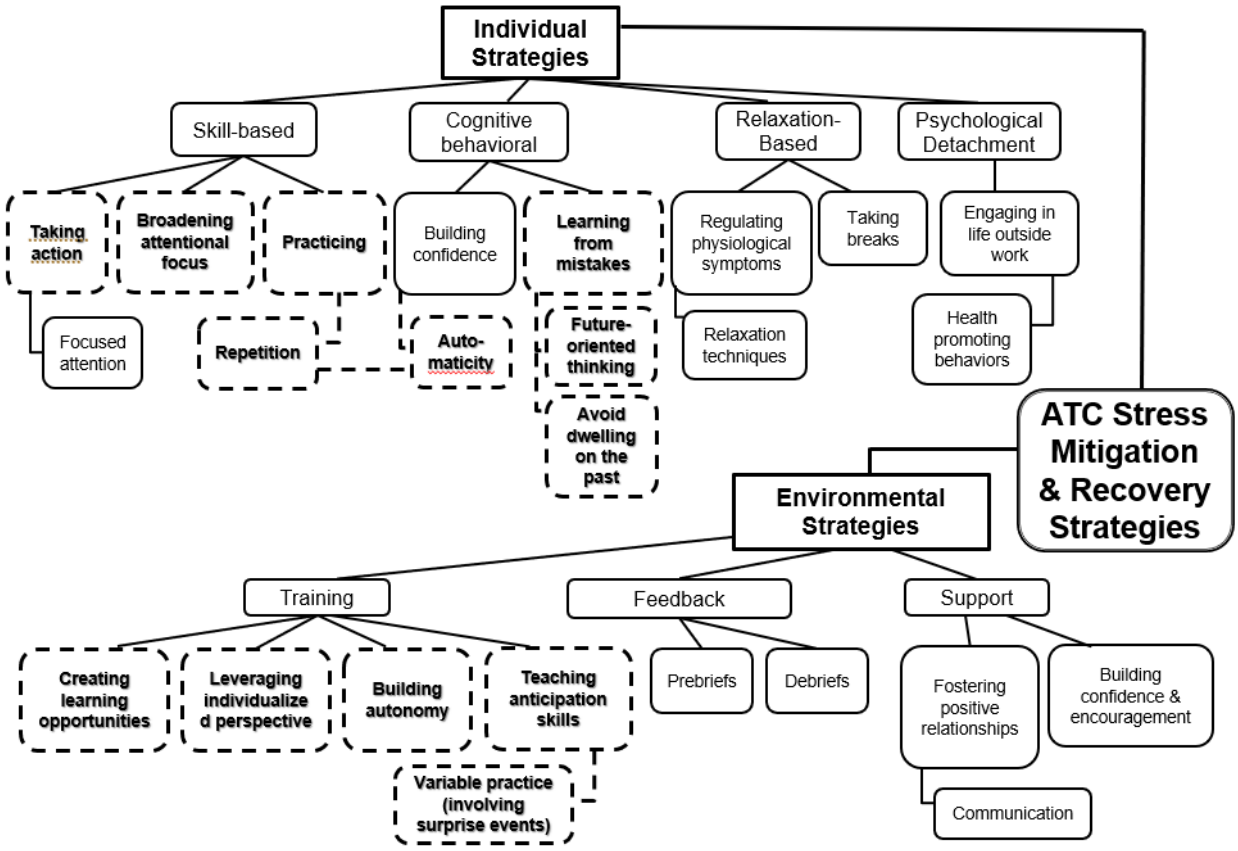


Figure 2

Model of Individual Operator and Environmental Stress Mitigation and Recovery. Dashed boxes with bolded, shaded font are novel points of emphasis.



3.1. Model Summaries

3.1.1. Stressors

For Research Question 1, stressors were grouped under individual operator and environmental top-level factors. Individual operator stressors included emotional and cognitive sub-factors, with lack of confidence as the primary emotional facet and knowledge synthesis and cognitive workload as the primary cognitive facets. Dealing with phraseology, multitasking and prioritizing, and applying knowledge in real time were the key sub-facet stressors emphasized by SMEs, grouped under knowledge synthesis. Environmental stressors included interpersonal and contextual sub-factors. Facets of the interpersonal factors were facility training culture and instructional inconsistencies, with procedural versus active-learning styles as a key sub-facet of instructional inconsistencies. With a procedural learning style, instructors prioritize giving trainees instructions for handling simulated traffic, explicitly defining what to do and what not to do, as events arise. Conversely, an active learning style affords trainees autonomy to make decisions and learn from mistakes when controlling simulated traffic. Finally, surprise events were a key contextual facet emphasized along with fast training pace and evaluations (e.g., high stakes; just being observed) as additional facets.

Knowledge synthesis and its sub-facets—phraseology, multitasking and prioritizing, and applying knowledge in real time—were the novel points of emphasis for individual operator stressors. Procedural versus active-learning styles and surprise events were the novel points of emphasis for environmental stressors. These novel points of emphasis are shown in Figure 1 with shaded and bolded font in dashed-line boxes. Example sentiments for individual stressors by level 1-3 codes are provided in Table 3 and for environmental stressors in Table 4.

Table 3

Individual Operator Stressor Factors (Level 4) – Example Sentiments by Level 1, 2, & 3 Codes

Level 3	Level 2 – Level 1	Example Sentiment
Cognitive	*Knowledge Synthesis – Phraseology*	The biggest hold up is the phraseology. Getting it correct. They've memorized it, but now they need to speak it, it's like Russian, it's a foreign language, forming a proper ATC sentence really stresses them out…
	Knowledge Synthesis – Multitasking, task prioritization, and decision making	See, recognize, and apply. Sometimes, you need to prioritize tasks, and some people have difficulty managing their prioritization. When you talk about stressors, you see the stress come up when they don't know what to do next. When there is multitasking, this increases stress if they aren't comfortable understanding what the priority is or what the solution is. If a person misses something or makes a mistake, this isn't a concern, but it gets to the point where they need to make a decision…
	Knowledge Synthesis – Application in real time	They have all the tools and training, but they have a problem assembling it, and it's a delivery thing…they have to make a quick analysis and come up with an application, then they have to prepare to make a decision…
	Cognitive workload – Memory retention load	…I would think just the mass of information they are trying to absorb and remember is overwhelming to them.
	Cognitive workload – Missing environmental cues	Putting all these things together, we refer to this as "when the switch comes on or getting the flick" – getting the entire picture. Novice controllers in initial training will want to concentrate on one or two of these skills, and the others get ignored, and this causes issues in the elements they are not observing but should be observing.
Emotional	*Lack of confidence*	In the beginning, it seems like they're very afraid of making a mistake, and when they key up, they can't even repeat what I've said. I'll say, hey, you're talking to a computer with me sitting next to you, this is the time to make mistakes. Some of them have no problem whatsoever, but others, in my opinion, it comes down to confidence, the best thing to say in my position is to sit there and say nothing.

Table 4

Environmental Stressor Factors (Level 4) – Example Sentiments by Level 1, 2, & 3 Codes

Level 3	Level 2 – Level 1	Example Sentiment
Interpersonal	*Facility training culture*	People who have gone through have demonstrated cognitive competencies, so the stress is different when you're training, as traffic builds, they will stress, but it's different in OJTI, in the academy everything is sterile and standardized, in the field, everything varies, some OJTIs think they are still in the field and there is little flexibility and then there are other instructors that are more patient, so you end up with two different training experiences.
	Instructional inconsistencies	Inconsistency in direction/instruction from leads, instructors, or OJTIs…When it hasn't been consistent throughout, I see confusion, stress, coming up. It has to be consistent or else repetition doesn't matter. Consistency with methods in training approach and demeanor.
	Instructional inconsistencies – Procedural vs. active learning styles	…instructors that would take over immediately…"hey you need to do this"…taking the reins from students is never beneficial. …positive reinforcement, letting the students make mistakes and fix them on their own, knowing when they can fail and get back on their own. Letting the students learn on their own with live traffic is important also. I think it has a lot to do with confidence and not taking away opportunities for students to build their own confidence. Noticing areas for improvement and challenging them accurately.
Contextual	*Surprise events*	Snowball effect usually comes from unusual events, if things are usual, then things usually work out, if things are unexpected or they forgot about something, then panic occurs.
	Fast training pace	They don't get a lot of time – 50 days, that is not a lot of time to develop someone.
	Evaluations	The evaluation is where the most nerves come in. We run with these students in open labs every day, we will run for hours, but the second an instructor comes in and sits behind them, they get so overwhelmed, and they crash.
	Evaluations – High stakes	At the academy, after the evaluation, you either have a job, or you don't. I have seen students who did great, but when it came down to the assessment, they bombed it.
	Evaluations – Being observed	I know I experienced the same thing. I always choked or had that stress level whenever I had an evaluation, even as a veteran, when someone plugged in behind me, I got sweaty palms, or the hair sticking up on the back of my neck…

3.1.2. Stress Mitigation and Recovery Strategies

Similar to the stressor model, for Research Question 2, stress mitigation and recovery strategies were grouped under individual and environmental top-level factors. Individual strategies included skill-based, cognitive-behavioral, relaxation-based (e.g., regulating physiological symptoms and relaxation techniques; taking breaks), and psychological detachment (e.g., engagement in life outside work and health-promoting behaviors) sub-factors. Key skill-based facets emphasized were taking action, broadening attentional focus, and practicing with lots of repetition to build automaticity. A mindset of learning from mistakes was the key cognitive-behavioral strategy emphasized by SMEs with future-oriented thinking and not dwelling on the past as key sub-facets. Building confidence was another cognitive-behavioral strategy identified.

Novel points of interest for the individual operator strategies were in the skill-based and cognitive-behavioral sub-factors. Specifically, taking action, broadening attentional focus, and practicing with lots of repetition were novel skill-based points of interest. Moreover, practicing with lots of repetition was a bridge to building confidence via automaticity. Learning from mistakes, future-oriented thinking, and not dwelling on the past were novel cognitive-behavioral points of interest. These novel points of emphasis are shown in the top half of Figure 2 with shaded and bolded text, outlined by dashed-line boxes.

Environmental strategies included training, feedback (e.g., pre-briefs; debriefs), and support (e.g., fostering positive trainer-trainee relationships and communication; building confidence and encouragement) sub-factors. The novel points of interest were found in the four training facets emphasized: creating learning opportunities, individualizing training, building autonomy in trainees, and teaching anticipation skills. Variable practice involving surprise events was a key sub-facet of teaching anticipation skills. These novel points of emphasis are shown in the bottom half of Figure 2 on the left with shaded and bolded text in dashed-line boxes. Example sentiments for individual strategies by level 1-3 codes are provided in Table 5 and for environmental strategies in Table 6.

Table 5

Individual Stress Mitigation and Recovery Strategies Factors (Level 4) – Example Sentiments by Level 1, 2, & 3 Codes

Level 3	Level 2 – Level 1	Example Sentiment
Skill-based	*Taking action*	It's a matter of trusting that you learned what you're supposed to do. Having a sense of action rather than a sense of observance…
	Taking action – Focused attention	Cancel out all outside noise and focus on fixing the task at hand, then worry about the rest later.
	Broadening attention focus	Do take a quick breath and push your mental vision back out. Do continue to see things develop, don't live in the past, don't overly punish yourself, do continue to see information and process it….

Level 3	Level 2 – Level 1	Example Sentiment
	Practicing	They have all the tools and training, but they have a problem assembling it, and it's a delivery thing…they have to make a quick analysis and come up with an application, then they have to prepare to make a decision…
	Practicing – Repetition	…I would think just the mass of information they are trying to absorb and remember is overwhelming to them.
Cognitive Behavioral	*Building confidence*	The foundation of being a controller is having confidence, and you need to establish this early on…
	Building confidence – Automaticity	Students can make sure to know their materials, if an unusual situation happens…those who know the material better are on autopilot, so it's almost reactionary.
	Learning from mistake	I tell them, this is the time to make mistakes, you don't need to be nervous with me. I've seen it all. We can't learn and we can't grow if we are afraid to make a mistake.
	Learning from mistake – Future-oriented thinking	I'm not thinking about what I'm saying, I'm thinking about what I need to say in the future.
	Learning from mistake – Avoid dwelling on past errors	The ability to just shake it off. Something bad has happened, I've lost separation, this is serious, but I still have 30 min left on position…instead of hitting myself and calling myself an idiot, you can't spiral out of control, Resiliency is important, take a breath and push through.
Relaxation-Based	*Regulating physiological responses*	You can see physical agitation- bouncing a leg. What helps most students is to immerse themselves if they get busy, then they start to calm down a bit. If things get less busy, they might start fidgeting again.
	Regulating physiological responses – Relaxation techniques	They need to learn how to breathe through a situation in the heat of the moment.
Psychological Detachment	*Taking breaks*	My advice to students in class is to get up, take a short break, and go do something…
	Engaging in life outside of work	I recommend immersing oneself in life outside of work, spending time with your spouse, kids, and friends to decompress. Sometimes talking about work helps, sometimes you need to get your mind off things, and stress levels go away. Sometimes getting away from it can help mitigate stress.

Level 3	Level 2 – Level 1	Example Sentiment
	Engaging in life outside work – Health-promoting behaviors	Things like going to bed early before a big exam, eating healthily, or staying off social media, just simply focusing on being an overall healthier person. If we could shift the focus from short term to long term strategies, this would help with stress.

Table 6

Environmental Stress Management and Recovery Strategy Factors (Level 4) – Example Sentiments by Level 1, 2, 3, Codes

Level 3	Level 2 – Level 1	Example Sentiment
Training	*Creating learning opportunities*	We gave those students more simulations, never with the intention of building their confidence; just continued performance and improvement was what was best with our students. We never explicitly talked about stress or performance but letting them know in those small moments that they are doing well did build confidence over time.
	Building autonomy	Helping them through guidance is helping lead them to how to best control air traffic. At the root of it, it's positive reinforcement, letting the students make mistakes and fix them on their own, knowing when they can fail and get back on their own. Letting the students learn on their own with live traffic is important also. I think it has a lot to do with confidence and not taking away opportunities for students to build their own confidence. Noticing areas for improvement and challenging them accurately.
	Teaching anticipation skills	Part of what causes this is learning to work ahead, and this is a skill developmentals have to develop. They must have multiple plans to anticipate things before they happen.
	Teaching anticipation skills – Variable practice	We spend a lot of hours together in training sessions. I'm able to work with them one-on-one or two-on-one. I also mix things up to get them to think differently...
	Leveraging an individual perspective	Can share stories of personal experience, some people don't like to share poor performance, but students can learn from these and give different techniques, giving stress mitigation techniques, what students have done in the past helps other students "some students will do pushups to help after a bad run" It's individualized, "whatever it takes for those students" to help de-stress them. "There is no one size fits all answer, unfortunately."

Level 3	Level 2 – Level 1	Example Sentiment
Feedback	*Prebriefs*	In my experience, all that stress will go away once you have the knowledge and understanding, but the pre-briefs, I think, would be instrumental in mitigating stress. Saying something like, "Hey, we're expecting some heavy traffic today; let's talk about the weather," I think this would make a world of difference.
	Debriefs	Debriefing is significantly important. That is when you have the opportunity to say, when things become paramount, to ask probing questions that they need to understand what they were doing…
Support	*Fostering positive relationships*	When you're in the field, you'll have consistent lead instructors, and these people have to understand where the trainees are emotionally and mentally.
	Fostering positive relationships – Communication	When you have a conversation with them, it draws them back into the situation.
	Building confidence and encouragement	I try to talk to the students not always as an instructor but as a friend and give them motivate and through the nerves, sometimes they can't understand in the moment, I explain to them there is no need to stress during the simulation

4. Discussion

The purpose of this work was to extend prior stress research in ATC training via a qualitative approach. Using findings from semi-structured interviews with six ATC training SMEs, we frame our results through the lens of action theory and evidence-based categorizations of stress mitigation techniques and recovery experiences.

Our results suggest several novel extensions to prior ATC stress research. First, our results provide new insights related to individual-level stressors, particularly cognitive stressors related to knowledge synthesis. SMEs frequently described the integration of phraseology, task prioritization, and real-time decision-making as salient sources of stress for trainees during both simulated and on-the-job training. From an action-theory perspective, these findings reflect aspects of regulation uncertainty and speak to the difficulties students and trainees have with taking action to control simulated and live traffic. These findings provide evidence that cognitive stressors extend beyond workload requirements and entail challenges with the synthesis and application of learned knowledge.

Second, at the environmental level, SMEs reported surprise events as particularly stressful for ATC trainees, such that a deviation from expected traffic patterns severely interfered with trainee performance, ultimately decreasing trainees' confidence in their ability to perform. Surprise events might be appropriately categorized as overtaxing regulations. Off-nominal events are likely to increase the number of informational cues a trainee must attend to in order to quickly mitigate issues as they arise while also maintaining incoming traffic. However,

surprise events may also reflect another aspect of regulation uncertainty and the difficulties trainees have in taking action.

Third, at the environmental level, SMEs reported that inconsistencies in instructor styles can be an impactful stressor, especially with respect to whether instructors adopt a procedural versus active-learning style when working with trainees. With respect to action theory, inconsistencies in instructor styles reflect a regulation obstacle that distracts student and developmental attention from the demands of controlling traffic. Yet, inconsistencies in instructor style also contribute to regulation uncertainty by adding ambiguity about how students and developmentals should approach their practice simulations and live-traffic training sessions. Should the approach be more about rote learning the information and strategies provided by instructors, or should the approach be more about taking ownership in developing a broader and more flexible understanding of controlling traffic?

The novel points of emphasis in our findings are particularly stark considering previous research in ATC has emphasized the importance of emotion-focused strategies meant to quell the influence of stress reactions on trainees' performance (cf. Barrett et al., 2018; Torrence et al., 2020, 2023). However, our results suggest trainees' stress reactions under performance conditions are more commonly related to a lack of confidence in their technical proficiency. As such, our novel points of emphasis for stress mitigation suggest that a problem-focused, rather than a strictly emotional, approach to stress mitigation is needed. Specifically, SMEs consistently underscored the instructor-trainee relationship as a critical foundation for managing trainee stress while also developing their technical proficiency. By adopting training approaches that balance constructive feedback with recognition of progress, instructors can provide training experiences that promote knowledge and skill development through focused action and help trainees develop a mindset suited for learning from mistakes.

Rather than solely focusing on managing trainees' emotional reactions to stressors, developing strong instructor-trainee relationships involves a problem-focused approach via resource enhancement that empowers trainees to be active learners who are willing to take action and learn from mistakes. The SMEs highlighted the importance of designing simulation-based learning experiences that align with trainees' developmental needs and provide opportunities to practice error recognition and correction in a controlled, non-safety-critical environment. By doing so, trainees may be more likely to develop and sustain confidence in their performance and view errors as opportunities for refinement, rather than threats to success. Thus, our results suggest that managing stress may not always be best achieved by a strict focus on the stress itself. Rather, much of trainees' stress may be addressed via intentional strategies that promote coaching-oriented approaches that emphasize autonomy, feedback quality, and individualized development, which can strengthen both learning outcomes and stress regulation.

We see our novel points of emphasis as validated by the fact that many aspects of our findings have also been emphasized in past research and are already recognized. For stressors, our findings confirmed cognitive workload and lack of confidence as individual-level facets, and the fast pace of training and evaluations came through as environmental facets. For stress mitigation and recovery, relaxation and detachment strategies were individual-level factors endorsed by SMEs, with specific facets pointing to the importance of techniques like deep breathing, taking breaks, and engaging in healthy living outside work. Feedback in pre-briefs and debriefs, as well as supportive training environments that foster positive relationships and build confidence and encouragement, were environmental strategies endorsed by SMEs. Altogether, our novel points of emphasis should be viewed as extensions and complements to past research and recommendations rather than contradictions or replacements.

4.1. Implication for Practice

Our findings carry several implications for stress management interventions designed for ATC training environments. As stated earlier, stress mitigation is not a sufficient substitute for technical proficiency. Our results suggest that instructional practices such as structured feedback, graduated exposure to complexity, and the explicit teaching of coping strategies may enhance trainee resilience alongside skill acquisition. These practices may be the most effective when instructors and trainees have strong, established training relationships. For example, Buck and Pierce (2018) highlighted the importance of the interpersonal dynamics between instructors and trainees, and they suggested providing opportunities for field trainees to familiarize themselves with their instructors via scaffolded training assignments, such as simulation training, prior to formal on-the-job training (OJT) under live traffic conditions. In doing so, trainees may be able to establish positive relationships and build confidence in their technical proficiency, thereby enhancing their resources for managing stress associated with the complexities of controlling live traffic. In FAA Academy and CTI settings, structured simulation practice with guided pre- and debrief sessions could help trainees build technical competence in addition to rapport with instructors, fostering confidence and buffering against stress during training. The importance of taking a more autonomy-supportive coaching approach with ATC instruction is consistent with research showing how increasing job control and work participation (Wall & Clegg, 1981; Jackson, 1983) in combination with social support from supervisors is critical to mitigating stress and building competence (Frese, 1999; Logan & Ganster, 2005).

Our results also point to the importance of active-learning approaches over procedural training in ATC. An active-learning approach contrasts sharply with the more traditional procedural approach that focuses on giving trainees explicit instructions and feedback on how to handle events. An instructor might mean well when telling trainees what to do and what not to do in the future. However, compared to an active-learning approach, procedural training falls short in building the self-regulation skills trainees need to stay engaged in training and build the depth and breadth of knowledge required for successful adaptation to a wide range of future events (Bell & Kozlowski, 2008; Healy et al., 2014). Active learning inherently builds emotion regulation capacity (Bell & Kozlowski, 2008; Keith & Wolff, 2015) along with the confidence and metacognitive skills needed for trainees to make decisions regarding what new strategies to explore in training versus those known and to be exploited (Hardy et al., 2014, 2019a, 2019b, 2024). Procedural training and an emphasis on immediate success in training ultimately undermine the adaptive capacity undoubtedly needed in ATC and other high-performance, safety-critical occupations.

With active learning, trainees are afforded autonomy to make decisions in simulations and supervised OJT. Certainly, exploring a new strategy will not always lead to complete success in handling a particular situation. Likewise, applying a well-learned strategy to a novel event may not lead to success. Nevertheless, debriefs that provide feedback about both errors and successes and also invite trainee input foster a deeper, more integrative understanding than debriefs that involve a top-down approach focused only on correcting mistakes (Ellis et al., 2014). With a deeper, more integrative understanding, trainees will learn how a once-failed strategy might be effective in a future situation. Similarly, trainees will better understand the limitations of strategies that have been successful in the past. Durable yet adaptive knowledge requires an integration of different pieces of knowledge with an understanding of the importance of the individual pieces (Shea & Kovacs, 2013; Arthur & Day, 2013; Healy et al., 2014). Active-learning training with instruction that emphasizes development over immediate success builds durable and adaptive knowledge along with the self-regulation skills needed for consistently

high performance and meeting the demands of performance environments marked with uncertainty (Keith & Wolff, 2015).

Although not novel, our findings also supported the importance of relaxation-based techniques and reducing physiological stress reactions. In this vein, feedback that also includes information about self-regulation and monitoring attention to emotions could be especially effective in cases when trainees are clearly experiencing a great deal of stress and self-doubt (Wisniewski et al., 2020). In particular, thought-stopping and centering techniques hold considerable promise for helping individuals focus their attention on task demands when experiencing physiological and emotional stress reactions. Thought-stopping and centering strategies have a rich history in sport and performance psychology (Cox, 2011; Hardy & Oliver, 2014; Nideffer, 1976, 1993; Ong & Chua, 2021; Singer, 2002; Williams & Bhalla, 2021). Thought stopping involves noticing thoughts reflecting self-doubt and low confidence and replacing them with confidence-boosting thoughts (e.g., memories of past successes) to help individuals focus on taking action. Centering involves focusing attention on reducing elevated physiological states (e.g., taking a deep breath) to help focus attention on critical cues in the task environment. Together, thought stopping and centering help individuals take action when they are overwhelmed by situations, worry, and self-doubt.

4.2. Limitations

The current study has limitations, including a small sample of SMEs. We relied on the perspective of ATC training SMEs, rather than Academy students, CTI students, or field trainees. Given the current ATC operational environment and ATC staffing shortage, we did not find it appropriate to interrupt training operations. As such, both stressors and strategies are based on retrospective reports and may reflect SME perceptions rather than in-the-moment training experiences. Future research should build on these findings through mixed-method, longitudinal studies to examine the prevalence and effectiveness of the identified stressors and mitigation and recovery strategies.

5. Conclusion

Overall, our findings offer a preliminary framework for understanding stress and coping in ATC training, addressing stressors and mitigation and recovery strategies at multiple levels. By framing our work within a discrepancy-reduction, action theory perspective and emphasizing both individual and environmental mitigation strategies, our findings provide foundational insight for interventions that address how trainees manage stress and how training environments can be structured to support their success. As in past research, our findings reflected that learning the complexities of ATC and adapting to its uncertainty are inherently stressful. Our findings highlighted the importance of skill development through many practice opportunities with supportive instructors. It is crucial for students and developmentals to effectively direct their attentional resources to manage self-doubt and to focus on the near-term actions needed to resolve events (e.g., controlling traffic) while making progress toward long-term achievement goals (e.g., graduating; getting certified). Our findings extend and complement recent reports that highlighted the importance of reducing the physiological and emotional strain experienced in training (e.g., Torrence et al., 2020; Torrence et al., 2023). Also, our findings are consistent with research on workplace stress, pointing to the importance of experience and expertise to stress management (e.g., LePine et al., 2005; Sonnentag, 2000), coupled with Buck and Pierce's (2018) findings that highlighted the importance of instructor-trainee relationships to success in training. Practice, learning from mistakes, and support from instructors are at the

very heart of student and developmental success. Much of the stress in ATC training may be effectively managed when instructors adopt a mentoring or coaching style to build rapport with students and developmentals, providing corrective feedback alongside recognizing progress and successes. Feedback effectiveness is not straightforward (Kluger & DeNisi, 1996; London & Mone, 2014). The interpersonal dynamics between instructors and learners are vital to ensuring students and developmentals become active learners who are not afraid to take action and learn from mistakes.

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