

Resilience, Psychological Stress, Physical Activity, and BMI among United States Air National Guardsmen: The COVID-19 Pandemic

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Background: Military service members carry the responsibility to maintain physical and psychological readiness. As such, it is critical for researchers to begin unravelling the widespread impact of the COVID-19 pandemic on service member's mental and physical wellbeing. The aim of this research was to investigate the complex relationships between BMI, physical activity, psychological stress and resilience among United States Air National Guardsmen (USANG), specifically during the pandemic.

Methods: An online survey was distributed to USANG members. The survey included: measures of resilience (CD-RISC-25), perceived psychological stress (PSS), perceived psychological stress brought on by COVID-19 (COVID-19 PSL), current levels of physical activity (IPAQ-SF), perceived impact on physical activity brought on by COVID-19 (COVID-19 PAL), and BMI. Pearson's correlation coefficients (r) were used to assess correlation significance ($\alpha \leq 0.05$), direction, and magnitude.

Results: A total of 110 responses met inclusion criteria for data interpretation. A majority reported a decline in physical activity 54.5%, while 60% reported an increase in psychological stress. According to BMI classifications, 60.9% were considered overweight or obese. Seven meaningful (effect size $\geq |2.0|$) and statistically significant salient associations were identified: resilience-PSS $r = -0.38$; resilience-COVID-19 PAL $r = 0.21$; PSS-COVID-19 PSL $r = 0.35$; PSS-COVID-19 PAL $r = -0.23$; COVID-19 PSL COVID-19 PAL $r = -0.24$; IPAQ-SF-BMI $r = -0.23$; BMI-Covid-19 PAL $r = -0.32$.

Conclusion: Key outcomes suggest: resilience is inversely associated with assessed and perceived stress, resilience may influence health-related behaviour which subsequently might aid as a protective factor against psychological stress. Knowledge regarding the relationships between the aforementioned variables may help inform decisions by military leadership regarding future lockdowns.

Key Words: Military, Physical activity, Stress

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INTRODUCTION

Chronic psychological stress, physical inactivity, and excess adiposity have been associated with the development of stress- and inflammatory-related diseases and disorders (autoimmune, metabolic, cardiovascular, psychiatric, and somatic) [1]. In addition, prolonged hormonal and physio-

logical activation of the stress response has been shown to cause systemic disturbances that progress into chronic perturbations such as anxiety disorders, negative psychosocial coping mechanisms, and chronic disease [2-4].

As a general term, stressors are manifested in various forms: psychological, physiological, and behavioral, and may either stand alone or be compounded through multiple or simultaneous exposures. Military personnel are not immune to the negative consequences associated with the accumulation of chronic stress. Stressors within the field of tactical operations may present itself through affects such as cognitive overload, thermal stress (hot and cold environments), caloric restriction, sleep deprivation, physical exertion, and emotional or psychological stress [5]. However, the conditions under which physical and psychological stressors become detrimental to one's health is highly variable among individuals and deserves more attention.

In recent years, the United States Department of Defense (DoD) has set out on a mission to empower military leaders and implement programs which focus on reducing the stigma associated with mental health services and employ a targeted approach to enhance protective factors for improving mental health such as resilience [6]. Resilience within the military may be defined as having the capacity to overcome adversity without negatively influencing military performance and/or combat effectiveness [5]. Within the context of wartime operations, resilience captures the concept of having the internal resolve to prevail in volatile, uncertain, complex and ambiguous environments [5]. As research has shown that negative health-related outcomes due to chronic stress may be mitigated in individuals who demonstrate high levels of resilience, the DoD has formed and implemented curriculums which incorporate real-world applications of clinical psychology in an attempt to enhance this quality among service members [5-7].

Research within the Armed Forces has highlighted the predictive ability of an individual's level of resilience to health-related behaviors and retention outcomes. Suboptimal levels of resilience have been shown to be a predictor of adverse health outcomes such as post-deployment adjustment difficulties among Navy personnel [8], self-reported alcohol misuse among military veterans [9], as well as unsuitability or mental illness among Air Force recruits

[10]. Thus, resilience is a supple term and has practical applications throughout many diverse contexts.

There are seemingly a multitude of factors which influence an individual's general health and allostatic load. Research suggests regular participation in physical activity mitigates behavioral stress disorders such as depression and anxiety as well as adverse health outcomes [1]. Data also demonstrates that physical fitness has positive psychological and physiological benefits, which in turn buffer stress reactivity and the development of stress-related mental disorders and chronic disease [1,11,12]. The findings from the latest Health-Related Behaviors Survey (HRBS), collected by Meadows et al. (2018) [7] revealed only 50% of active duty service members self-reportedly engaged in vigorous physical activity for at least 75 minutes per week, while 64.1% engaged in moderate physical activity for at least 150 minutes per week. Although the prevalence of chronic disease diagnoses was lower among service members than the general public, 38.6% had at least one diagnosed chronic physical health condition. Though the source of obesity remains multifactorial, many researchers have attributed the prevalence of obesity to environmental factors such as physical, social, cultural, economic, and policy, all of which play critical roles in modifiable behaviors and ultimately determine health outcomes [13-15].

Body mass index (BMI) and mortality rates share a strong correlation when evaluated across broad geographical areas and populations [16]. The prevalence of active duty service members with overweight and obesity has sky rocketed by 73% between the 2011 HRBS and the 2015 HRBS [17]. The health consequences associated with having overweight or obesity include the development of comorbidities such as hypertension, type-2 diabetes, coronary heart disease, stroke, osteoarthritis, respiratory problems and various forms of cancer [16-18]. The DoD spends approximately \$1.5 billion in annual health care costs to provide medical treatment for obesity-related illnesses and injuries for current and former service members and their families, as well as the costs associated to replace unfit service members [17]. It is also estimated that absenteeism in active service members because of having overweight or obesity is roughly 658 thousand days per year and costs the DoD upwards of \$103 million per year [17]. In a cross-sectional study conducted

by Shiozawa and colleagues, there was a disproportionately higher rate of health care visits for diagnostic categories involving musculoskeletal injuries, mental health, and the endocrine system among soldiers with obesity [19]. Service members unable to meet deployment readiness standards threaten U.S. national security and results in devastating fiscal consequences for the DoD.

In March of 2020, the World Health Organization (WHO) officially declared the novel SARS-CoV-2 (COVID-19) outbreak a global health pandemic [20]. Many military installations have responded to the pandemic by escalating Health Protection Condition (HPCON) levels, resulting in the cancelation of personnel gatherings, base gym closures, the suspension of official duty and training assignments, as well as the postponement of the physical fitness test (PFT). As of December 7, 2020, approximately 18,000 National Guard troops have been activated as a result of major disaster declarations submitted by state and territory leaders [21]. National Guard troops have been mobilized across the United States to support in-state and territorial mission assignments such as distributing food and personal protective equipment (PPE), contact tracing, mobile testing sites, as well as patient care to aid in vaccination distribution and administration (Fig. 1).

Given this unique role in supporting the COVID-19 response mission, national guardsmen are under a considerable amount of pressure to maintain deployment readiness to support state, national, and global mission assignments. Due

to the novelty of the pandemic, data that evaluates the potential health-related discourse associated with the COVID-19 pandemic on military personnel remains extremely rare. Moreover, most of what is known about physical fitness and resilience among military service members stems from research conducted within active duty military components, as such, there is limited research examining health and human behavior constructs within the United States Air National Guard (USANG) population [7,11].

As the complex relationship between resilience and stress has been viewed both as a bi-directional and a dichotomous pair, our research aims to examine the associations between resilience and variables such as psychological stress, physical activity, and BMI within the USANG, particularly during the COVID-19 pandemic. Knowledge regarding the relationship between the aforementioned variables may help inform decisions by military leadership regarding policy/training in order to prepare for ongoing and/or future COVID-19 lockdowns.

MATERIALS AND METHODS

1. Participants

Only active USANG personnel, both men and women, serving at the respective Mountain-West Guard Base were considered eligible participants for this research study. Individuals who had recently retired, separated, or discharged, or were pregnant did not fit the inclusion criteria



Fig. 1. In response to COVID-19 National Guard troops mobilized across the United States to support mission assignments such as distributing food and personal protective equipment (PPE), contact tracing, mobile testing sites, as well as patient care to aid in vaccination distribution and administration. Public domain: <https://www.ang.af.mil/Media/Photos/>.

and were rejected from the data sample. There was no obligation for USANG members to participate in the study. Collected responses and individual identities of participants remain strictly confidential and anonymous. USANG did not receive any compensation or incentives for participation. Permission was obtained from the Southern Utah University (SUU) Institutional Review Board (IRB) prior to collecting any personal information.

2. Procedures

An online questionnaire was disseminated among National Guardsmen at an USANG base located within the US Mountain-West Territory. Data were collected from July to September, 2020 with approval from the Air Force Survey Office (AFSO) as well as the Wing Judge Advocate General (JAG) officer, Wing Commander, and other leadership entities of the respective Air National Guard base. All methods were administered in accordance with AFMAN 36-2664 directives and did not involve the use of any federal resources provided by the United States Air Force (USAF). Service members had the option of participating in the survey by either scanning a QR code from one of the printed flyers posted on community announcement boards located across the base or by having one of the researchers send a personalized link to their civilian email address or mobile device. The survey consisted of questions pertaining to demographics, current psychological perception of stress, resilience, average frequency and duration of physical activity during the pandemic (from the time COVID-19 was declared a public health emergency) and BMI. Respondents were also asked to rate how the COVID-19 pandemic has personally affected their current levels of psychological stress (COVID-19 PS Level) and physical activity (COVID-19 PA Level) using a Likert scale assessment.

3. Measures

Under essential ethical and legal obligation, a written form of consent (Waiver of Documentation of Consent: HRP-411) was provided to all participants. Consent was assumed if the service member read through the informed consent and chose to click on the link to the survey. Participants were asked to provide information regarding their age, gender, race/ethnicity, marital status, military

rank, and current measures of height and weight. Participants were also asked to report if they had experienced a recent illness, injury, or childbirth within the last 6 months which would have resulted in a significant reduction or complete cessation of physical activity. Those who answered “yes”, were also included in the total data set to highlight the existence of any potential relationships between the variables under investigation. Other measures included in the survey are described below.

The Perceived Stress Scale (PSS) is a 14 item, self-reported standard instrument for measuring the extent to which an individual perceives various experiences and circumstances as stressful [22]. The questions in the scale ask respondents to identify the frequency of a proposed emotional state “*during the last month*” by choosing from a 5-point Likert scale ranging from 0 = never to 4 = very often. Scores ranging from 0-13 are assigned to the “low stress” category, while scores ranging from 27-40 are assigned to the “high stress” category, respectfully. The PSS allows clinicians to assess general levels of stress and offers valuable insight as to how the perception of stress potentially influences the ability to cope which is often associated with mental and physical health problems. While there is limited data on the perceptions of stress within the military, a study conducted by Park and Colvin [23], analyzed a sample of 373 military personnel found that overall, the PSS showed a person and item reliability of .82 and .98 based on Rasch reliability and has the ability to identify certain psychometric properties among military personnel [23]. At the end of the PSS portion of the survey, participants were asked, “Since the start of the pandemic, please indicate how it has personally affected your current levels of stress” and given the following options: (1 = *decreased dramatically*; 2 = *decreased some*; 3 = *stayed the same*; 4 = *increased some*; 5 = *increased dramatically*).

The 25-item Connor-Davidson Resilience Scale (CD-RISC-25) is intended to measure internal resolve and adaptability and includes the evaluation of five psychometric factors of resilience; (1) personal competence; (2) effects of stress; (3) acceptance of change and strong relationships; (4) control; and (5) spiritual influences. Each item in the CD-RISC uses a 5-point Likert scale from 0 = not true at all to 4 = true nearly all the time [24]. Scores are the sum

of all 25 items, with higher scores reflecting greater resilience [24]. The total possible scores on the CD-RISC-25 range from 0-100. The reported Cronbach's α for scores on the CD-RISC-25 range from .88 to .92, there is extensive psychological research which demonstrates this scale's validity and reliability within many diverse contexts such as; professional and athletic populations, patients in treatment for post-traumatic stress disorder (PTSD), survivors of various traumas, and military personnel [6,24,25].

The International Physical Activity Short-Form Questionnaire (IPAQ-SF) is a 7-item questionnaire which was designed to measure habitual physical activity across all domains of sport, leisure and recreation, work, transportation, household tasks, and sitting during an average week. The IPAQ-SF allows respondents to report frequency and duration "during an average week" of sitting, walking, moderate-intensity and vigorous-intensity physical activity performed for at least 10 minutes duration per session. In the interest of understanding what kinds of physical activities USANG engaged in during the COVID-19 pandemic, respondents were asked about, "the time you spent being physically active within an average week from the time when the United States declared the COVID-19 pandemic as a national emergency on March 13, 2020 until present day today". Each domain of the self-reported physical activity data is then transcribed into metabolic equivalents (METs) which essentially represents the rate of energy expended during an activity relative to a person's resting metabolic rate. The total MET minutes per week is used to categorize the sample population into three levels of physical activity: "low" (physically inactive), "moderate" and "high" levels of physical activity [26,27]. Due to the restrictions implemented by national and state officials in response to the pandemic, respondents were also instructed to, "please indicate how it (businesses, gyms, and recreational area suspensions or closures) has personally affected your current levels of physical activity." Respondents were given the 5-point Likert scale assessment (1 = *drastically decreased* to 5 = *drastically increased*) presented in the COVID-19 PS Level measure.

4. Analysis

Data obtained from the Qualtrics survey were checked

for completeness and filtered to ensure participants met inclusion criteria. Data were exported to SPSS version 27.0 and analysed. The initial analysis included descriptive statistics to characterize information regarding age, gender, race/ethnicity, marital status, military rank, and current height and weight. The magnitude and direction of associations for PSS, CD-RISC-25, IPAQ-SF, BMI, as well as self-perceived levels of physical activity (COVID-19 PA Level) and perceived stress (COVID-19 PS Level) during the COVID-19 pandemic was assessed by utilizing Pearson correlation coefficients to assess bivariate correlations. The effect size of the bivariate correlations were determined as defined by Cohen [28]: small $r = 0.10$, medium $r = 0.30$, and large $r = 0.50$. The statistical significance for the study was set at a value of $\alpha \leq 0.05$.

RESULTS

A total of 121 responses ($N = 121$) were collected during the 8-week recruitment period, of which 110 USANG ($n = 110$) met the inclusion criteria for data interpretation. Of the 110 participants, 72 were male and 38 were female. Descriptive data outlining participant demographics are presented in Table 1.

When assessed for current levels of psychological stress using the PSS, 1.8% ($n = 2$) were in the high-stress category, 34.5% ($n = 38$) were in the moderate category, and 63% ($n = 70$) were in the low stress category, respectively. Though, when asked to evaluate how the pandemic has personally affected current levels of psychological stress, 50.9% ($n = 56$) indicated that the COVID-19 pandemic had increased some of their overall stress, whereas 9.1% ($n = 10$) reported a dramatic increase. Collectively, a majority of USANG ($n = 66$; 60%) report that the COVID-19 pandemic has left a negative impression on their mental health.

When assessing levels of physical activity during the COVID-19 pandemic, only 0.9% ($n = 1$) reported low-levels of weekly physical activity, 12.7% ($n = 14$) reported moderate levels and 86.4% ($n = 95$) were categorized as having high-levels of physical activity according to the IPAQ-SF scoring tabulation [29]. After completing the IPAQ-SF, respondents were also asked to evaluate how the pandemic has personally affected their overall levels of physical activity;

21.8% (n = 24) reported that their physical activity had dramatically decreased, whereas another 32.7% (n = 36) had indicated that the COVID-19 pandemic had decreased their physical activity to some extent.

Measurements of height and weight were self-reported and BMI was calculated utilizing the metric equation: mass in kilograms/(height in meters)². At the time of survey, a majority of the USANG within our sample were considered to have overweight (50%; n = 55) or obesity (10.9%; n = 12) and 39.1% (n = 43) were of a normal weight, according to BMI classifications. A full statistical analysis of all variables under investigation is presented in Table 2, whereas the frequency analysis of variables may be found in Table 3.

According to bivariate correlations (Table 4), resilience

was inversely associated with psychological stress, as measured by the PSS (r = -0.38; p < 0.001). Likewise, significant associations exist between resilience and self-reported levels of physical activity (COVID-19 PA Level) (r = 0.21; p < 0.05); COVID-19 PA Level and PSS, (r = -0.23; p < 0.05); PSS and COVID-19 PS Level (r = 0.35; p < 0.001); COVID-19 PS Level and COVID-19 PA Level (r = -0.24; p < 0.05); BMI and IPAQ-SF (r = -0.23; p < 0.05); & BMI and COVID-19 PA Level (r = -0.32; p < 0.05).

Table 1. Participant demographics and frequencies

| | N = 110 | n | % |
|--|---------|----|-------|
| Gender | | | |
| Male | | 72 | 65.5% |
| Female | | 38 | 34.5% |
| Age range | | | |
| < 20 years old | | 1 | 0.9% |
| > 40 years old | | 40 | 36.4% |
| 21-25 years old | | 10 | 9.1% |
| 26-30 years old | | 16 | 14.5% |
| 31-35 years old | | 23 | 20.9% |
| 36-40 years old | | 20 | 18.2% |
| Race/Ethnicity | | | |
| African-American/Black | | 2 | 1.8% |
| American Indian | | 1 | 0.9% |
| Asian American/Pacific Islander | | 4 | 3.6% |
| Caucasian/White | | 87 | 79.1% |
| Caucasian/White, Hispanic/Latinx/Mexican American | | 1 | 0.9% |
| Hispanic/Latinx/Mexican American | | 12 | 10.9% |
| Mixed White and Hispanic | | 1 | 0.9% |
| Central Asian | | 1 | 0.9% |
| Caucasian and Asian American | | 1 | 0.9% |
| Relationship status | | | |
| Married | | 75 | 68.2% |
| Never married, but currently in a romantic relationship | | 7 | 6.4% |
| Separated/Divorced/Widowed | | 13 | 11.8% |
| Single | | 15 | 13.6% |
| Rank | | | |
| E1-E4 | | 18 | 16.4% |
| E5-E6 | | 31 | 28.2% |
| E7-E9 | | 31 | 28.2% |
| O1-O3 | | 13 | 11.8% |
| > O4 | | 17 | 15.5% |

Table 2. Variables scores

| | N = 110 | BMI | PSS | IPAQ-SF total activity min/wk | CD-RISC 25 |
|---------|---------|------|------|-------------------------------------|---------------|
| Mean | | 25.8 | 11.8 | 231.0 | 79.6 |
| SD | | 3.3 | 6.4 | 111.5 | 11.4 |
| Minimum | | 19.8 | 0 | 15 | 46 |
| Maximum | | 34.0 | 34 | 540 | 99 |

Table 3. Frequency analysis of variables

| | n | % |
|-------------------------------------|----|-------|
| BMI category | | |
| Normal | 43 | 39.1% |
| Obesity | 12 | 10.9% |
| Overweight | 55 | 50.0% |
| PSS category | | |
| Low psychological stress | 70 | 63.6% |
| Moderate psychological stress | 38 | 34.5% |
| High psychological stress | 2 | 1.8% |
| COVID-19 psychological stress level | | |
| Decreased dramatically | 5 | 4.5% |
| Decreased some | 6 | 5.5% |
| Stayed the same | 33 | 30.0% |
| Increased some | 56 | 50.9% |
| Increased dramatically | 10 | 9.1% |
| IPAQ-SF physical activity category | | |
| Low | 1 | 0.9% |
| Moderate | 14 | 12.7% |
| High | 95 | 86.4% |
| COVID-19 physical activity level | | |
| Decreased dramatically | 24 | 21.8% |
| Decreased some | 36 | 32.7% |
| Stayed the same | 36 | 32.7% |
| Increased some | 8 | 7.3% |
| Increased dramatically | 6 | 5.5% |

Table 4. Bivariate correlations of variables

| | BMI | PSS score | IPAQ-S total activity min/wk | CD-RISC 25 score | COVID-19 PS level | COVID-19 PA level |
|------------------------------|-------|-----------|------------------------------|------------------|-------------------|-------------------|
| BMI | 1.0 | | | | | |
| PSS score | | 1.0 | | | | |
| IPAQ-S total activity min/wk | -0.23 | | 1.0 | | | |
| CD-RISC 25 score | | -0.38 | | 1.0 | | |
| COVID-19 PS level | | 0.35 | | | 1.0 | |
| COVID-19 PA level | -0.32 | -0.23 | | 0.21 | -0.24 | 1.0 |

Only $r \geq |0.20|$ and $p < 0.05$ reported.

DISCUSSION

The purpose of the current investigation was to examine the associations between resilience and constructs such as psychological stress, physical activity, and BMI within the USANG during the COVID-19 pandemic. Seven meaningful (effect size $\geq |2.0|$) and statistically significant salient associations were identified.

Two of the seven salient relationships identified were between resilience and PSS and COVID-19 PS Level. The present study supports that there is generally an inverse relationship between characteristics of resilience and psychological stress. With psychological stress being an inimitable part of the human experience, resilience may serve as a key protective factor during times of adversity as a way to endure stressful or traumatic experiences. Though the term resilience is often viewed as a mindset, our data suggests that physical activity engagement may allow service members to overcome the negative effects of psychological stress through physiological mechanisms. While the degree of stress response is relative to the characteristics of the individual, the situation, and the controllability of the stressor, ultimately perception regulates the nature of the stress response [22].

Consistent with recent global health findings, our data has demonstrated that people commonly experience reductions in physical activity during times of adversity as a result of acute psychological distress [30]. A review by Voliant-Holz et al. [30], indicated that lockdown measures during the COVID-19 pandemic have resulted in a cataclysm of changes in behavior, all of which have contributed to the recent prevalence of psychiatric morbidity and psycho-

logical distress within the adult population [30]. In a review conducted by Stults-Kolehmainen & Sinha [2], the authors concluded that the onset of psychological stress was indicative of sedentary behavior and reductions in physical activity among a majority of populations [2]. While this may suggest that there is generally an inverse relationship between the influence of stress and physical activity, research has also demonstrated that patterns of exercise engagement under stressful circumstances appear to be based on the Transtheoretical Model stages of change (contemplation, preparation, action, maintenance, relapse) [31]. In which case, those who have previously maintained physical activity are more likely to respond to stress by increasing physical activity as a coping mechanism (behavioral activation), and those in earlier stages of the Transtheoretical Model have been shown to respond to stress with reduced physical activity (behavioral inhibition) [2,31]. Findings in a literature review conducted by Liao et al. [32], summarized the associations between affective states and physical activity, suggest that “positive affective states” or “psychological experiences” (emotion and mood) and “physical feeling states” or “sensory experiences” (energy and fatigue) predicts physical activity engagement [32]. While physical activity may be an effective strategy for alleviating psychological stress, its execution as a self-regulated behavior will be largely dependent upon relevant moderators (i.e. resiliency; self-efficacy; physical activity enjoyment; social, physical, and psychological context, etc.).

Self-reported reductions in physical activity engagement during the COVID-19 pandemic is likely due to a variety of factors, one of which may be attributed to the social isolation individuals could have experienced during the quar-

antine period employed to mitigate the spread of SARS-CoV-2 infection. With the prevalence of mental health disorders on the rise, the DoD has made a point to underscore the significance of sustaining resilience in means of preserving the strength of the US Armed Forces during the COVID-19 pandemic. In a review conducted by Meredith and colleagues [6], researchers concluded that the development of resilience within the military is fostered by several key intrinsic and extrinsic elements. While individual-level elements (positive coping, positive affect, positive thinking, realism, behavioral control, physical fitness, and altruism) remain at the very core of resilience, external support systems to include family-level (i.e. support, nurturing, communication, and emotional connection), unit-level (i.e. positive command climate, teamwork, and cohesion), and community-level (i.e. belonging, cohesion, connectedness, and working together) appear to enhance resilience to stress, improve quality of life, and buffer against trauma-induced disorders [6,33]. Likewise, a review conducted by Theorfilou and Saborit [34] identified social support (i.e. group cohesion, physician influence, a socially supportive environment through friends, family, and spouse) as having significant associations with adherence to physical activity in previous cross-sectional and prospective studies [34]. Thus, while reductions in physical activity may have been related to logistical limitations imposed by the COVID-19 pandemic, diminished social support due to the “stay at home” order appears to have played a pivotal role in further exacerbating the effects of isolation and sedentary behavior on general health and well-being [35].

Though aspects of normalcy during the COVID-19 pandemic seem far removed, many of the resultant restrictions and stressors arguably resemble the unknown and austere conditions that service members may be confronted with in a tactical environment where opportunities for structured exercise is limited and exercise frequency and volume is significantly reduced. In these instances as well as within the context of other stressful circumstances, individuals may need to adjust their physical activity goals and expectations and focus on maintaining a basic level of physical readiness. According to a review by Spiering et al. [36], it appears that endurance performance may be maintained for up to 15 weeks when training volume is reduced by 33-66% or as

little as 2 times per week, so long as exercise intensity is maintained [36]. Whereas muscle size and strength may be maintained for up to 32 weeks with only 2 sessions per week and 2-3 sets per exercise among older populations, and only 1 session per week with 1 set per exercise in younger populations, so long as relative intensity (mechanical loading) is maintained [36]. From a practical standpoint these findings indicate that fitness can be maintained even if exercise frequency and duration is decreased, so long as exercise intensity does not decrease.

Maintaining a physical activity regimen during times of stress also appears to benefit mood and cognition [37]. Moreover, the cross-stressor adaptation hypothesis suggests that engaging in acute bouts of exercise has the ability to facilitate the physiological and psychological mechanisms known to be held responsible for attenuating the hormonal response to acute stress [38]. This collection of data suggests that, regardless of stressors and the magnitude of those stressor, individuals should strive for a general wellness routine which focuses on the engagement of physical activity as a consistent behavior so that the long-term neurocognitive and physiological benefits may be realized.

The vast majority of adult physical activity recommendations have been established with the general public in mind. While these recommendations provide relevant insight into the amount of physical activity required to reduce risk of chronic disease, they are not necessarily suitable for military personnel to optimize performance. Crucial to maintaining deployment readiness, exercise program recommendations for service members should remain highly subjective and relative to the person and his or her age, training history and training objectives. Thus, while the IPAQ-SF categorical scoring protocol classified a majority of our sample (86.4%; n = 95) into the “high level” of weekly physical activity, to date, data regarding effective training and assessment recommendations for military personnel continue to evolve [39-45]. Nonetheless, regular participation in physical activity appears to have significant merit in the prevention of stress-related inhibitions and obesity-related chronic ailments which have been observed after extended periods of physical inactivity.

While it may be perceived as an outdated tool for assessing overall health and disease risk, the DoD commonly em-

ploys BMI as a method to interpret population-level trends within the Armed Forces. Today, the BMI measurement remains at the epicenter of many controversial debates regarding its capacity to efficaciously screen an individual's prevalence for illness and disease risk. Nonetheless, recent data suggests that COVID-19 infection presents extraordinary risks and a burden of complications among those who have moderate to severe obesity. Due to excess adipose tissue, individuals with obesity are in a chronic inflammatory state, potentially leading to a disruption in immune and thrombogenic responses to pathogens as well as impaired lung function [46].

To our knowledge, this is the first study to evaluate the extent to which the global COVID-19 pandemic has affected health-related behaviors among military service members. Through our investigations, we have uncovered that resilience appears to play a pivotal role in moderating health-related behaviors such as physical activity during the COVID-19 pandemic. Though, a clear weakness within our study was the apparent lack of diversity within this particular sample of the population. With a predominantly white sample (79.1%; n = 87), the inference of data remains highly contextual.

Furthermore, we acknowledge that the inference of data is based upon the ability of each participant being able to accurately report his or her height and weight as well as recall previous physical activity patterns and psychological stress prior to the COVID-19 pandemic. Due to the varying degrees of deviation associated with BMI when compared to other field measurements, we recognize that self-reported data, while feasible and non-invasive, is not preferred and presents substantial limitations with regards to assessing general health and well-being. Additionally, rather than expressing these findings as causative, we recognize that our research highlights the correlational trends and associations relative to resilience and specifically reflects the data collected within a sample of USANG stationed within the Mountain-West territory.

CONCLUSION

Within the parameters of this study:

- USANG members experienced an increase in psycho-

logical stress and a decrease in physical activity during the COVID-19 pandemic,

- Resilience is inversely associated with assessed and perceived stress,
- Characteristics of resilience appear to have a distinct influence on health-related behaviour (physical activity), which subsequently may aid as a protective factor against psychological stress, and
- Knowledge regarding the relationship between the aforementioned variables may help inform decisions by military leadership regarding policy/training in order to prepare for ongoing and/or future COVID-19 lockdowns.

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