Active Warfighter Resilience

A Descriptive Analysis

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ABSTRACT

Purpose: Our aim in this study was to psychometrically test resilience assessments (Ego Resiliency Scale [ER89], Connor-Davidson Resilience Scale [CD-RISC 25], Responses to Stressful Experiences Scale [RSES short-form]) and describe resilience levels in a Special Operations Forces (SOF) combat sample. **Methods:** Fifty-eight SOF combat Servicemembers either entering SOF (career start; n = 38) or having served multiple years with their SOF organization (mid-career; n = 20) self-reported resilience, mild traumatic brain injury (mTBI) history, and total military service. **Results:** All resilience metrics demonstrated acceptable internal consistency, but ceiling effects were found for CD-RISC and RSES scores. ER89 scores were moderate on average. ER89 scores were higher in SOF career start than mid-career Servicemembers ($\eta_p^2 = 0.07$) when accounting for the interaction between SOF career stage and total military service ($\eta_p^2 = 0.07$). **Discussion:** SOF mid-career Servicemembers had similar ER89 resilience scores with more total military service. The SOF career start combat Servicemembers had higher ER89 measured resilience with less total military service only, potentially showing a protective effect of greater service before entering SOF. **Conclusion:** The ER89 may be a more optimal military resilience metric than the other metrics studied; longitudinal research on SOF combat Servicemember resilience is warranted.

Keywords: *ego resiliency; US Army; US Air Force; psychometrics; readiness*

Introduction

Resilience, an individual's capacity to equilibrate or adapt affective and behavioral responses to adverse physical or emotional experiences,[1] is an increasingly popular topic in military research and training settings.[2] Although resilience research with military Servicemember populations increased approximately 10 years ago in conjunction with rising Servicemember suicide rates,[3] there is no consensus on resilience measurement.[4] The present study aimed to psychometrically assess multiple resilience metrics and describe resilience with respect to stress-related factors in active-duty SOF combat Servicemembers.

One methodological review of resilience scales postulated that the 25-item CD-RISC[5] was the most psychometrically sound but concluded that there was still no gold standard. That is, no single psychometric assessment excels in providing criterion, content, and construct validity alongside internal consistency, reproducibility, and floor/ceiling effects.[4] Resilience psychometric assessments include the CD-RISC[5] and ER89,[1] both of which were created to measure one's resilience dispositions and tendencies. These metrics have exhibited acceptable[6] internal consistency in military[7-11] and civilian adult[12,13] samples. Because of the relatively taxing military environment, researchers have created a military-based resilience scale, the RSES,[10] which explained incremental variance in posttraumatic stress disorder symptoms after controlling for the CD-RISC.

Servicemembers have endorsed high resilience relative to the RSES[10] and the CD-RISC[7,14] ceilings in military resilience literature. A notable exception to ceiling effects was a study of Servicemembers deployed to combat settings (i.e., in theater).[8] It is possible that military Servicemembers selected their occupation because they were high in resilience, but high scores do not align with the mental health problems seen in active and retired Servicemember samples.[15-17] Being mentally healthy (i.e., with low mental illness symptoms, high well-being) is a postulated tertiary component of resilience, and these constructs have been associated across multiple populations.[18] This discrepancy between Servicemembers endorsing high resilience, as well as having a prevalence of clinical mental health disorders, reduces the construct validity of those measures. Because resilience is a construct that is so inherently desired in the

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military,[10] metrics may not be performing as well as theorized, in part because of conscious or unconscious social desirability and/or self-serving biases that result in inflated scores. This leaves military resilience research, which has generally used the CD-RISC,[8,19] in search of a better metric.

The ER89, in contrast, has relatively low face validity (i.e., in which a scale's items look like the construct they measure).[6] It has been argued that having high face validity may not necessarily inherently indicate optimal measurement, especially when the construct is one that the respondent may or may not wish to possess.[6] This is particularly pertinent for resilience because the capacity to adapt well to stress is integrally necessary for success in the military.[10] The ER89 has also demonstrated high content validity—scale items representing the span of the underlying construct[6]—with not only mental health outcomes, but also adaptive biological stress responses that align with the definition of resilience.[12,20] Specifically, individuals with higher ER89 scores recovered faster from visual[12] and physiological[20] stressors. Further, ER89 scores have been moderate, on average, across SOF combat Servicemembers.[20] With this, the ER89 may be a more optimal resilience metric for military populations, but no study has investigated these resilience metrics concurrently. Therefore, our first aim was to psychometrically assess the ER89, CD-RISC, and RSES head-to-head in SOF combat Servicemembers.

As mentioned, the ER89, CD-RISC, and RSES were generally designed to measure dispositional resilience, which most foundational research in this area considered it to be. With this understanding, resilience is conceptualized as a set of adaptive traits that an individual tends to display across contexts.[18] In line with stress theory,[21] researchers have since combined intrapersonal and environmental factors to best conceptualize resilience as a dynamic coping process that involves state and trait factors. State factors are transient and based on the momentary context, including factors such as one's available resources. Trait factors are generally stable across contexts and include a person's protective personality traits.[5,18] State and trait factors combine when coping with a stressor, and their interaction results in various behavioral and affective responses.[22] This process is iterative—influenced by past experiences—and, therefore, individual resilience should be measured as trajectories over time. There is potential growth in learning from past experiences, known as posttraumatic growth,[23] but there are also factors that can lead to decreased resilience.

In the military context, with continual exposure to stress (i.e., training, deployment, injury), the consistent resource depletion may accumulate into actual resilience decrements. Following stressor exposure, resilience may be impaired if the individual does not have time to process information or recover following adaptation, which may lead to decay in one's resilience.[24] This agrees with more recent resilience research, which argues that an individual cannot respond resiliently when their resources are depleted, making them vulnerable to stressors.[25] This vulnerability can occur when the system is impaired and especially when the adversity is prolonged.[2] Indeed, SOF medical researchers acknowledge that "[e]ven the most resilient—those who can withstand the most hardship for the longest periods—have a breaking point."[26] Therefore, combat Servicemembers' resilience could decay from years of SOF service involving continually stressful combat and combat-related training. In the absence of multiyear longitudinal data in this population, there does not exist a strong foundation upon which studying the effect of career occupational exposures may be shown to affect short- and long-term resilience among SOF combat Servicemembers.

A compounding stressor to that of SOF combat service is mild traumatic brain injury (mTBI), which occurs at a relatively high prevalence in active Servicemembers compared with the civilian population.[15] Veterans reported lower trait resilience with a higher prevalence of mTBI history,[27] indicating that sustaining more of these injuries may also impair resilience. For that reason, controlling for mTBI history should highlight the effects of SOF service. Although mid-career SOF combat Servicemembers have had longer SOF careers, this is not a clear indication of total military service (e.g., some Servicemembers may join SOF later in their military careers), and it is important to control for it in the present study to ensure that differences in SOF career stage are preliminary evidence of SOF service effects.

Based on the lack of measurement consensus and SOF resilience description, the present study had two aims: (1) to psychometrically assess three resilience metrics in active SOF combat Servicemembers via central tendency and dispersion, reliability, and content validity, and (2) to differentiate resilience between SOF career stages in combat Servicemembers while accounting for total military service and mTBI history. We hypothesized that all metrics would demonstrate acceptable internal consistency but that the RSES and CD-RISC would show ceiling effects. We also hypothesized that the metrics would relate negatively to mental illness symptoms and positively to subjective well-being. We further hypothesized that SOF career start combat Servicemembers would endorse higher resilience than their mid-career colleagues who have been through more specialized military stress exposure. Finally, we predicted that the ER89 and CD-RISC would be sufficiently sensitive to detect differences in resilience between SOF career stages, even when controlling for mTBI and total military service.

Methods

Participants

Active SOF combat Servicemembers (age, 33.1 ± 4.5 years; all males) were assigned to the United States Special Operations Command (USSOCOM). These combat Servicemembers are affiliated with either the United Stated Army Special Operations Command (USASOC) or the Air Force Special Operations Command (AFSOC). Fifty-eight SOF combat Servicemembers completed the psychometric battery, either when entering SOF (career start; n = 38) or after multiple years with their SOF organization (mid-career; n = 20). Thirty-seven combat Servicemembers were in the USASOC (63.8%; n = 17 SOF career start; n = 20 SOF mid-career) and 21 in the AFSOC (36.2%; n = 21 SOF career start). Thirty-three SOF combat Servicemembers reported no lifetime clinician-confirmed mTBI history (56.9%); those with a mTBI history reported one to six mTBIs. There was no difference in mTBI history between career stages ($\chi^2(1) = 0.03$; $p = .59$). The SOF career start combat Servicemembers tended to be 6.5 years (SE = 0.9) younger than mid-career combat Servicemembers, which was statistically different ($t_{56} = -7.07$; $p < .01$). For this reason, age was controlled for in preliminary analyses. On average, SOF combat Servicemembers have spent approximately 12.6 years in active military service. The SOF career start combat Servicemembers served an average of 10.3 years (range, 5.8 to 27.7 years) and mid-career, an average of 16.9 years (range, 9.6 to

25.5 years) in the military; this was statistically different (t_{56} = −5.53; $p < .01$).

Procedures

American Psychological Association ethical standards were adhered to in the present study.[28] All study participants provided verbal consent prior to testing, and the entire study protocol was approved by the Office of Human Research Ethics at the University of North Carolina at Chapel Hill and by the Human Research Protection Office at the US Army Medical Research and Development Command (USAMRDC). The SOF combat Servicemembers participated in a testing session that took place in a university-based mTBI clinical research center. During that time, each combat Servicemember completed computer-based assessments, prompting them to self-report demographic information. Using the same online platform, participants completed all psychometric assessments.

Measures

Participants self-reported whether they had ever experienced a clinician-confirmed mTBI at any point in their lifetime, the number of mTBIs (ranging from 0 to 10), and the recency of the last injury. For the current project, we used a total of lifetime mTBIs, which has been used in previous SOF research.[29] Each SOF combat Servicemember self-reported their date of birth, which was used to calculate age (in years) from their testing date. Participants also reported their date of enlistment or date of commission; total military service was calculated as the difference between the enlistment or commission date and testing date (in years). Study personnel recorded SOF career stage (career start or mid-career) and USSOCOM branch (Army or Air Force) for each participant.

Resilience

Psychological resilience was measured using three separate valid and reliable psychometric assessments: the ER89,[1] CD-RISC,[5] and RSES.[9] A full description of these metrics can be found in Table 1.

Mental Health

Valid and reliable psychometrics were used to assess subjective well-being (the Mental Health Continuum-Short Form),[30,31] depression (the Patient Health Questionnaire),[32] anxiety (the Generalized Anxiety Disorder questionnaire),[33] and posttraumatic stress (the Posttraumatic Stress Disorder Checklist).[34] Items for each measure were aggregated to calculate four symptoms scores, with higher scores indicating higher subjective well-being, depression, anxiety, and posttraumatic stress.

Data Analyses

Demographic variables were probed for significant bivariate correlations to all resilience metrics and were appropriately controlled for in further analyses. Data were tested for statistical assumptions to inform hypothesis testing. A Shapiro-Wilks normality test was used to determine normal distributions of participant responses. To test the first aim, central tendency and dispersion values (means and standard deviations or medians and ranges based on skewness, as well as minimum and maximum scores and interquartile ranges) and internal consistency (Cronbach's alpha) values were computed. Additionally, Pearson bivariate correlations were run between each resilience metric and mental health symptoms. To test the second aim, one resilience metric was the dependent variable, and SOF career stage was the independent variable, while age, mTBI history, and total military service were covariates. The ER89 showed a normal distribution, and therefore, multivariable regression analyses were used. Two separate Poisson regression analyses were used for the CD-RISC and RSES because these were both discrete and negatively skewed. Because of graphical representation of study variables, the interaction between SOF career stage and total military service was also probed. Post hoc contrast analyses for low, median, and high resilience used quartile ranges per resilience metric. The criterion for statistical significance was set a priori at 0.05. All data were analyzed using SAS statistical software (version 9.4; SAS Institute). Materials and analysis code for this study are not available.

Results

Psychometric Assessment and Description

The CD-RISC (skewness = −0.61; W = 0.95; $p = .014$) and RSES (skewness = −1.30; W = 0.72; $p < .001$) were both negatively skewed and exhibited non-normal distributions. Medians and interquartile ranges are reported. All resilience metrics exhibited acceptable[6] internal consistency (RSES α = 0.71; CD-RISC α = 0.85; ER89 α = 0.77). Across subjects, SOF combat Servicemembers reported moderate resilience, as indexed by the ER89 (mean = 46.21 ± 5.03 out of 56), as well as high resilience, as indexed by the CD-RISC (median = 88.5; interquartile range [IQR] = 11 out of 100) and the RSES (median = 16; IQR = 2 out of 16) relative to response options. Twenty-seven SOF combat Servicemembers (46.55%)

TABLE 1 *Study Resilience Psychometrics*

Metric	Scale	Items	Example Items	Scoring[a]
Ego Resiliency Scale (ER89) (Block & Kremen, 1996)	1 – Does Not Apply at All 2 – Applies Slightly 3 – Applies Somewhat 4 – Applies Very Strongly	14	• I enjoy dealing with new and unusual situations. • I get over my anger at someone reasonably quickly.	Aggregate (14–56) Higher score = higher resilience
Connor Davidson Resilience Scale (CD-RISC) (Connor & Davidson, 2003)	0 – Not True at All 1 – Rarely True 2 – Sometimes True 3 – Often True 4 – True Nearly All the Time	25	• Under pressure, I stay focused and think clearly. • Having to cope with stress makes me stronger.	Aggregate (0–100) Higher score = higher resilience
Response to Stressful Experiences Scale (RSES) – Brief (De La Rosa et al., 2016)	0 – Not at All Like Me 1 2 3 4 – Exactly Like Me	4	• During and after life's most stressful events, I tend to find a way to do what's necessary to carry on. • During and after life's most stressful events, I tend to learn important and useful life lessons.	Aggregate (0–16) Higher score = higher resilience

[a]possible range reported in parentheses

endorsed in the top 10% possible CD-RISC scores, and 35 (60.34%) endorsed the highest possible RSES score, indicating ceiling effects. Resilience central tendency and dispersion calculations for each SOF career stage group can be found in Table 2. In regard to content validity, the ER89 and CD-RISC scores were significantly related to subjective well-being and not to depressive, anxiety, or posttraumatic stress symptoms. The RSES was significantly related to all mental health symptoms. Correlations between resilience and mental health symptoms can be found in Table 2.

SOF Career Stage Differences

In preliminary SOF career stage difference models, age did not individually associate with ER89 (t_{55} = 0.93; p = .357), CD-RISC [$\chi^2(1)$ = 0.03; p = .870], or RSES scores [$\chi^2(1)$ = 1.39; p = .239] and was therefore dropped from all subsequent models.

ER89

In a univariate model, there were significant SOF career stage ER89 differences (t_{52} = -2.51; p = .015). However, there were no significant SOF career stage differences in ER89 scores when accounting for total military service and mTBI history (t_{53} = −1.71; p = .094). Total military service (t_{53} = 0.82; p = .415) and mTBI history (t_{53} = −1.09; p = .282) showed nonsignificant main effects. Then, the interaction effect between career stage and total military service was added. The interaction effect was significant (t_{52} = −2.04; p = .047), indicating that SOF career stage differences were a function of total military service (see Table 3). Partial variance accounted for by career stage (η_p^2 = 0.11) and the interaction effects (η_p^2 = 0.07) exhibited medium-to-large effect sizes.[35] Post hoc contrasts revealed that SOF mid-career combat Servicemembers with low (t_{48} = −2.27; p = .028) and moderate (t_{48} = −2.31; p = .025) total

TABLE 2 *Central Tendency and Dispersion Values for Each Resilience Metric Across Participants and Within Each SOF Career Stage, and Correlations between Resilience Scales and Mental Health Symptoms*

Resilience Metric	Overall	SOF Career Start	SOF Mid-Career	Subjective Well-being	Depression	Anxiety	Posttraumatic Stress
ER89				0.42**	−0.12	−0.15	−0.17
Mean (SD)	46.21 (5.03)	47.02 (4.41)	44.65 (5.83)				
Range	34–54	37–54	34–54				
Metric Ceiling	56	56	56				
CD-RISC				0.29*	−0.20	−0.18	−0.12
Median (IQR)	88.5 (11)	87.5 (15)	90 (9.5)				
Range	66–100	66–100	73–98				
Metric Ceiling	100	100	100				
RSES				0.56**	−0.47**	−0.33**	−0.37**
Median (IQR)	16 (2)	16 (1)	15.5 (2)				
Range	11–16	11–16	12–16				
Metric Ceiling	16	16	16				

CD-RISC, 25-item Connor Davidson Resilience Scale; ER89, Ego Resiliency Scale; RSES, Short Form Response to Stressful Experiences Scale; SOF, Special Operations Forces.

Means and standard deviations are reported for the ER89, but medians and interquartile ranges are reported for the CD-RISC and RSES. Pearson correlations were used to assess the relationship with mental health variables for the ER89. Spearman correlations were used for the CD-RISC and RSES.

*p < .05, **p < .001.

TABLE 3 *Model Estimates and Standard Error for Each Resilience Metric*

Resilience Metric	Parameter	Main Effects	SOF Career Stage and Total Military Service Interaction
ER89	Intercept	46.04 (3.15)**	47.87 (2.20)**
	SOF Career Stage	−2.96 (1.71)	−12.63 (5.04)*
	Total Military Service	3.60 (4.39)	−1.83 (5.03)
	mTBI History	−0.50 (0.46)	−0.31 (0.46)
	SOF Career Stage*Total Military Service		17.73 (1.03)*
CD-RISC	Intercept	4.52 (0.06)**	4.51 (0.10)**
	SOF Career Stage	0.08 (0.04)*	0.08 (0.13)
	Total Military Service	0.17 (0.09)†	0.17 (0.11)
	mTBI History	0.01 (0.01)	0.01 (0.01)
	SOF Career Stage*Total Military Service		0.01 (0.18)
RSES	Intercept	2.71 (0.06)**	2.69 (0.10)**
	SOF Career Stage	−0.02 (0.03)	0.09 (0.10)
	Total Military Service	0.01 (0.09)	0.05 (0.10)
	mTBI History	0.01 (0.01)	0.01 (0.01)
	SOF Career Stage*Total Military Service		−0.21 (0.18)

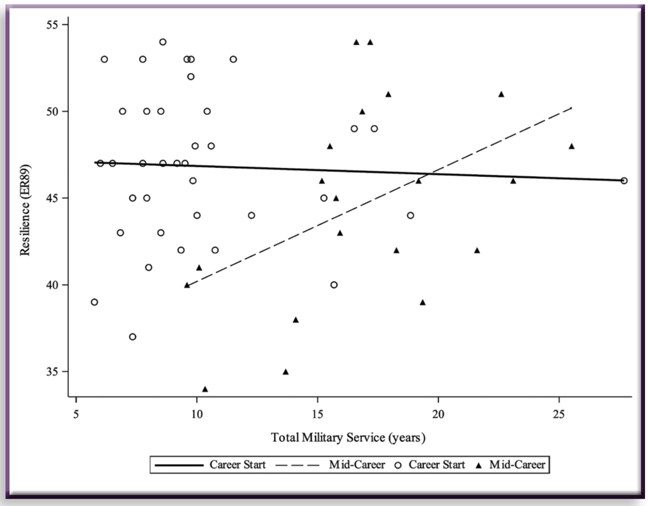
CD-RISC, 25-item Connor Davidson Resilience Scale; ER89, Ego Resiliency Scale; RSES, Short Form Response to Stressful Experiences Scale; SOF, Special Operations Forces.

General linear models were used for the ER89. Poisson regression analyses were used for the CD-RISC and RSES.

†p < .10, *p < .05, **p < .001.

military service tended to report lower ER89 scores than did career start Servicemembers, but ER89 scores between career stages were not significantly different from high total military service (t_{48} = 0.69; p =.494). This interaction is graphically depicted in Figure 1.

FIGURE 1 *ER89 scores between career stages when accounting for total military service.*



CD-RISC

Career start SOF Servicemembers reported lower CD-RISC scores than did mid-career Servicemembers [$\chi^2(1)$ = 4.60; p = .03; Figure 2]. This effect was small, as SOF mid-career combat Servicemembers reported CD-RISC scores approximately 8% higher than those of career start colleagues. Total military service [$\chi^2(1)$ = 3.66; p = .06] and mTBI history [$\chi^2(1)$ = 0.36; p = .55] had nonsignificant main effects (Table 3).

RSES

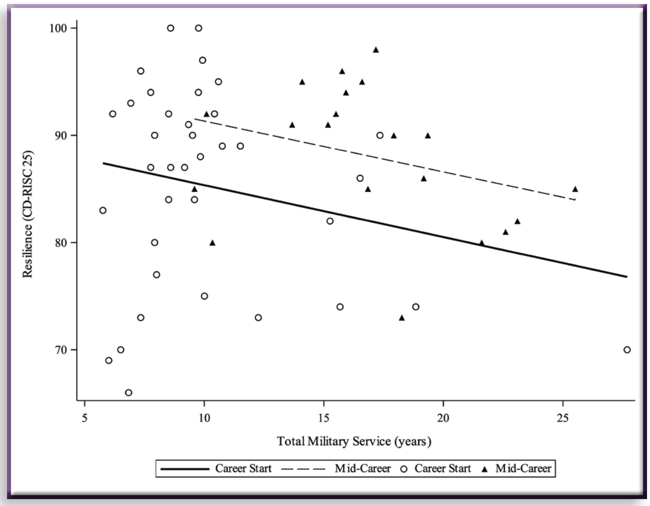
SOF career start and mid-career Servicemembers did not significantly differ in RSES resilience scores [$\chi^2(1)$ = 0.49; p = .48], and neither total military service [$\chi^2(1)$ = 0.01; p = .919] nor mTBI history [$\chi^2(1)$ = 1.26; p = .262] showed significant main effects. Career start and mid-career SOF combat Servicemembers remained similar even when accounting for total military service and mTBI history (see Table 3).

Discussion

The three resilience scales tested in our study were internally consistent, in that scale items were related to the scale as a whole. This is considered a measure of psychometric reliability.[6] The ER89 did not demonstrate ceiling effects; across SOF combat Servicemembers, ER89 scores were moderate, whereas CD-RISC and RSES scores were high relative to possible metric ranges, with the RSES showing little variability to warrant the metric's use. Monitoring overreporting is particularly pertinent for resilience because the capacity to adapt well to stress is inherently desired in the military. The SOF combat Servicemembers endorsed different central tendencies for CD-RISC and ER89 scores despite these metrics claiming to measure the same construct; further construct validity (e.g., physiological stress responses and/or objective performance) of both these metrics may need to be evaluated.

We observed hypothesized positive relationships between the scores on the ER89 and CD-RISC with subjective well-being,

FIGURE 2 *Career start vs. mid-career SOF Servicemembers when accounting for total military service.*



with supports partial content validation the small,[36] nonsignificant relationships between the ER89 and CD-RISC with mental illness symptoms did not support content validation of these metrics, which was opposite to our hypothesis. Because the definition of resilience is one's stress-response capacity, it may be that the amount of stress that SOF combat Servicemembers endure requires all of one's resilience. Perhaps SOF combat Servicemembers prioritize maintaining operational performance above mental health. Future research should consider objective personal and team performance measures to test this. It also may be that resilience and negative mental health symptoms do not demonstrate as strong a relationship as previously hypothesized in this specific population.

We also aimed to capture preliminary evidence regarding dynamic resilience change via differences between combat Servicemembers entering SOF and those who had been in SOF service for years, with stronger effects found for the ER89. Based on stress theory[21] and recovery science,[24] it could be posited that SOF mid-career combat Servicemembers would endorse lower resilience scores than career start Servicemembers because of greater combat training and operations exposure. Counter evidence was found with the CD-RISC, despite its ceiling effects, with a small effect size. Partial evidence supported the decay hypothesis as mid-career SOF combat Servicemembers reported lower ER89 scores than their career start counterparts, but only when low in total military service (Figure 1). This effect demonstrated a medium effect size. The SOF mid-career combat Servicemembers with lower total military service reported the lowest resilience. Perhaps entering SOF service without extensive previous military service is a risk factor for suboptimal resilience. Longitudinal resilience studies in SOF combat Servicemembers through their SOF careers are necessary to elucidate the intricacies of these relationships over time.

An unhypothesized positive linear relationship between total military service and ER89 scores was observed only in SOF mid-career combat Servicemembers which indicates that that more military experience (including SOF service) could be beneficial for one's resilience. Recently, researchers have begun investigating whether one can build resilience through the iterative process of successful stressor adaptation (i.e., engaging in coping responses that aid performance and/or health).[37-39] Increased resilience over time reflects the capacity to learn from previous adaptation to various other stressors or to adapt more efficiently (physiologically and/or affectively). Thus, our results may reflect that maintaining active combat service is associated with resilience growth, partially because of sustaining sufficient recovery[25] after both training and combat operations. Conducting longitudinal observational studies on SOF combat Servicemembers may identify aspects of military training and experiences that facilitate and/or inhibit resilience. This information would directly inform future resilience interventions that have shown limited effectiveness in the current literature.[8,40,41]

Although researchers have found statistically significant negative relationships between mTBI history and trait resilience in veterans,[27] the present study failed to reject null hypotheses regarding mTBI history effects. Discrepancies between our results and prior work may be the result of the limited range of histories reported (zero to six mTBIs) in the present study. It should be noted that we used a retrospective self-reported measure of one's lifetime mTBIs. Though self-report mTBI history measurement may have been a limitation, it has been noted that self-reported recall of mTBI history is reliable and particularly useful when medical records cannot be accessed.[42] All other study variables were also self-reported and subjective measures. The greatest threats to validity in our study fall under information or observation biases, with measurement error being the greatest potential threat. In addition to potentially inflated CD-RISC and RSES scores, reported negative mental health symptoms were near the metrics' floors and related to very high RSES scores, indicative of a strong desirability effect. This points to the need for resilience measurements beyond self-report, whether biological (e.g., stress reactivity, blood hormone levels), behavioral (e.g., days of missed work), or other (e.g., peers, superiors, spouses), that are used to index these constructs. These recall and social desirability biases[43] can be mitigated by creating a quiet testing space to optimize recall and by reminding participants that their responses were confidential, in that their colleagues and superiors will not have access to all of their responses. In line with American Psychological Association best practices,[28] we employed only valid and reliable psychometric assessments and ensured participant confidentiality.

Limitations

There were other limitations to this study's methods. We were unable to account for all potentially influential factors, such as environmental (i.e., heat or cold) and personal (i.e., training, sleep) factors that can contribute to Servicemember readiness and resilience.[44] The present study also used a cross-sectional design to infer long-term resilience change in SOF combat Servicemembers. Our study aimed to describe information necessary to guide future surveillance studies, which we acknowledge would also benefit from a broader inclusion of Special Operations Forces across all US military Servicemembers beyond the convenience sample of Army and Air Force SOF Servicemembers. Future studies using a longitudinal design should employ more appropriate statistical analyses, such as linear mixed-effect models,[45] to account for the latent heterogeneity between Servicemembers because not all factors can feasibly be controlled or accounted for. Finally, the prevailing COVID-19 pandemic limited access to study participants, rendering a small sample size for our study, especially for SOF mid-career Servicemembers (n = 20). Small sample sizes can increase the possibility of type II error in findings. We do not believe this to be the case, based on the medium effect size. However, replicating our findings with a larger sample size would confirm these relationships.

Conclusion

The present study is the first, to our knowledge, to look exclusively at SOF combat Servicemember resilience. Researching resilience can help scientists and stakeholders gain foundational understanding about SOF combat Servicemember stress adaptation, but little is known about measuring or describing this construct in this population. The SOF combat Servicemembers' ER89 scores were moderate, on average, and this metric displayed preliminary evidence that it is sufficiently sensitive to detect resilience differences when accounting for mTBI history and total military service. Future research regarding the differences in SOF combat Servicemember resilience dynamics with military service (i.e., evaluating psychological, physiological, and performance resilience dynamics based on operational environments) more granularly over time is warranted.

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Disclaimer

The views, opinions and/or findings contained in this report are those of the authors and should not be construed as an official Department of the Army position, policy or decision unless so designated by other documentation.

Disclosure

Coauthors Bailar-Heath and Burke were employed by Air Force Special Operations Command for the study period. Authors DeLellis, Depenbrock, Kane, Lynch, and Means were employed by USASOC for part or all of the study period.

References

1. **Block J, Kremen AM.** IQ and ego-resiliency: conceptual and empirical connections and separateness. *J Pers Soc Psychol*. 1996;70 (2):349–361.
2. **Palmer B, Tepe V.** Introduction. In: Lukey BJ, Tepe V, eds. *Biobehavioral Resilience to Stress*. 1st ed. Boca Raton, FL: Taylor & Francis; 2008:xiii–xxi.
3. **Simmons A, Yoder L.** Military resilience: a concept analysis. *Nurs Forum*. 2013;48(1):17–25. https://onlinelibrary.wiley.com/doi/pdf/10.1111/nuf.12007. Accessed August 27, 2019.
4. **Windle G, Bennett KM, Noyes J.** A methodological review of resilience measurement scales. *Health Qual Life Outcomes*. 2011;9 (8):1–18.
5. **Connor KM, Davidson JRT.** Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety*. 2003;18(2):76–82.
6. **DeVellis RF.** *Scale Development: Theory and Applications*. 4th ed. Thousand Oaks, CA: SAGE Publications; 2017.

7. **Bezdjian S, Schneider KG, Burchett D, Baker MT, Garb HN.** Resilience in the United States Air Force: psychometric properties of the Connor-Davidson Resilience Scale (CD-RISC). *Psychol Assess*. 2017;29(5):479–485.
8. **Carr W, Bradley D, Ogle AD, Eonta SE, Pyle BL, Santiago P.** Resilience training in a population of deployed personnel. *Mil Psychol*. 2013;25(2):148–155.
9. **De La Rosa GM, Webb-Murphy JA, Johnston SL.** Development and validation of a brief measure of psychological resilience: an adaptation of the Response to Stressful Experiences Scale. *Mil Med*. 2016;181(3):202–208.
10. **Johnson DC, Polusny MA, Erbes CR, et al.** Development and initial validation of the Response to Stressful Experiences Scale. *Mil Med*. 2011;176(2):161–169.
11. **Saxon L, DiPaula B, Fox GR, et al.** Continuous measurement of reconnaissance marines in training with custom Smartphone app and watch: observational cohort study. *JMIR Mhealth Uhealth*. 2020;8(6):e14116.
12. **Fredrickson BL, Tugade MM, Waugh CE, Larkin GR.** What good are positive emotions in crisis? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. *J Pers Soc Psychol*. 2003;84(2): 365–376.
13. **Waugh CE, Thompson RJ, Gotlib IH.** Flexible emotional responsiveness in trait resilience. *Emotion*. 2011;11(5):1059–1067.
14. **Campbell-Sills L, Kessler RC, Ursano RJ, et al.** Predictive validity and correlates of self-assessed resilience among U.S. Army soldiers. *Depress Anxiety*. 2018;35(2):122–131.
15. **Fischer H.** *U.S. Military Casualty Statistics: Operation New Dawn, Operation Iraqi Freedom, and Operation Enduring Freedom*. Washington DC; 2013. https://apps.dtic.mil/sti/citations/ADA590694. Accessed September 18, 2018.
16. **Meadows SO, Engel CC, Collins RL, et al.** *2015 Department of Defense Health Related Behaviors Survey (HRBS)*. Vol 8.; 2018.
17. **Moriarty H, Winter L, True G, Robinson K, Short TH.** Depressive symptomatology mediates associations with community reintegration in veterans with TBI. *Mil Psychol*. 2016;28(6):376–389.
18. **Southwick SM, Bonanno GA, Masten AS, Panter-Brick C, Yehuda R.** Resilience definitions, theory, and challenges: interdisciplinary perspectives. *Eur J Psychotraumatol*. 2014;5:1–14.
19. **Mota NP, Cook JM, Smith NB, et al.** Posttraumatic stress symptom courses in U.S. military veterans: a seven-year, nationally representative, prospective cohort study. *J Psychiatr Res*. 2019;119: 23–31.
20. **Barczak-Scarboro NE, Roby PR, Kiefer AW, et al.** The relationship between resilience and neurophysiological stress in Special Operations Forces combat service members. *Eur J Neurosci*. 2022;55(9-10)2804–2812.
21. **Lazarus RS, Folkman S.** *Transactional Theory and Research on Emotions and Coping*. Vol 1. 1987. https://onlinelibrary.wiley.com/doi/pdf/10.1002/per.2410010304. Accessed January 10, 2019.
22. **Waugh CE, Koster EHW.** A resilience framework for promoting stable remission from depression. *Clin Psychol Rev*. 2015;41:49–60.
23. **Hill Y, Den Hartigh RJR, Meijer RR, De Jonge P, Van Yperen NW.** Resilience in sports from a dynamical perspective. *Sport Exerc Perform Psychol*. 2018;7(4):333–341.
24. **Heidari J, Beckmann J, Bertollo M, et al.** Multidimensional monitoring of recovery status and implications for performance. *Int J Sports Physiol Perform*. 2019;14(1):2–8.
25. **Fletcher D, Sarkar M.** A grounded theory of psychological resilience in Olympic champions. *Psychol Sport Exerc*. 2012;13(5): 669–678.
26. **Kemplin KR, Paun O, Sons N, Brandon JW.** The myth of hyperresilience: evolutionary concept analysis of resilience in Special Operations Forces. *J Spec Oper Med*. 2017;18(1):54–60.
27. **Graham DP, Helmer DA, Harding MJ, Kosten TR, Petersen NJ, Nielsen DA.** Serotonin transporter genotype and mild traumatic brain injury independently influence resilience and perception of limitations in Veterans. *J Psychiatr Res*. 2013;47(6):835–842.
28. **American Psychological Association.** *Publication Manual of the American Psychological Association*. 7th ed. Washington, DC; 2019.
29. **Barczak-Scarboro NE, Cole WR, DeLellis SM, et al.** Mental health symptoms are associated with mild traumatic brain injury history in active Special Operations Forces (SOF) combat and combat support Soldiers. *Mil Med*. 2020;185(11–12), e1946–e1953. https://doi.org/https://doi.org/10.1093/milmed/usaa167
30. **Keyes C.** Brief description of the mental health continuum short form (MHC-SF). *Am J Public Health*. 2009;100(12):2366–2371.
31. **Lamers SMA, Westerhof GJ, Bohlmeijer ET, ten Klooster PM, Keyes CLM.** Evaluating the psychometric properties of the Mental Health Continuum-Short Form (MHC-SF). *J Clin Psychol*. 2011;67(1):99–110.
32. **Kroenke K, Spitzer RL, Williams JBW.** The PHQ-9. *J Gen Intern Med*. 2001;(16):606–613.
33. **Spitzer RL, Kroenke K, Williams JBW, Löwe B.** A brief measure for assessing generalized anxiety disorder. *Arch Intern Med*. 2006;166(10):1092–1097.
34. **Blevins CA, Weathers FW, Davis MT, Witte TK, Domino JL.** The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): development and initial psychometric evaluation. *J Trauma Stress*. 2015;28(6):489–498.
35. **Cohen J.** *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. New York, NY: Lawrence Erlbaum Associates; 1988.
36. **Cohen J.** A power primer. *Psychol Bull*. 1992;112(1):155–159. http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf. Accessed April 19, 2018.
37. **Bryan C, O'Shea D, MacIntyre TE.** The what, how, where and when of resilience as a dynamic, episodic, self-regulating system: a response to Hill et al. (2018). *Sport Exerc Perform Psychol*. 2018;7(4):355–362.
38. **Crane MF, Searle BJ, Kangas M, Nwiran Y.** How resilience is strengthened by exposure to stressors: the systematic self-reflection model of resilience strengthening. *Anxiety Stress Coping*. 2019;32(1):1–17.
39. **Crane MF, Searle BJ.** Building resilience through exposure to stressors: the effects of challenges versus hindrances. *J Occup Health Psychol*. 2016;21(4):468–479.
40. **Broaddus MW.** U.S. Army Command and General Staff Officers' course and student resilience: a quantitative quasi-experimental study. 2019.
41. **Johnson DC, Thom NJ, Stanley EA, et al.** Modifying resilience mechanisms in at-risk Individuals: a controlled study of mindfulness training in Marines preparing for deployment. *Am J Psychiatry.* 2014;171(8):844-853.
42. **Wojtowicz M, Iverson GL, Silverberg ND, et al.** Consistency of self-reported concussion history in adolescent athletes. *J Neurotrauma*. 2017;34(2):322–327.
43. **Van De Mortel TF.** Faking it: social desirability response bias in self-report research. *Austral J Adv Nursing*. 2008;25(4). http://www.ajan.com.au/ajan_25.4.html. Accessed December 6, 2019.
44. **Nindl BC, Billing DC, Drain JR, et al.** Perspectives on resilience for military readiness and preparedness: report of an international military physiology roundtable. *J Sci Med Sport*. 2018;21(11):1116–1124.
45. **Fitzmaurice GM, Laird NM, Ware JH.** *Applied Longitudinal Analysis*. 2nd ed. Hoboken, New Jersey: John Wiley & Sons; 2011.

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