Editor’s Note By: Gregory L Walterhouse Editor-in-Chief


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The IPSA Journal is an opportunity to publish manuscripts about leadership issues and best practices applicable to all facets of public safety, and to provide the public safety community with timely access to pertinent information that impacts decision-making, policy, administration, and operations. Our readers represent the entire public safety community including law enforcement, fire service, EMS, 911 telecommunications, public works (water, sanitation, and transportation), public health, hospitals, security, private sector, and emergency management. In this issue, readers will see the following peer-reviewed manuscript:

1. Emotion Regulation and Health Status in Southeast Rural Firefighters by Bridget F. Melton, Catherine Gallagher, Jeffrey J. Klibert, Erika Moeller, Caitlin Fountain, and Gregory Ryan.

The IPSA Journal has a systematic process in place for approval, rejection, and resubmissions of manuscripts. The IPSA Journal enlists peer reviewers made up of public safety practitioners and academicians with experience in scholarly writing to review all manuscripts.

It is the vision of the IPSA Journal to continually accept manuscripts and to release future editions of the IPSA Journal. We seek high-quality manuscripts from all public safety professionals, academia, researchers, and scholars.

The IPSA Journal is published bi-annually in June and December. I encourage those interested to download and review the IPSA Manuscript Guidelines, use the IPSA Journal Template, and submit a manuscript to us for publication consideration. There is so much knowledge to share within and between each public safety discipline, and I invite you to be a part of it.

Stay safe,
Emotion Regulation and Health Status in Southeast Rural Firefighters

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Emotion Regulation and Health Status in Southeast Rural Firefighters

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Abstract
Firefighters experience occupational difficulties, leading to higher risks of physical, behavioral, and emotional concerns. While research pinpoints best practices in minimizing physical harm and health safety concerns, few guidelines offer pathways to protect firefighter behavioral health and well-being. At a theoretical level, emotion regulation, an individual's ability to increase, maintain, or decrease responses to emotional experiences, is a targeted behavioral intervention that may support firefighter wellness. However, it is unknown how emotion regulation strategies are correlated with key health determinants among diverse firefighter samples. The present study sought to evaluate the relationships between facets of emotion regulation and health fitness metrics (e.g., body fat percentage, waist-to-hip ratio, and cardiovascular endurance) in a sample of career firefighters. Forty-four full-time rural firefighters participated in this study. Emotion regulation was examined using the 36-item Difficulties in Emotion Regulation Survey (DERS). The results indicated significant mean differences in DERS total scores and Perceived Health ($X^2(2) = 6.51, p = .04$). No significant differences were found in DERS total scores and cardiovascular endurance (i.e., estimated VO2max) ($X^2(2) = 4.23, p = .12$). However, when broken down into DERS subgroups, Goals ($p = .02$) and Awareness ($p = .01$) showed significant associations with Estimated VO2max groups. The firefighters' DERS total score, DERS subgroups, and health status fitness metrics from the present research are somewhat consistent with theoretical studies outlining the benefits of emotion regulation. Given the preliminary nature of the study, our findings provide new directions to evaluate emotion regulation in first responder samples.

Keywords: first responder, physical health, firefighter, emotion regulation, stress
Emotion Regulation and Health Status in Southeast Rural Firefighters

Due to the nature of their career, firefighters (FFs) are consistently exposed to painful and traumatic situations, placing them at risk for physical and mental harm (International Association of Fire Chiefs, 2015). FF’s occupational stress is often repeated and cumulative, resulting in a higher likelihood of developing a myriad of behavioral health disorders (e.g., posttraumatic stress, anxiety, and substance abuse; Jahnke et al., 2016). Compared to the 6.8% to 7.8% lifetime prevalence rate of post-traumatic stress disorder in Americans, FFs range from 8% to 32%, along with a 13% to 16% risk of depression (Haddock et al., 2018; Lanza et al., 2018). Furthermore, alcohol consumption is commonly used as a stress reliever, where at least 56% of FFs partake in binge drinking once a month compared to the 17.1% estimated average in U.S. adults (Haddock et al., 2011). In addition to behavioral health disorders, FFs are also at risk for comorbid physical health conditions (e.g., sleep disorders; Carey et al., 2012); 42% of FF fatalities from 2009 to 2019 were due to sudden cardiac death (Smith et al., 2019). In total, these trends highlight the immediate need to develop interdisciplinary health prevention programming to increase FF wellness (Gnacinski et al., 2015).

While research supports the benefits of diverse physical health prevention programs (i.e., sleep hygiene, fitness; Hershey et al., 2023; Schneider, 2010; Winter et al., 2010) on FF wellness, few studies evaluate the usefulness and efficacy of behavioral health programs. One behavioral health pathway to mitigating FF’s mental and physical health risks may involve targeting emotions, which when chronic and dysregulated, contribute to adverse health outcomes (e.g., cardiovascular disease; Rozanksi et al., 2005). However, FFs who pursue behavioral health services often face multiple barriers when seeking help, including the availability of resources, cost, and stigma (Carpenter et al., 2020). While several evidence-based treatments exist for regulating emotions among civilian and military populations, there is a lack of research on how to best implement these treatments among first
responders (Hom et al., 2016). Thus, exploring how emotion regulation skills can promote behavioral and physical health among FFs is necessary, as members of this population are continuously faced with emotionally and physically stressful situations (Leonard et al., 2023). The first step in this line of examination is evaluating the degree to which emotions and how they are regulated are linked to different physical health facets of FF wellness. This is the primary purpose of the current study.

**Health Status among Firefighters**

Health status is an individual’s relative level of wellness or illness, and it is often linked to their perceived health (Ware, 1992). One indicator of health status is body composition, which includes body fat mass and nutritional intake (Thibault et al., 2012). Obesity is a risk factor associated with cardiovascular disease morbidity (Koliaki et al., 2019). A study by Poston and colleagues (2018) reveals that FF body fat and waist-hip measurements are similar to those of the US general population. However, 75% of career and volunteer firefighters fall into overweight and obese categories on the Body Mass Index scale (BMI ≥ 25 kg/m²; Poston et al., 2018). This is concerning, given the physical demand required to perform FF duties efficiently. Another indicator of health status is aerobic capacity, or VO\(_2\) Max, an individual’s ability to prolong strenuous physical activity for an extended amount of time. Interestingly, obesity is correlated with not meeting the minimum aerobic capacity standard for FF populations (Poston et al., 2018). Decreased aerobic capacity impacts cardiovascular and respiratory system functions. However, stress and related factors (e.g., emotions) can affect oxygen utilization, impacting one’s VO\(_2\) Max (Radak et al., 2013). The standard set by the National Fire Prevention Association (NFPA; 2016) requires a yearly medical and fitness evaluation comprised of multiple tests, including body composition and aerobic capacity (Squeglia, 2012). Despite these evaluation requirements, as of 2016, only 27% of fire
departments had programs in place to maintain basic fitness (NFPA, 2016). Failure to meet the recommended guidelines within firefighter standards can result in lower performance in critical settings. Additionally, there are strong indirect cross-effects between physical health and behavioral health, wherein previous behavioral health difficulties impact indices of physical health and vice versa (Ohrnberger et al., 2017). Most notably, physical health is adversely affected by chronic stress, which negatively impacts cardiovascular and immunological functioning (Yaribeygi et al., 2017), as well as adiponectin levels needed for managing insulin and obesity (Salleh et al., 2020). Given FF’s exposure to repeated stress, how FFs manage intense and debilitative emotions derived from stressful conditions may have important physiological, occupational, and other wellness-based implications.

**Emotion Regulation**

Chronic stress influences emotions (Lazenby et al., 2019) and the regulation of these emotions is critical to promote health status (Cloitre et al., 2018). Stress tends to increase negative or unpleasant emotions (e.g., fear, anger) and decrease positive or pleasant emotions (e.g., happiness, joy; Ong, 2016). Problems regulating emotions are associated with a variety of clinical symptoms (e.g., binge eating, alcohol misuse) and psychiatric diagnoses (e.g., anxiety and mood disorders; Aldao et al., 2015; Gross, 1998; Sheppes et al., 2015). Emotion regulation (ER), an individual’s ability to sufficiently use conscious and non-conscious strategies to increase, maintain, or decrease responses to emotional experiences, is key for managing stress and promoting wellness (Guendelman et al., 2017; Rolston & Lloyd-Richardson, 2015). ER also includes the ability to influence the quality, content, and intensity of emotional experiences and expressions (Gratz & Roemer, 2004). While ER skills are unique to the individual, several common ER strategies exist, including *cognitive reappraisal* (i.e., reinterpretation of emotions and experiences), *suppression* (i.e.,
attempts to repress emotions), *distraction* (i.e., redirecting one's attention), and *response modulation* (i.e., changing the experiential or physiological effects of emotion after it occurs; Gross, 2015). These strategies can be used to down-regulate negative emotions, up-regulate positive emotions, or to facilitate a dual-process involving both (Gross et al., 2015).

The types of ER skills used by first responders may modify how they react to crucial on-the-job occurrences and influence their overall vulnerability to debilitating behavioral health outcomes. Although studying ER is an important step toward identifying behavioral health disorders, little is known regarding the types of ER skills impacting the physical health of FFs. It is essential to identify how ER processes and skills are linked to facets of physical health among diverse first responder populations.

**Emotion Regulation Well-Being and the Six Subgroups**

Daily subjective wellness and perceived stress are linked to various emotion regulation (ER) processes and can differ among individuals (Katana et al., 2019). Emotion regulation involves managing the intensity and fluctuations of emotional states, making it a crucial aspect of daily functioning. Enhanced ER skills contribute to cognitive development, foster healthier social interactions, and support overall well-being and attention (Mestre et al., 2017; Saarni et al., 1998; Steinberg, 2005). For instance, individuals adept at cognitive reappraisal tend to exhibit more positive emotions, experience higher levels of personal well-being, and demonstrate reduced symptoms of depression (Gross et al., 2003). Conversely, those who frequently resort to emotional suppression often exhibit impaired emotional, interpersonal, and well-being functioning (Gross et al., 2008; 2003). The ramifications of deficient ER skills can be severe, with difficulties in emotion regulation correlating with heightened risk of self-harm (Gratz & Roemer, 2004). However, establishing risk stemming from ER processes is complicated as there are many dimensions
underlying ER (Anderson et al., 2021). The evaluation of different dimensions of ER is important as some features or processes may differentiate risk across a wide spectrum of health concerns (Anderson et al., 2021). Thus, in evaluating diverse outcomes stemming from ER processes, it is important to assess ER using multidimensional measures. The Difficulties in Emotion Regulation Scale (DERS) assesses dynamic facets of emotion dysregulation (Gratz & Roemer, 2004). Within the DERS are six subdomains used to capture potential difficulties with emotion regulation: awareness of emotions (Awareness), clarity of emotions (Clarity), controlling emotional impulses (Impulse), accepting emotions (Nonacceptance), acting on goals in the presence of emotions (Goals), and implementing strategies to regulate emotion (Strategies; Gratz & Roemer, 2004). Previous research indicates evaluating the benefits of using the DERS, particularly in studies evaluating the connection between ER processes and physical/somatic symptoms. Specifically, unique dimensions of ER buffer the effects of perceived stress on different somatic symptom sets (Selvi & Bozo, 2023).

**Emotion Regulation and Health Outcomes**

While there is limited investigation into the link between ER and health in FF samples, emotion regulation has important implications for physical and mental health (Guendelman et al., 2017) in tactical athlete, broad first responder, and military populations. For instance, from a regulatory perspective, managing emotions impacts coordination and execution of motor actions in tactical athletes (Beatty & Janelle, 2020) and fitness improvement in unique military populations (Cardenas et al., 2020). Emotions not only have direct health effects (e.g., changes in cortisol), but they also indirectly impact physical health by influencing decision-making and health behaviors (e.g., choosing to drink alcohol when anxious; DeSteno et al., 2013). Dysregulated anger and hostility
are associated with the development of atherosclerosis and adverse cardiac outcomes, while difficulties regulating low mood are linked to insulin resistance and sympathetic nervous system dysregulation (Rozanski et al., 2005). Alternatively, the use of cognitive reappraisal to increase positive emotions (e.g., amusement) results in improved cardiovascular functioning (Guiliani et al., 2008), while the written expression of anger is associated with decreased chronic pain (Graham et al., 2008). When used effectively, ER skills can bolster physical health and wellness, especially in general populations of adults.

At a preliminary level, ER among first responders has equally important implications for health, with some techniques being more helpful than others. Emotional suppression and rumination are linked to increased PTSD and depression (Gärtner et al., 2019; Tan et al., 2023), physical symptoms (e.g., stomachaches; Gärtner et al., 2019), hazardous alcohol use, and suicidal ideation (Gryshchuk et al., 2022). However, first responders who engage in cognitive reappraisal and emotional acceptance tend to have improved outcomes (e.g., decreased PTSD, depression, and anxiety; Gärtner et al., 2019; Kshtriya et al., 2022). Limited research on FFs specifically indicates difficulties utilizing emotion regulation strategies (i.e., DERS “Strategies” subscale) significantly mediate the relationship between insomnia and depression (Hom et al., 2016). Additionally, FFs who manage stress by attempting to modify their emotional responses to stressful situations experience greater resilience and posttraumatic growth (i.e., positive transformations following trauma; Sattler et al., 2014). Nevertheless, more research is needed to clarify how, and which ER skills positively influence health among FFs. Particularly, it is important to evaluate connections between different ER dimensions and health-based standards for FF health and fitness for duty.

Current Study

Given the scarcity of studies evaluating ER processes in FF samples, the present study sought
to evaluate preliminary lines of inquiry in this line of evaluation. Specifically, we aimed to evaluate whether relationships exist between difficulties with emotional regulation constructs and health status variables among FFs. Based on the theoretical and experiential literature, we hypothesized that difficulties with ER, as conceptualized through the DERS, would be positively related to problematic health indicators (i.e., perceived health, body fat percentage, waist-hip ratio, VO2) commonly assessed through FF health screening examinations. Alternatively, the null hypothesis for this line of investigation is that there will be no statistically significant correlations between ER indices and physical health indicators of wellness. In addition, we sought to determine whether dimensions of ER could explain differences among different health-based groups of FFs. We expected that different groups of FFs (e.g., VO2max Ideal vs. VO2max Consultation vs. VO2max Exercise Plan) would report differential mean scores for all facets of ER. Alternatively, the null hypothesis for this line of inquiry was different health-related groups of FFs would report comparable ER scores. This study is key because it is one of the first to examine ER processes within the health-related framework of FFs. If results hold up to expectations, our findings will offer a platform by which other researchers, professionals, and educators can introduce different facets of ER into wellness programming.

**Methods**

**Participants and Procedure**

A convenience sample of 44 career FFs from a rural southeastern fire department volunteered to participate in the study. To be considered eligible for participation, individuals had to be a full-time active-duty FF in the department and older than the age of 18 years. Health metric data was acquired for this study as part of the department’s annual fitness assessment, and a follow-up survey was added. Prior to participation, all FFs were informed of the procedures, requirements, and risks involved in the study and then asked to provide written informed consent. After
completing the fire department’s required physical fitness assessment, FFs were asked to complete the hard copy survey in a private location. All methodologies used in the study were approved by the university’s institutional review board, approval number H19098. G-Power highlighted that 36 participants were needed for significant relationships to be revealed between emotion regulation and health status variables.

**Measures**

**Emotional Regulation.** The Difficulties in Emotion Regulation Scale (DERS) was used to assess emotional dimensions associated with mental health. The DERS (Gratz & Roemer, 2004) is comprised of 36 questions rated on a 5-point scale where a higher score indicates a greater difficulty in regulating emotions (1=almost never to 5=almost always). It is based on a total sum and six subgroups: Nonacceptance, Goals, Impulse, Awareness, Strategies, and Clarity. These domains have been validated as more interpretable when assessing trait-level perceived emotion regulation ability (Hallion et al., 2018). The six subscales are interpreted as such: (a) **nonacceptance**, the unwillingness to accept certain emotional responses (e.g., “When I’m upset, I become embarrassed at myself for feeling that way”); (b) **goals**, individuals have difficulty in engaging in goal-directed cognition along with behavior when upset (e.g., “When I am upset, I have difficulty focusing on other things”); (c) **impulses**, where an individual has difficulty regulating their behavior when upset (e.g., “I experience my emotions as overwhelming and out of control”); (d) **awareness**, a reverse score, where one may lack emotional awareness (e.g., “When I am upset, I acknowledge my emotions”); (e) **strategies**, where an individual may lack access to strategies for feeling better when upset (e.g., “When I am upset, I believe that I will remain that way for a long time”); (f) **clarity**, where one may lack emotional clarity (“I have difficulty making sense out of my feelings”; Gratz & Roemer, 2004).

**Health Status.** Health status was defined based on four variables: perceived health status,
body fat percentage, waist-hip ratio, and cardiovascular fitness. Perceived health ratings were adapted from the Medical Outcomes Study Short Form (MOS SF-36; e.g., “In general, would you say your health is: Excellent, Very Good, Good, Fair, Poor”; Ware et al., 1993).

**Body Fat Percentage.** Body fat percentage was measured during the FFs’ annual fitness assessment using the averages of three different testing procedures. First, a bioelectrical impedance analysis from foot-to-foot was measured using the Tanita (TBF300 WA, Tanita Corporation, Tokyo, Japan). Next, a 7-site skinfold measurement was administered using the Lange skinfold calipers. The measurement sites included the chest, midaxillary, triceps, subscapular, abdominal, suprailiac, and thigh. The same experienced technician took all measurements following American College Sport Medicine (ACSM) guidelines. Lastly, a whole-body Dual-energy X-ray absorptiometry scan was used for assessment.

**Waist-Hip Ratio.** The waist-hip ratio was administered using a tape measure and an experienced technician. The ratio was calculated by dividing the waist by the hips in centimeters. Following the ACSM’s guidelines, individuals were appropriately categorized from very high, high, moderate, and low. All three measures of body fat were averaged, giving a total body fat percentage, where individuals were then categorized based on the ACSM’s chart from Obese to Underweight.

**VO2.** Estimated cardiovascular endurance, measured by estimating the volume of oxygen consumed (VO2), was measured during the FFs’ annual fitness assessment. The National Fire Protection Association (NFPA) requires a minimum threshold of ≥ 42 ml/kg/min, and the Queens College 3-minute Step-test was used to calculate this estimated VO2 using a validated equation and heart rate recovery (NFPA, 2016; ACSM, 2022). Based on recorded VO2 scores, the NFPA Scale four categorizes individuals into Ideal, Consultation, Exercise Plan, and Supervised Program groups. Each category represents a unique profile of health, whereby individuals scoring in the Ideal category are
performing well in terms of cardiovascular endurance and individuals placed in the lower groups (Exercise Plan and Supervised Program) require more direct intervention to increase cardiovascular functioning.

Demographics

Basic demographic information, including age, gender, ethnicity, smoking status, years of service, and FF rank, was obtained through self-report. Table 1 outlines the demographic breakdown of our samples.

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Mean ± SD</th>
<th>Min Score</th>
<th>Max Score</th>
<th>n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>35.98 ± 8.81</td>
<td>23</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Years of Service</td>
<td>12.61 ± 8.61</td>
<td>1</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Gender Identity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisgender Man</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>44(100%)</td>
</tr>
<tr>
<td>Cisgender Woman</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>43(98%)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1(2%)</td>
</tr>
<tr>
<td>Smoking Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>26(59%)</td>
</tr>
<tr>
<td>No</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>18(41%)</td>
</tr>
<tr>
<td>Professional Rank</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrator</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>7(16%)</td>
</tr>
<tr>
<td>Battalion Chief</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>3(7%)</td>
</tr>
<tr>
<td>Captain</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6(14%)</td>
</tr>
<tr>
<td>Lieutenant</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6(14%)</td>
</tr>
<tr>
<td>Fire Apparatus Operator</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>13(30%)</td>
</tr>
<tr>
<td>Fire Fighter</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>9(20%)</td>
</tr>
</tbody>
</table>

Statistical Analysis

Data was analyzed using SPSS version 27. Both descriptive and inferential data analyses were completed. Demographic characteristics were described using frequencies and descriptive
statistics. Bivariate correlations were analyzed to evaluate the relationships between DERS total/subdomain scores and different markers for health. Inferential analysis also included running Kruskal Wallis tests to reveal differences between variables in health status (i.e., Perceived Health, Body Fat, Waist-Hip, and VO2max). Post hoc pairwise comparisons were used on all significant findings.

**Results**

Forty-four firefighters were included in the data analysis. However, only 43 were used in VO2 Max due to the incompleteness of testing. Health status metrics are presented in Table 2. These data tell an interesting story regarding how FF within our sample perceived their health status when compared to behavioral/objective physiological markers of health. Importantly, there seems to be a discrepancy between reports of perceived health status and Body Fat %. Notably, a fair number of FFs self-indicated being in good to excellent health, yet Body Fat % suggests a large proportion of the sample has significantly high levels of body fat. Alternatively, perceived health reports appear to be more consistent with metrics stemming from an evaluation of waist-hip ratios and estimated VO2 NFPA which present a more evenly distributed assessment of health across the sample. There are two possible interpretations of these patterns. First, it is quite possible that Body Fat % is measuring unique features of health and fitness not accounted for by other health metrics. If this is the case, then fitness efforts for our sample needed to be directed toward reducing body fat over other goals to support the physical health of participants. Second, these data call into question whether sampled FFs are good judges of their own fitness. It is quite possible that social desirability and other confounds may have skewed how FFs reported their perceived health.
Table 2. Categorizing Health Status Metrics of Rural Firefighters in Southeast Georgia

<table>
<thead>
<tr>
<th>Health Status Variable</th>
<th>Categories</th>
<th>n(%)</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Health</td>
<td>Excellent/Very Good</td>
<td>13 (30%)</td>
<td>1.909 ± .709</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>22 (50%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fair/Poor</td>
<td>9 (20%)</td>
<td></td>
</tr>
<tr>
<td>Body Fat %</td>
<td>Excellent</td>
<td>1 (2%)</td>
<td>29.977 ± 6.826</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>2 (5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>4 (9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>4 (9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very Poor</td>
<td>33 (75%)</td>
<td></td>
</tr>
<tr>
<td>Waist-Hip Ratio</td>
<td>Low</td>
<td>16 (36%)</td>
<td>.884 ± .06</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>16 (36%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>10 (23%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very High</td>
<td>2 (5%)</td>
<td></td>
</tr>
<tr>
<td>Estimated VO2 NFPA</td>
<td>Ideal</td>
<td>24 (56%)</td>
<td>44.511 ± 7.937</td>
</tr>
<tr>
<td></td>
<td>Consultation</td>
<td>15 (35%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exercise Plan</td>
<td>4 (9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervised Program</td>
<td>0 (0%)</td>
<td></td>
</tr>
</tbody>
</table>

Note: VO2 = estimated maximal oxygen consumption; NFPA = national fire prevention association

Next, mean and standard deviation scores of the six domain scores within the DERS are provided in Table 3. These data also tell an interesting story especially when compared to reported patterns in other populations. Specifically, FFs in our sample reported substantially lower scores on the DERS subscales compared to military service members seeking mental health care (Baer et al., 2019). Our FF sample also reported lower mean scores on most DERS subscales compared to college student samples (Haliczer et al., 2020) with one notable exception, lack of emotional awareness; our sample reported slightly more elevated difficulties with recognizing and becoming aware of different emotional states when compared to college students. In total, these patterns suggest our sample is reporting very few difficulties with emotion regulation.
Table 3. Descriptive statistics for DERS subgroup categories

<table>
<thead>
<tr>
<th>DERS Subgroup variables</th>
<th>Mean ± SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonacceptance of Emotional Responses</td>
<td>9 ± 3.2</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Difficulties Engaging in Goal-Directed Behavior</td>
<td>9 ± 3.4</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>Impulse Control Difficulties</td>
<td>8 ± 2.8</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Lack of Emotional Awareness</td>
<td>17 ± 4.6</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>Limited Access to Emotional Regulation Strategies</td>
<td>12 ± 4.9</td>
<td>8</td>
<td>31</td>
</tr>
<tr>
<td>Lack of Emotional Clarity</td>
<td>8 ± 2.2</td>
<td>5</td>
<td>14</td>
</tr>
</tbody>
</table>

Spearman’s correlations were performed to assess whether relationships exist between the DERS subgroup scores and health status metrics. Correlation coefficients are presented in Table 4. There were no statistically significant correlations between the DERS scores and perceived health status. Similar patterns were identified between DERS scores and average body Fat % and DERS scores and Waist-Hip Ratio. However, there were some differential findings associated with the estimated VO₂ NFPA index. Specifically, there was a statistically significant, negative correlation between the total DERS score and VO₂ NFPA index, \( r_s(43) = -0.312, p < 0.05 \), along with a statistically significant, negative correlation between DERS Awareness subgroup score and VO₂ NFPA index, \( r_s(43) = -0.479, p < 0.01 \). These findings suggest that individuals with higher cardiovascular endurance metrics reported less difficulties with ER in total and less difficulties becoming aware of their emotions. Moving forward, it will be important to evaluate potential relationships between ER scores and health metrics using more fine-grained analyses.
Table 4. Correlations between Emotion Regulation Domain Scores and Health Metrics

<table>
<thead>
<tr>
<th>Variables</th>
<th>DERS Total</th>
<th>DERS Non-Accept</th>
<th>DERS Goals</th>
<th>DERS Impulse</th>
<th>DERS Aware</th>
<th>DERS Strategies</th>
<th>DERS Clarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Health</td>
<td>.079</td>
<td>-.038</td>
<td>.012</td>
<td>.037</td>
<td>.054</td>
<td>.151</td>
<td>.045</td>
</tr>
<tr>
<td>Average Body Fat %</td>
<td>.143</td>
<td>.141</td>
<td>.217</td>
<td>.132</td>
<td>.001</td>
<td>.267</td>
<td>.062</td>
</tr>
<tr>
<td>Wait-Hip Ratio</td>
<td>-.068</td>
<td>-.033</td>
<td>.106</td>
<td>-.092</td>
<td>-.111</td>
<td>.129</td>
<td>-.210</td>
</tr>
<tr>
<td>Estimated V02 NFPA</td>
<td>-.312*</td>
<td>-.176</td>
<td>.092</td>
<td>-.069</td>
<td>-.479*</td>
<td>-.105</td>
<td>-.265</td>
</tr>
</tbody>
</table>

Note. * significant at .05 level. DERS Total = Total Emotion Regulation Score, DERS Non-Accept = Nonacceptance of Emotional Responses, DERS Goals = Difficulties Engaging in Goal-Directed Behavior, DERS Impulse = Impulse Control Difficulties, DERS Aware = Lack of Emotional Awareness, DERS Strategies = Limited Access to Emotion Regulation Strategies, DERS Clarity = Lack of Emotional Clarity

Perceived Health

A Kruskal-Wallis H test was conducted to determine if there was a difference between the DERS total scores and perceived health. There was a statistically significant difference when looking at DERS total scores and Perceived Health, $X^2(2) = 6.51, p = .04$. Based on perceived health variables, “Excellent” (n = 1) and “Very Good” (n = 12) were categorized together, along with “Fair” (n = 9). “Poor” (n = 0) were also categorized together. Subsequently, pairwise comparisons were performed using a Bonferroni correction. Adjusted P-values showed no significant differences between comparison groups; Very Good/Excellent vs Fair/Poor ($p = 1.0$), Very Good/Excellent vs Good ($p = .08$), Fair/Poor vs Good ($p = .18$). Lastly, when broken down into DERS subgroups, no significant differences were found.

Body Fat

A Kruskal-Wallis test was conducted to determine if there was a difference between the DERS total scores and body fat. There was no significant difference, $X^2(4) = 6.29, p = .18$. Additionally, when broken down into DERS subgroups, no significant differences were found.

Waist and Hip
A Kruskal-Wallis test was conducted to determine if there was a difference between the DERS total scores and waist and hip ratio. There was no significant difference, $X^2(3) = .75, p = .87$. Additionally, when broken down into DERS subgroups, no significant differences were found.

**Estimated VO$_2$ Max**

A Kruskal-Wallis H test was conducted and noted no significant difference, $X^2(2) = 4.23, p = .12$, between the DERS total scores and Estimated VO$_2$ Max. However, when broken down into DERS subgroups, Goals ($p = .02$) and Awareness ($p = .01$) showed a significant difference among the Estimated VO2max groups. This post hoc analysis revealed statistically significant differences in Goals median scores between the Exercise Plan and Consultation, with higher scores shown in Consultation compared to the Exercise Plan ($p = .04$). The post hoc analysis also revealed statistically significant differences in Awareness median scores between Consultation vs Ideal, with higher scores shown in Ideal compared to Consultation ($p = < .01$). Pairwise comparisons were performed using a pairwise Bonferroni correction. Adjusted p-values are presented. See Table 4 for values within each.

**Table 5. DERS Subgroups Statistics within Estimated VO2max Categories**

<table>
<thead>
<tr>
<th>DERS Subgroups</th>
<th>Ideal ≥43.9 mL/kg/min</th>
<th>Consultation 36-42.9 mL/kg/min</th>
<th>Exercise Plan 29-35.9 mL/kg/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonacceptance</td>
<td>9.5 ± 5.5</td>
<td>8 ± 6</td>
<td>6.5 ± 2</td>
</tr>
<tr>
<td>Goals</td>
<td>8.5 ± 3</td>
<td>10 ± 3*</td>
<td>6.5 ± 2</td>
</tr>
<tr>
<td>Impulse</td>
<td>8.0 ± 2.75</td>
<td>8 ± 7</td>
<td>7.0 ± 2</td>
</tr>
<tr>
<td>Awareness</td>
<td>18.5 ± 5.75*</td>
<td>13 ± 6</td>
<td>18 ± 2</td>
</tr>
<tr>
<td>Strategies</td>
<td>10.5 ± 5.5</td>
<td>11 ± 10</td>
<td>9 ± 4.5</td>
</tr>
<tr>
<td>Clarity</td>
<td>9.0 ± 4</td>
<td>8 ± 2</td>
<td>6 ± 2.25</td>
</tr>
</tbody>
</table>

Note: DERS = difficulties in emotion regulation; *Defines differences within subgroups compared to estimated VO2max categories

**Discussion**

This study evaluated the relationships between specific ER domains and health status in a rural fire department in southeast Georgia. The value of this study lies in its aim to establish novel connections between behavioral and physical health, specifically tailored to an understudied first
responder population. By exploring these connections, the study seeks to enhance the overall well-being and resilience of FFs, potentially leading to improved health outcomes and quality of life within this critical population.

While expectations were only partially met, this study yielded significant findings, particularly in the correlation between emotional regulation (ER) domains and VO₂ metrics, which are measures of cardiovascular endurance. Notably, participants who reported optimal levels of cardiovascular endurance also reported fewer difficulties across total ER and in identifying various emotional states. Moreover, significant variations were observed in reports of engaging in goal-directed behaviors and emotional awareness among specific subgroups (ideal, consultation, exercise plan) of rural firefighters (FFs). These findings align with previous research, affirming the substantial connections between fitness metrics and ER domains within tactical athlete and military populations, as highlighted by Beatty & Janelle (2020) and Cardenas et al. (2020). However, our findings go one step further by differentiating what ER domains are most specific to healthier levels of cardiovascular endurance. Importantly, multiple pieces of evidence suggest being more aware of emotional experiences and responses is strongly (Cohen, 1992) related to better cardiovascular endurance. Currently, it is unknown why acknowledging and attending to different emotional states is correlated with ideal levels of cardiovascular endurance. One explanation may be that effective ER allows individuals to manage stressors more efficiently, reducing the physiological burden of chronic stress on the cardiovascular system (Huang et al., 2013). By mitigating the impact of stressors, first responders may maintain healthier cardiovascular function over time. It is also possible that sharp emotional awareness skills may help FFs better situate themselves in initiating fitness programming and maximize their time during fitness training. For instance, emotional awareness programs increase mindfulness and motivation skills (Smith et al., 2024) needed to
maintain high commitment to fitness, especially in demanding occupational spaces (Arjmand et al., 2024). Such skills are important in helping choose when and how FFs organize their training regimen and persist with training goals during demanding schedules and job-related duties. Moving forward, it is important to evaluate whether increasing emotional awareness skills have a causal effect on cardiovascular improvement. If a causal relationship exists, it is important to further evaluate the underlying mechanisms (e.g., mindfulness, motivation) that contribute to this causal effect.

The absence of significant correlations between enhanced cardiovascular functioning and other emotional regulation (ER) domains, particularly impulse control strategies, was somewhat surprising. Impulse control plays a pivotal role in making sound nutritional and fitness training decisions (Fu et al., 2023). However, the current study failed to establish a meaningful relationship in this regard. One plausible explanation for this lack of connection could be attributed to the methodology employed, specifically the use of self-report surveys to assess ER strategies. For instance, items within the impulse control domain (e.g., "I experience my emotions as overwhelming and out of control.") may not sufficiently capture the essential components of this ER approach necessary for comprehensively understanding the process of building cardiovascular endurance. Although firefighters (FFs) may perceive their emotions as overwhelming, they may also possess the resilience and persistence required—key elements of impulse control (Troy et al., 2023)—to actively navigate through these perceptions that overwhelm. Essentially, the items in the Difficulties in Emotion Regulation Scale (DERS) might not fully capture the behavioral manifestations of resilience and persistence needed to facilitate effective coping and impulse management actions. In future studies, it will be important to employ observational, behavioral, and procedural methods of assessing ER strategies to better determine how underlying behavioral features connect to
cardiovascular outcomes.

Our study also explored the connections between ER domains and perceived health, revealing a complex relationship that often diverged from our initial expectations. Perceived health is a subjective measure of one’s overall health status, allowing individuals to self-assess their health quality and capture unique physiological and psychological reserves not reflected in other metrics. First, no single DERS score domain was related to perceived health. However, individuals who rated their health as "good" tended to have higher total DERS scores, indicating greater difficulty accessing emotion regulatory strategies. This finding was unexpected and may suggest limitations in the self-report assessment of health status, especially given the context in which our data was collected.

Notably, participants might have experienced significant levels of social desirability concern, which is a common barrier in assessing for health-based outcomes (Latkin et al., 2017). This concern is particularly prevalent in workplace settings, where first responders may fear negative career consequences from being too honest about their health (Bell & Palmer-Conn, 2018). Participants may have hesitated to accurately report health concerns, especially considering that data collection was conducted by health professionals establishing training regimens, engaging in discussions about health concerns with administration, and using confidential but non-anonymous data collection methods. Furthermore, there is evidence to suggest that participants may not have accurately recorded their own health status. Specifically, perceived health metrics seemed incongruent with other metrics of health, specifically with body fat %, where most of the participants fell within a poor range of functioning. Collectively, we believe that social desirability concerns may have adversely impacted participants' self-rated health assessments. This, in turn, may have hindered our ability to ascertain the existence of relationships between various emotional
regulation dimensions and perceived health. Future researchers should consider using methodological procedures to ensure anonymity in data collection to evaluate whether self-reported health assessments are related to ER dimensions.

We were also a little surprised by the lack of significant relationships between ER domain scores and other health metrics, particularly body fat % and waist-hip circumference. Our findings largely do not support a link between ER and these health dimensions, which contradicts our initial expectations. However, the lack of significant findings is likely due to low statistical power resulting from the small sample size. Examining the correlation matrix (Table 4), the effect sizes of some of these relationships are low-moderate to moderately strong (Cohen, 1992). For instance, body fat % is positively related to difficulties engaging in goal-directed behaviors ($r = .217$) and limited access to ER strategies ($r = .217$). Yet, due to the relatively small sample size, our inferential statistics were only able to detect significant findings with large effect sizes ($r = .4$ and above), prohibiting our ability to detect practically meaningful relationships with moderate or moderately low effect sizes. It will be important for future researchers to re-evaluate our findings with greater methodological power, mostly obtained through collecting more data from diverse FF participants.

**Limitations**

As with any study, this investigation did have its limitations, and these should be noted. First, the small sample size was a critical limiting factor of the study, as only 44 individuals participated. Second, the DERS primarily focuses on regulating negative emotional states (i.e., most items begin with the phrase “When I’m upset”). Future research could incorporate a broader range of self-report measures, such as assessing difficulties with the regulation of positive emotional states. Third, answers from the DERS survey may have been influenced by self-report and environmental bias, such as taking the survey at the department and in the presence of coworkers even though they
were informed about taking the survey in isolation. Fourth, the nature of the Queen's step test for VO2 could impact the reliability of data due to it being based on heart rate and not a true VO2 estimate. Fifth, we failed to assess the impact of stigma on health reporting; individuals may have felt the urge to not fully and honestly answer health-related questions. Sixth, the generalizability of these findings is an issue. Specifically, these findings are only applicable to rural FFs who identify as white men. The sample of FFs contained little diversity in terms of gender identity, ethnic identity, and geographic location. Therefore, we do not know if our findings will hold with more diverse sample of FFs. Finally, these data are correlational and collected through a cross-sectional design. Therefore, we cannot make attributions about whether ER dimensions impact different health metrics. More longitudinal- and intervention-based designs are needed to determine if certain ER dimensions influence the development, maintenance, and expansion of health and fitness, particularly in cardiovascular endurance training.

**Strengths, Clinical Applications, and General Conclusions**

Despite these limitations, the current study possesses a significant number of strengths. Importantly, this was the first study to evaluate ER dimensions in the context of a health assessment with FF samples. Currently, there are severe and extensive gaps in explaining how behavioral health metrics (i.e., ER) may promote better fitness approaches in FFs, especially those in geographically isolated and under-resourced areas of the US. Our findings offer extremely preliminary evidence for the role of ER dimensions on different health outcomes. Particularly, our results highlight a strong relationship between emotional awareness and cardiovascular endurance. From a clinical perspective, future research needs to evaluate the effectiveness of emotional awareness programs in helping FFs develop and maintain high commitment to building cardiovascular endurance. Programs like the Emotional Skills Training (Smith et al., 2024) and RISE (Reconnecting to Internal
Sensations and Experiences; Smith et al., 2023) appear suitable to help FFs extend their emotional awareness skills in ways that support greater adherence and commitment to maximizing benefits from fitness training.

In addition, this was the first study to evaluate the connection between ER dimensions and health metrics using more objective health assessments (i.e., Waist-Hip Ratio, Estimated VO2 NFPA, and Body Fat %). Commonly, relationships drawn from ER research heavily rely on self-reports indices of health. While important, these indices are limited by how individuals perceive certain facets of their health. Instead, our findings highlight more concrete evidence that certain ER dimensions are connected to behavioral and objective assessments. Finally, our study offers some important insights on how fire departments can emphasize behavioral health elements in everyday training and work response approaches. Currently, the requirements for health standards and mental health screenings are minimal across FF settings. The data gathered from this study can aid in establishing stronger mental health screenings and resources. Importantly, it seems prudent for fire departments to include behavioral health screeners in estimating more holistic forms of health. These screeners should include a recognition of negative and positive emotional states and how such states are being managed in the fulfillment of work responsibilities and managing work-life balance. Results leveraged from these screeners can support early intervention efforts to minimize job-related stress and possibly increase FF commitment to health and wellness training. Our findings also provide some context by which behavioral health training programs (e.g., Emotional Skills Training and RISE) can be implemented effectively. Most notably, these programs should be leveraged as strength-based models of wellness not programs designed to identify and remediate deficits. Using strength-based language, like building skills and capitalizing on identified strengths, may minimize the effects of behavioral health stigmas and reinforce the value of behavioral health.
interventions in FF settings.

Overall, this study adds to the research evaluating rural FF health through a behavioral health lens. Behavioral health mechanisms, like managing emotional awareness, may play a key role in helping FFs commit to and build a better platform of physical health. However, shortcomings within our study need to be addressed to better determine if and how ER processes support the physical health of FFs. We hope to leverage these findings into a larger discourse of how ER strategies, and broader behavioral health principles, can serve as better determinants for FF health.
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Declaration of Conflicting Interests

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References


Winter, F.D., Seals, N., Martin, J., & Russell, B. (2010). Implementation of the first wellness-fitness evaluation for the Dallas Fire-Rescue Department. *Baylor University Medical Center*

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