JMVH

Volume 33 Number 3 July 2025
Journal of Military and Veterans' Health

- Effects of Lighting Conditions on Psychophysiological Re-sponses and Motor Skills in Warfighters During Close Quarter Combat Simulations
- The Evolution of Operational Health Support Provided to United States, United Kingdom and Australian Special Operations Forces from 1940 - 2024
- Efficacy of Yoga for Managing Sleep Problems among Military Veterans: A Systematic Review

The Journal of the Australasian Military Medicine Association

Australian Government
Department of Veterans' Affairs

Veteran Support and Services Guide

The Department of Veterans' Affairs (DVA) handy *Veteran Support and Services Guide* provides a comprehensive overview of the support, services and programs available to veterans and their families during service, transition, after service and as they age.

You might want to take a look at the range of transition services DVA provides that may benefit your patients - from education and training, assistance finding a job after leaving the military, to establishing social connections.

Download a digital copy at www.dva.gov.au/services-guide or scan the QR code.

P04848

Table of Contents

Editorial

Original Articles

History

Review Article

Book Review

Letter to the Editor

Cover Photo: Credit to Department of Defence Imagery.

Journal of Military and Veterans' Health

Australasian Military Medicine Association

STATEMENT OF OBJECTIVES

The Australasian Military Medicine Association is an independent, professional scientific organisation of health professionals with the objectives of:

- Promoting the study of military medicine
- Bringing together those with an interest in military medicine
- Disseminating knowledge of military medicine
- Publishing and distributing a journal in military medicine
- Promoting research in military medicine

Membership of the Association is open to doctors, dentists, nurses, pharmacists, paramedics and anyone with a professional interest in any of the disciplines of military medicine. The Association is totally independent of the Australian Defence Force.

JMVH is published by the
Australasian Military Medicine Association

227 Collins Street Hobart Tas 7000 Australia
Ph: +61 3 62347844
Email: editorial@jmvh.org

ISSN No. 1835-1271

Editorial

Editorial – Military Speculative Fiction

In 1961, Edward Carr noted that 'the past is intelligible to us only in the light of the present, and we can fully understand the present only in the light of the past'.[1] George Chesney's story of the invasion of England in the *Battle of Dorking* (1871), one of the early attempts to predict the future of conflict, led to a major debate on the United Kingdom's readiness for war and spawned a whole genre of foreordained and precautionary writings.[2] In 2015, August Cole and Peter Singer published *Ghost Fleet*, which outlined a conflict with China where the United States' military forces were badly impacted because of their over-reliance on advanced technologies, vulnerability to weaponised satellites and unprepared for new threats to their supply chains.[3] This picked up on many of the themes in Singer's non-fiction work *Wired for War* (2009) on robotics and drone warfare in a highly effective way.[4] The impact of the book was significant, despite some major weakness in its portrayal of China's motives, with major interest from both military and civilian policymakers, growing recognition of the potential for war with China, reconsideration of some strategic vulnerabilities, and far greater penetration and influence in wider society than strategic policy papers.[5]

Australian Major General Mick Ryan's book *White Sun War: The Campaign for Taiwan* (2023) takes the concept further, suggesting that 'fiction is a superior tool for passing on knowledge and driving both learning and adaptation'.[6] The novel is more realistic in its strategic, operational and tactical considerations, while extending the likely role of cyber and autonomous robotic systems.[7] Ryan also draws on his non-fiction work *War Transformed* (2022) to provide the theoretical basis for the novel.[8] Through the novel, Ryan raises scenarios and questions that require further analysis and solutions, as they may influence how future military leaders and warfighters plan for coming conflicts, particularly between major military powers.[9] Such military speculative fiction is designed to engage readers, highlight risks and vulnerabilities, and envision how emerging technologies and changing geopolitical and economic situations will influence the future of war.[10] They also build on developmental work, such as fully autonomous robotic systems, and the challenges of operating with and against such systems.[11] While most speculative fiction does not address military health support, planning for the medical implications of such future conflicts remains critical.

Our third issue of 2025 contains a range of articles on diverse topics spanning special operations forces, naval medical history, mental health, and veterans' health. We continue to attract a good range of articles, including from overseas, as is demonstrated in this issue. Other military and veterans' health articles, however, are always very welcome, and we would encourage all our readers to consider writing on their areas of military or veterans' health interest. We would particularly welcome papers based on presentations given at the Brisbane 2024 ICMM conference or planned for our 2025 conference but welcome any articles across the broader spectrum of military health.

Dr Andy Robertson, CSC, PSM
Commodore, RAN
Editor-in-Chief

References

1 Edward Hallett Carr, *What is history?* (Penguin UK, 1990), 55.
2 Lawrence Freedman, *The future of war: a history* (Penguin Books, 2018), 4-5.
3 Freedman, The future of war, 251-252.; August Cole and P. W. Singer, "Thinking the unthinkable with useful fiction," *Journal of Future Conflict 2* (2020): 5.
4 Peter Warren Singer, *Wired for war: The robotics revolution and conflict in the 21st century* (Penguin, 2009), 15.
5 Mark D. Jacobsen, "The Uses and Limits of Speculative Fiction: Three Novels about a US–China War," *Journal of Indo-Pacific Affairs 6* (2023), 5.; Cole, "Thinking the unthinkable," 5.; J. Furman Daniel III and Paul Musgrave, "Synthetic experiences: How popular culture matters for images of international relations," *International Studies Quarterly* 61, no. 3 (2017):512-513.
6 Jacobsen, "The Uses and Limits of Speculative Fiction," 8.
7 Jacobsen, "The Uses and Limits of Speculative Fiction," 8.
8 Richard Norton, "White Sun War: The Campaign for Taiwan," *Naval War College Review* 77, no. 3 (2024): 182-183.
9 Norton, "White Sun War," 184.
10 Jacobsen, "The Uses and Limits of Speculative Fiction," 1.; Brent D. Ziarnick, "Ghost Fleet: A Novel of the Next World War," *Air & Space Power Journal* 30, no. 1 (2016): 100.
11 David Petraeus and Andrew Roberts, *Conflict: The Evolution of Warfare from 1945 to Ukraine* (William Collins, 2023), 416.

Effects of Lighting Conditions on Psychophysiological Re-sponses and Motor Skills in Warfighters During Close Quarter Combat Simulations

A Rubio-Zarapuz, M Stergiou, J F Tomero Aguilera, J J Robles-Pérez, J Rey-Mota, V J Clemente-Suarez

Abstract

This study examines the impact of lighting conditions (darkness, rotational light and continuous light) on warfighters' psychophysiological responses and fine motor skills in close-quarter combat (CQC) simulations. The study assessed the rate of perceived exertion, blood lactate concentration, cortical arousal, isometric lumbar and leg strength, and the time required to reload a pistol magazine in 50 male military personnel experienced in international missions. Findings revealed distinct psychophysiological responses correlated with lighting conditions, with significant responses under rotational and no-light scenarios. Notable correlations included the critical flicker fusion threshold with magazine reload time ($r = -0.547$, $p < 0.000$) and isometric strength post-CQC with the rate of perceived exertion ($r = 0.319$, $p < 0.009$). The study suggests that manipulating lighting conditions can enhance training and performance in high-stress environments, applicable to warfighters, police officers and firefighters.

Keywords: stress; cortical arousal; strength; fine motor skill; lactate

Introduction

Combat represents one of the most stressful situations for warfighters, requiring them to manage numerous dangerous stimuli that threaten their integrity and life. Previous research indicates that stress conditions reduce peripheral perception of relevant stimuli,[1,2] cause performance rigidity,[3] and impair the ability to analyse complex situations.[4] Urban warfare introduces stressors such as low visibility and unidentified, constantly changing enemies.[5] Recent studies have shown activation of ancient survival mechanisms like the fight–flight response in combat,[6–9] leading to heightened sympathetic nervous system activity, increased anaerobic metabolism and elevated heart rate, which warfighters may not perceive due to low reported exertion.[8,10–12] Combat stress also decreases information processing and fatigues the nervous system,[6,13,14] potentially overwhelming the brain and causing anxiety.[15] Military psychologists must address this anxiogenic response,[16] as it affects psychophysiological responses and memory performance.[17]

External factors, including lighting conditions, significantly impact combat and stress perception. Constant light exposure can induce depressive and anxiety states,[18] increase fatigue perception and slow response times.[19] Further, in military areas, nocturnal combat in the absence of light is considered one of the most stressful situations.[20] Also, light changes in close-quarter combat (CQC) and urban combat, one of the situations that soldiers must face, produce pupil size variations affecting visual perception.[21] Therefore, light is an element that can completely change the conditions of both military and police interventions, as tactics must be modified in the dark, producing increased stress with the consequent anxiogenic response.[22] Increasing the physiological response and heart rate of police officers and warfighters produces a decrease in fine motor skills.[23]

In this line, military actions in current conflict zones are conducted in changing environments, as they switch between symmetrical and asymmetrical combat, but a common characteristic is that both normally conclude with a close quarter or melee

combat. These are traditionally defined as one of the most stressful situations a warfighter may face as they must directly face their foe at very close range.[24] In addition to an already stressful situation, lighting conditions may differ depending on the time of the day and the changing illumination of the urban area (windows, interior rooms, holes in walls, etc.), diminishing vision. However, despite its vital role in military and police survival and operational efficiency, no previous research has been carried out regarding the effects of light conditions on psychophysiological response and operational performance. For this reason, the present research aimed to analyse the modifications that variations in light conditions may cause in the psychophysiological response and specific fine motor skills of warfighters in CQC. The initial hypothesis was that no-light conditions would produce a higher psychophysiological response than in lighted conditions.

Materials and methods

Experimental approach to the problem

To test the hypothesis, we analysed cortical arousal, RPE, heart rate, blood lactate, muscular strength and fine motor skills before and after CQC simulations under three lighting conditions: light, no light and rotary light. Independent variables were the lighting conditions, while dependent variables included RPE, lower-body muscular power, blood lactate concentration, cortical arousal and time to reload a pistol magazine.

Participants

Participants included 50 male soldiers from the Spanish Army with an average age of 33.8±3.4 years, height of 177.1±7.9 cm, and weight of 72.9±5.9 kg. Sample size determination used G*Power statistical software. This approach involved a prior analysis to ascertain the minimum sample size required to detect an effect of a given size with a specified level of confidence. Key parameters, including the effect size, alpha level and power, were input based on estimates from similar studies. The G*Power analysis indicated that a sample of 50 participants was sufficient to achieve the necessary statistical power for detecting significant differences or correlations in our study, while remaining feasible within our logistical and resource constraints. All subjects had 12.4±6.4 years of professional experience in their units, and most of them had experience in international missions in current conflicts: Lebanon, Afghanistan, Bosnia, Kosovo and Iraq. All participants were equipped with standard military gear during simulations of 23.6 kg. Procedures were explained, and written consent was obtained according to the Declaration of Helsinki. The study received approval from the Medical Service and Headquarters.

Measurements

A validated methodology, previously established in similar research streams and with comparable population groups, was employed in our study.[1,6,8,9] This approach has been endorsed by prior studies and authors who have conducted research in the same domain, ensuring its relevance and applicability to our specific investigative context. All variables in our study were meticulously measured before and after the combat simulation, fully equipped to capture any changes induced by the simulated combat conditions. Additionally, to ensure consistency and optimal participants' readiness, a standard warm-up procedure was implemented prior to the commencement of the simulation.

This warm-up consisted of mobility exercises and a thorough explanation of the movements and tests to be conducted. The warm-up exercises were designed to prepare the participants physically and mentally for the combat simulation, reducing the risk of injury and ensuring that their bodies were adequately conditioned for the physical demands of the simulation.

The detailed briefing on the movements and tests also familiarised the participants with the upcoming procedures, reducing any potential anxiety or uncertainty about the simulation. This preparatory stage was crucial for ensuring that the participants were in a standardised physical and mental state before the baseline measurements were taken, thus enhancing the reliability and validity of our findings.

- RPE, 6–20 scale.[25,26]
- We utilised a SECA scale, model 714, for body weight assessment, known for its high precision (with a 100-gram sensitivity, ranging from 0.1 to 130 kg). This scale was placed on a flat, smooth surface and carefully calibrated to zero before each measurement. Subjects, facing forward, barefoot and wearing minimal clothing, positioned themselves at the centre of the platform. They were instructed to stand still, avoiding contact with surrounding objects and ensuring their weight was evenly distributed on both feet. This standardised protocol was strictly adhered to for consistency in weight measurement.
- Height measurements were conducted using the same SECA scale model 714, offering a precision of 0.1 mm and accommodating a

60–200 cm range. Participants were positioned upright, barefoot, with their head oriented in the Frankfurt plane—a standardised position ensuring the horizontal line from the ear canal to the lower border of the orbit of the eye is parallel to the floor. Their arms were positioned along the sides of their trunk, fully extended with palms resting against the external face of the thighs. The participants' heels were placed together, touching the lower end of the vertical surface of the anthropometer, with the inner edge of the feet aligned. The occipital area, scapular region, buttocks, posterior aspect of the knees and calves were in contact with the vertical surface of the anthropometer, ensuring a precise and accurate stature measurement.

- Isometric lumbar and leg strength was assessed with a TKK: 5402 dynamometer (Takei Scientific Instruments CO. LTD). Warfighters performed two maximal contractions, in which they had to raise the bar of the dynamometer grasped with both hands in a standing position with 135° of knee flexion. We only registered the best of the two repetitions.[27]
- Leg muscle power was evaluated by an Abalakov jump. The Sensorize FreePowerJump system (SANRO Electromedicina, Madrid. Spain) was used to measure the height of the jump. The participant stood upright and then performed a 90° knee and hip flexion accompanied by a backward movement of the arms followed by a rapid knee, hip and ankle extension and a shoulder flexion with the arms reaching up.[28]
- Participants' blood lactate concentration was measured by puncturing one finger to extract 32 μl—not the trigger finger as it might hinder performance. Prior, the finger was cleaned. Analysis was performed using a Dr. Lange Miniphotometer plus LP 20. v 1.4.
- Cortical arousal was assessed by the critical flicker fusion threshold (CFFT). An increase in CFFT suggests an increase in cortical arousal and information process. By contrast, when the values fall below the baseline, it suggests a reduction in the efficiency of processing information and fatigue of the central nervous system.[29–31] Subjects were seated in front of a viewing chamber (Lafayette Instrument Flicker Fusion Control Unit Model 12021), which was constructed to control extraneous factors that might distort CFFT values. Two light-emitting diodes (58 cd/m2) were presented simultaneously in the viewing chamber, one for the left eye and one for the right eye. The stimuli were separated by 2.75 cm (centre to centre) with a stimulus-to-eye distance of 15 cm and a viewing angle of 1.9°. The inside of the viewing chamber was painted flat black to minimise reflection. The flicker frequency increment (1 Hz/sec) from 20 to 100 Hz until the participant perceived fusion. After a fovea binocular fixation, participants were required to respond by pressing a button upon identifying the visual fusion thresholds.[29–31] Before the experiment, they performed as many practice trials as needed to become familiar with the exigencies of the CFF test. Then, five trials were performed with an interval of 5 seconds. In each one, the test times were quantified as the amount of time a subject took to detect the changes in the light from the beginning of the test until the moment of pressing a button. The average of these times was calculated to determine the CFFT.
- Specific fine motor skills were measured by the time taken to reload a Beretta 92X Centurion magazine with 9 mm parabellum bullets measured by a stopwatch.

Procedure

The CQC simulation depicted an urban area controlled by local insurgency in which warfighters must find a warlord, capture and extract them to a safe area to be processed by justice for war crimes. For this aim, warfighters were randomly divided into four-person units and conducted the manoeuvre in a specialised training facility designed to simulate Close Quarter Battle (CQB) scenarios that allow the capability to control and divide spaces effectively. This facility also allows for configuring different CQB environments and enables the manipulation of lighting conditions to which warfighters are exposed. This set-up is crucial for realistically replicating the varying light environments encountered in real-world CQB situations, enhancing the training experience and the development of relevant psychophysiological responses and motor skills.

CQC simulations were conducted across three days, with a two-day interval between sessions to ensure adequate recovery and minimise learning effects. These simulations were carried out under three distinct lighting conditions within the CQB facilities: continuous light, complete darkness and rotary light. The rotary light condition involved a rotating light source to simulate dynamic and changing light environments, mimicking real-world scenarios like moving vehicle lights or emergency response situations.

While the core incidents in the CQC simulations remained consistent across all three sessions, the

distribution and characterisation of these incidents varied daily. This approach was carefully designed to prevent a potential learning effect, ensuring that participants' responses were influenced by the lighting conditions rather than familiarity with the scenarios.

Statistical analysis

Data analysis for this study was conducted using SPSS statistical software (version 17.0; SPSS, Inc., Chicago, IL, USA). We began by ensuring that our data met the necessary assumptions for our chosen statistical tests. This included verifying the normality and homogeneity of variance in our dataset, which we accomplished using the Kolmogorov-Smirnov test. These preliminary checks were crucial to validate the appropriateness of the subsequent analyses. Once these assumptions were confirmed, we examined the differences among the groups using Multivariate Analysis of Variance (MANOVA). This technique allowed us to assess multiple dependent variables simultaneously and determine if there were any significant differences across the different lighting conditions.

Additionally, the magnitude of the observed effects was quantified using Cohen's D, which provided us with the Effect Size (ES) for each finding. This metric is crucial as it helps to understand the practical significance of the results beyond statistical significance. We conducted bivariate correlation analysis using Pearson's correlation coefficient to explore the interrelationships among the variables. This analysis helped us to understand the relationships between different variables and how they might influence each other. In all our inferential tests, we set a threshold of $p < 0.05$ to denote statistical significance. This standard benchmark ensured that the likelihood of committing a Type I error (falsely declaring a result significant) was minimal.

This comprehensive approach to data analysis, utilising a combination of MANOVA, Cohen's D for ES and Pearson's correlation, allowed us to thoroughly investigate the impact of lighting conditions on the psychophysiological responses and fine motor skills of warfighters in CQC simulations.

Results

Results are presented as Median ± Standard Deviation. Data analysis showed a significant decrease in magazine reload time in no-light conditions and a significant increase in cortical arousal in rotary light conditions (Table 1).

Results (Table 2) indicated a significant decrease in magazine reload time under no-light conditions and a significant increase in cortical arousal under rotary light conditions. Blood lactate concentration increased across all light conditions, with the highest change in rotary light conditions. RPE increased

Table 1. Multivariate analysis of study parameters.

	Magazine reload time (s)				**Critical flicker fusion threshold (hz)**					**Blood lactate concentration (mmol/l)**				
	Pre	Post	% change	p	Pre	Post	% change	ES	p	Pre	Post	% change	ES	p
No light	16.1±3.0	13.6±2.7	-2.6	0.007	30.2±6.4	33.6±5.2	3.5	0.65	0.472	1.2±0.5	4.8±2.8	300	1.29	0.000
Rotary light	14.7±2.4	16.3±2.7	1.5	0.021	35.6±5.2	37.3±3.5 *(0.005)	1.6	0.49	0.000	1.1±0.5 *(0.003)	6.0±1.3 *(0.027)	445.5	3.77	0.000
Light	15.4±1.9 *(0.012)	16.2±1.6	0.8	0.088	34.7±3.7	34.7±2.4	-0.02	0.00	0.963	1.2±0.3	4.3±1.2 †(0.002)	258.3	2.58	0.000
	RPE (a.u.)				Isometric strength (n)					Abalakov jump (m)				
	Pre	Post	% change	p	Pre	Post	% change	ES	p	Pre	Post	% change	ES	p
No light	6.1±0.1	11.6±1.9	93.3	0.000	127.4±23.5	127.0±19.3	-0.4	0.02	0.887	0.36±0.1	0.37±0.0	2.1	0.25	0.088
Rotary light	6.1±0.1	12.7±1.6	111.6	0.000	144.8±20.2	143.7±25.1	-1.2	0.04	0.509	0.33±0.1 *(0.004)	0.36±0.0	7.9	0.75	0.000
Light	6.1±0.1	12.7±1.6	103.3	0.000	147.1±17.6	137±14.5	-9.7	0.67	0.002	0.32±0.1 *(0.005)	0.37±0.1	14.84	1.0	0.000

* $p < 0.05$ vs no light; † $p < 0.05$ vs rotary light.

Table 2. Correlation analysis data.

		MRT pre	MRT post	CFFT pre	CFFT post	Lactate pre	Lactate post	RPE post	IS pre	IS post	ABK pre
MRT post	r	0.376**									
	p	0.002									
CFFT pre	r	-0.598**	-0.412**								
	p	0.000	0.001								
CFFT post	r	-0.547**	-0.369**	0.801**							
	p	0.000	0.002	0.000							
Lactate pre	r	0.160	-0.041	-0.324**	-0.177						
	p	0.199	0.746	0.008	0.155						
Lactate post	r	-0.211	-0.237	0.251*	0.503**	0.044					
	p	0.090	0.055	0.042	0.000	0.728					
RPE post	r	-0.241	-0.225	0.299*	0.582**	0.006	0.493**				
	p	0.051	0.070	0.015	0.000	0.959	0.000				
IS pre	r	-0.021	0.060	0.223	0.071	-0.112	-0.167	0.089			
	p	0.869	0.632	0.073	0.572	0.370	0.181	0.476			
IS post	r	-0.112	0.043	0.401**	0.379**	-0.043	0.010	0.319**	0.791**		
	p	0.372	0.729	0.001	0.002	0.731	0.936	0.009	0.000		
ABK pre	r	0.155	-0.085	0.082	-0.005	0.091	0.064	0.315*	0.166	0.306*	
	p	0.215	0.495	0.511	0.968	0.468	0.611	0.010	0.184	0.013	
ABK post	r	-0.070	-0.058	0.197	0.054	0.107	-0.128	0.221	0.194	0.404**	0.879**
	p	0.574	0.646	0.113	0.666	0.390	0.304	0.075	0.119	0.001	0.000

*- p<0.05; **- p< 0.01; MRT: Magazine Reload Time; CFFT: Critical Flicker Fusion Threshold; RPE: Rated of Perceived Exertion; IS: Isometric Strength; ABK: Abalakov jump.

significantly in all scenarios. Isometric strength decreased in lighted conditions, while leg power increased in rotary and lighted conditions. Correlation analysis revealed significant relationships between CFFT, lactate, RPE, isometric strength and magazine reload time.

Discussion

This study aimed to analyse the modifications in psychophysiological response and specific fine motor skills of warfighters in CQC in different light conditions. The analysis of the results showed differences in psychophysiological response and specific fine motor skills between light condition, with the highest psychophysiological response being recorded in rotatory and no-light conditions.

On this line, military actions in actual theatres of operations and police interventions could be conducted in many stressful situations and conditions. In police situations, there are many night interventions with a low-light level.[32] While in military missions, there are night operations and sustained operations that extend into the night were traditionally already considered as the most stressful situations these combatants may face, especially in CQC; however, there is no scientific evidence of this fact that could be used as a guide to improve training programs for these conditions.

The present research found that light conditions directly affected warfighter's cortical arousal. In lighted conditions, warfighters presented no modifications in cortical arousal, in contrast, with rotary light conditions, there was an increase in this parameter. The lack of modification of cortical arousal modifications in lighted conditions reflects the individual's inclination to perform standard operating procedures, which are over-trained and, therefore, require less effort. This response might

maximise output at minimal cognitive resource cost.[33] However, cortical arousal increased when the light level decreased, measuring the highest increase in combat conducted in dark conditions. This could be explained because warfighters exert their cognitive capabilities trying to obtain as much information as possible in these limiting conditions where other senses must be highly activated to compensate the lack of information they may obtain from their sight.[7] In previous studies conducted in lighted CQC, a decrease in cortical arousal was found, which could be related to the high stress of the manoeuvre or the lower CQC training of the warfighters analysed in this study compared with the subjects of the present research.[6,34–36]

Reloading magazines in stressful situations is a critical fine motor skill that soldiers need to master and is trained by the entire Army in preparation for actual missions in operation areas.[28] Coinciding with the highest increase in cortical arousal, the time to reload the magazine presented the best score in dark conditions. These results were similar to airborne warfighters after an automatic parachute jump, where a high anxiety response was measured but did not negatively affect their fine motor skills.[37] In opposition to traditional stress theories,[32,38] which identify a decrease in motor fine skills in stressful situations, the present research found an increase in warfighters' specific motor skills in the most stressful situation, the CQC conducted in dark conditions. The fact that warfighters improved fine motor skills in dark conditions is singular, primarily because in this stressful situation, the anxiogenic response of the organism may interfere with motor control. This increase in fine motor skills performance could be related to a higher cortical arousal, which improves fine motor control, as an increased cortical arousal is related to higher muscle control and activation.[30] In addition, this result could be possible because of an optimal specific training of the warfighters in this condition. Future research should strongly consider studying fine motor performance under conditions of extreme stress.

Furthermore, light conditions influence metabolic response, as with rotary lights, with the highest blood lactate concentration, while the values are lower in no-light and lighted conditions. These results may have important implications since this large anaerobic lactic metabolism activation could negatively impact fine motor skills performance and hinder decision making in important tasks such as shooting.[32] With rotary light conditions, the warfighters' pupils had to manage continuous light intensity changes, which may be an extra stress stimulus that increased anxiogenic response. Moreover, the anxiogenic response was measured in previous studies in symmetrical and asymmetrical combat, and the authors concluded that this response was modulated by the activation of the fight–flight response and the increase of the anaerobic lactic metabolism to provide energy for muscles to be prepared to respond to any threat.[6] In addition, the metabolic response in the no-light situation was lower than in rotary conditions because the pupil adapted to dark conditions at the beginning of the simulation, and they didn't experience continuous changes in light, making this situation less stressful and then producing a lower anxiety and metabolic response.[18] In the same way, in lighted conditions the pupil did not need to adapt to any change in light, producing this situation a lower anxiogenic and metabolic response than previous ones. Independently of the organic metabolic response, the rate of RPE was similar in the three situations, showing how the warfighters were not conscious of their organic response, results similar to previous research conducted in asymmetrical,[6] symmetrical[24] and melee combats6 as well as in tactical parachute jumps.[37,39,40]. Nevertheless, RPE showed a positive correlation with cortical arousal and metabolic fatigue (lactate concentration), in opposition to Clemente-Suárez & Robles-Pérez,[6] suggesting that soldiers are aware of the physiological and psychological load increase but with a lower interpretation of the actual organic load evaluated. Therefore, RPE seems to be an affordable, practical and valid tool for monitoring intensity and cortical load, as Scherr et al.[41] demonstrate. In any case, the differences found in previous studies suggest the importance of carrying out new research in the military context and maximum-stress situations.

Further on, analysing strength data, we found an inverse tendency depending on the principal musculature used in combat situations. CQC melee techniques are principally used because of the short distance of engagement actions in which the upper-body musculature is highly activated.[42] The over-activation of these musculature could be the reason for the decrease in isometric strength.[43] Nevertheless, the increase in strength manifestations of the lower-body musculature may be related to the lower use of this musculature in CQC, in which soldiers perform slow movements during actions,[24] and therefore no fatigue was accumulated.

Practical applications

This study analysed the effects of lighting conditions on psychophysiological responses and fine motor skills in CQC simulations. Findings suggest that lighting conditions significantly influence cortical

arousal and motor performance, with rotary and no-light conditions eliciting the highest responses. These results have practical implications for military and law enforcement training, suggesting that simulating varying light conditions can enhance operational readiness and performance under stress. Further research should explore the impact of lighting conditions on other professional groups and investigate additional physiological and psychological measures.

Study limitations

The principal limitations of the current research include the inability to directly measure cortical arousal and the lack of control over stress hormones such as cortisol and amylase. These limitations were primarily due to financial and technological constraints, which restricted our ability to conduct a more comprehensive study.

Regarding the pre-test differences observed among the groups (no light, rotary light and light) in measures such as magazine reload time, blood lactate concentration and Abalakov jump height, it is important to consider these in the context of the study's overall findings. While these differences were statistically significant, they were relatively small and within the range of normal variability for these measures. Therefore, we believe they do not fundamentally undermine the study's validity. Instead, they highlight the natural variation in human performance and physiological responses, an inherent aspect of research in this field. To account for these initial group differences, we employed rigorous statistical analyses to adjust for any potential baseline imbalances. This approach ensures that the observed effects are attributable to the lighting conditions rather than pre-existing group differences. Furthermore, the consistency of the trends observed across different measures lends credibility to our findings, suggesting that the lighting conditions had an impact as hypothesised.

Future research might seek to include more comprehensive measures of physiological and psychological states, as well as employ strategies to ensure even more homogeneous grouping at the outset. However, we maintain that the current study's findings are valid and contribute valuable insights into the effects of lighting conditions on physical and physiological parameters.

Conclusions

Light conditions directly affect warfighters psychophysiological response, with rotary lights producing the highest psychophysiological activation. Further, the current study provides a further step to understanding the relationships between psychological, physiological and motor responses in a specific military context by manipulating light conditions in a simulated intervention. Moreover, the findings highlight their suitability to use in other tactical athletes due to the nature of their duty, such as warfighter, police or firefighter populations.

Author contributions: All authors contributed equally to the development of this manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional review board statement: The study was conducted in accordance with the Declaration of Helsinki.

Informed consent statement: Any Informed consent was obtained from all subjects involved in the study.

Data availability statement: Not applicable

Conflicts of interest: The authors declare no conflict of interest.

Corresponding Author: Alejandro Rubio-Zarapuz, alejandro.rubio.z@hotmail.com
Authors: A Rubio-Zarapuz[1], M Stergiou[1], J F Tomero Aguilera[2], J J Robles-Pérez[3], J Rey-Mota[3], V J Clemente-Suarez[1]
Author Affiliations:
1 Department of Sport Science, Faculty of Medicine, Health and Sports, Universidad Europea de Madrid
2 Graduate School of Business, Universidad ESAN, Alonso de Molina 1652, Santiago de Surco, Lima, Peru.
3 Ejército de Tierra

References

1. Bellido A, Ruisoto P, Beltran-Velasco A, Clemente-Suárez VJ. State of the art on the use of portable digital devices to assess stress in humans. J Med Syst. 2018;42(6):1–5.
2. Staw BM, Sandelands LE, Dutton JE. Threat Rigidity Effects in Organizational Behavior: A Multilevel Analysis. Adm Sci Q. 1981;26(4): 501–524.
3. Friedland N, Keinan G. Training Effective Performance in Stressful Situations: Three Approaches and Implications for Combat Training. Military Psychology. 1992;4(3):157–174.
4. Larsen RP. Decision Making by Military Students under Severe Stress. Military Psychology. 2001;13(2):89–98.
5. Weissmann M. Urban Warfare. In: Advanced Land Warfare. Oxford University Press; 2023.
6. Clemente-Suárez VJ, Robles-Pérez JJ. Psycho-physiological response of soldiers in urban combat. Anales de Psicologia. 2013;29(2) 598–603.
7. De Lecea L, Carter ME, Adamantidis A. Shining light on wakefulness and arousal. Vol. 71, Biological Psychiatry. 2012.
8. Sánchez-Molina J, Robles-Pérez JJ, Clemente-Suárez VJ. Assessment of Psychophysiological Response and Specific Fine Motor Skills in Combat Units. J Med Syst. 2018 Mar;42(4):67.
9. Tornero-Aguilera JF, Robles-Pérez JJ, Clemente-Suárez VJ. Use of Psychophysiological Portable Devices to Analyse Stress Response in Different Experienced Soldiers. J Med Syst. 2018 Mar;42(4):75.
10. Clemente-Suárez V, Robles J. Analysis of physiological markers, cortical activation and manifestations of force in a simulated combat. Arch Med Dep. 2012;149:594–600.
11. Sánchez-Molina J, Robles-Pérez JJ, Clemente-Suárez VJ. Psychophysiological and Specific Fine Motor Skill Modifications in a Checkpoint Action. J Med Syst Internet. 2019;43(4):90.
12. Delgado-Moreno R, Robles-Pérez JJ, Aznar S, Clemente-Suarez VJ. Inalambric Biofeedback Devices to Analyze Strength Manifestation in Military Population. J Med Syst. 2018 Feb;42(4):60.
13. Tornero-Aguilera JF, Clemente-Suárez VJ. Effect of experience, equipment and fire actions in psychophysiological response and memory of soldiers in actual underground operations. Int J Psychophysiol. 2018 Jun;128:40–6.
14. Tornero-Aguilera JF, Robles-Pérez JJ, Clemente-Suárez VJ. Effect of Combat Stress in the Psychophysiological Response of Elite and Non-Elite Soldiers. J Med Syst. 2017 Jun;41(6):100.
15. Hale BD. Competitive Anxiety in Sport. Sport Psychol. 2016;5(3):1–77.
16. Adler AB, Gutierrez IA. Acute Stress Reaction in Combat: Emerging Evidence and Peer-Based Interventions. Vol. 24, Current psychiatry reports. 2022.
17. Taverniers J, Van Ruysseveldt J, Smeets T, Von Grumbkow J. High-intensity stress elicits robust cortisol increases, and impairs working memory and visuo-spatial declarative memory in Special forces candidates: A field experiment. Stress. 2010;13(4):323–33.
18. Tapia-Osorio A, Salgado-Delgado R, Angeles-Castellanos M, Escobar C. Disruption of circadian rhythms due to chronic constant light leads to depressive and anxiety-like behaviors in the rat. Behavioural Brain Research. 2013;252:1–9.
19. Bellia L, Bisegna F, Spada G. Lighting in indoor environments: Visual and non-visual effects of light sources with different spectral power distributions. Build Environ. 2011;46(10):1984–1992.
20. Robles-Pérez JJ, Aguirre-Puig JA, Montañez-González P, Jesús Ramos-Campos D, Clemente-Suárez VJ. Technical Analysis of Close Quarter Combat with Rifle. Open Sports Sci J. 2014;7(1).
21. King AC. Close Quarters Battle: Urban Combat and "Special Forcification." Armed Forces Soc. 2016;42(2):276–300.
22. Van Liempt S, Vermetten E, Lentjes E, Arends J, Westenberg H. Decreased nocturnal growth hormone secretion and sleep fragmentation in combat-related posttraumatic stress disorder; potential predictors of impaired memory consolidation. Psychoneuroendocrinology. 2011;36(9).
23. Vartanian O, Boscarino C, Jarmasz J, Zotov V. Training-Related Stress and Performance in the Military. In: Handbook of Military Sciences. SpringerLink; 2022.

24. Clemente-Suárez VJ, Robles-Pérez JJ. Mechanical, physical, and physiological analysis of symmetrical and asymmetrical combat. J Strength Cond Res. 2013 Sep;27(9):2420–6.
25. Borg G. Borg's perceived exertion and pain scales. Borg's perceived exertion and pain scales. Champaign, IL, US: Human Kinetics; 1998. viii, 104–viii, 104.
26. Borg G. Perceived exertion as an indicator of somatic stress. Scand J Rehabil Med. 1970;2(2).
27. Clemente-Suarez VJ, Palomera PR, Robles-Pérez JJ. Psychophysiological response to acute-high-stress combat situations in professional soldiers. Stress Health. 2018 Apr;34(2):247–52.
28. Clemente-Suárez VJ, González-Ravé JM, Navarro-Valdivielso F. Short-term periodized aerobic training does not attenuate strength capacity or jump performance in recreational endurance athletes. Acta Physiol Hung. 2014;101(2).
29. Clemente-Suárez VJ. The Application of Cortical Arousal Assessment to Control Neuromuscular Fatigue During Strength Training. J Mot Behav. 2017;49(4):429–34.
30. Presland JD, Dowson MN, Cairns SP. Changes of motor drive, cortical arousal and perceived exertion following prolonged cycling to exhaustion. Eur J Appl Physiol. 2005;95(1).
31. Clemente-Suarez VJ, Robles-Pérez JJ. Acute effects of caffeine supplementation on cortical arousal, anxiety, physiological response and marksmanship in close quarter combat. Ergonomics. 2015;58(11):1842–50.
32. Hübner S. Combat shooting and self-defense. REDE Ed Buenos Aires. 1984;1:40–112.
33. Roberts APJ, Cole JC. The effects of exercise and body armor on cognitive function in healthy volunteers. Mil Med. 2013;178(5).
34. Clemente-Suárez VJ, Robles-Pérez JJ, Herrera-Mendoza K, Herrera-Tapias B, Fernández-Lucas J. Psychophysiological Response and Fine Motor Skills in High-Altitude Parachute Jumps. High Alt Med Biol. 2017 Dec;18(4):392–9.
35. Diaz-Manzano M, Robles-Pérez JJ, Herrera-Mendoza K, Herrera-Tapias B, Fernández-Lucas J, Aznar-Lain S, et al. Effectiveness of Psycho-Physiological Portable Devices to Analyse Effect of Ergogenic Aids in Military Population. J Med Syst. 2018;42(5):84.
36. Clemente-Suárez VJ, Diaz-Manzano M, Robles-Pérez JJ. Use of Minicameras to Improve Operative Procedure in Security Forces. J Med Syst. 2017;41(9):130.
37. Clemente-Suárez VJ, de la Vega R, Robles-Pérez JJ, Lautenschlaeger M, Fernández-Lucas J. Experience modulates the psychophysiological response of airborne warfighters during a tactical combat parachute jump. Int J Psychophysiol. 2016 Dec:110:212–216.
38. Hardy L, Mullen R, Jones G. Knowledge and conscious control of motor actions under stress. British Journal of Psychology. 1996;87(4):621–36.
39. Clemente-Suárez VJ, Robles-Pérez JJ, Montañez-Toledo P. Respuesta psicofisiológica en un salto táctico paracaidista a gran altitud. A propósito de un caso. Archivos de Medicina del Deporte. 2015;32(3).
40. Clemente-Suárez VJ, Delgado-Moreno R, González-Gómez B, Robles-Pérez JJ. Respuesta psicofisiológica en un salto táctico paracaidista HAHO: caso de Estudio. Sanidad Militar. 2015;71(3):179–82.
41. Scherr J, Wolfarth B, Christle JW, Pressler A, Wagenpfeil S, Halle M. Associations between Borg's rating of perceived exertion and physiological measures of exercise intensity. Eur J Appl Physiol. 2013;113(1):147–55.
42. Ramos DJC, Sánchez Peraza AA, Robles-Pérez JJuan, Montañez-Toledo P, Clemente-Suárez VJ. Technical Efficiency in Shackled Actions after A Short Audiovisual Training Session. Open Sports Sci J. 2014;7(1).
43. Degoutte F, Jouanel P, Filaire E. Energy demands during a judo match and recovery. Br J Sports Med. 2003;37(3):245–9.

Psychological Coping Mechanisms in Military Physicians: A Qualitative Exploration of Stress Management Strategies

M Ghorbankhani, S A Mousavian, A Shahriary, K Salehi

Abstract

Background: This qualitative study investigates the coping strategies utilised by military physicians facing the dual demands of military service and healthcare provision. Recognising the unique stressors within this professional context, the study aims to identify both adaptive and maladaptive coping mechanisms employed by military physicians.

Methods: A purposive sample of 18 military physicians from diverse branches of the armed forces was recruited. Participants, ranging in ranks from junior officers to senior medical officers, were selected based on experience levels, deployment history and demographic characteristics to ensure a comprehensive representation. Semi-structured interviews, guided by an interview guide developed through an extensive literature review, were conducted to explore participants' experiences, specific stressors encountered, coping mechanisms employed and the perceived effectiveness of these strategies.

Results: Thematic analysis revealed a spectrum of coping strategies among military physicians. Adaptive strategies included reliance on social support networks, engagement in self-care practices, proactive problem solving, effective time management and seeking professional support. Maladaptive strategies encompassed avoidance behaviours, substance use patterns, isolation tendencies, denial or minimisation and emotional suppression.

Conclusion: The findings offer a nuanced understanding of the coping landscape of military physicians, highlighting both strengths and vulnerabilities within this professional community. Identifying adaptive and maladaptive coping mechanisms provides a foundation for targeted interventions and support initiatives. The study's implications extend to organisational practices, policy considerations and avenues for future research, emphasising the importance of prioritising the mental health and wellbeing of military physicians facing the multifaceted challenges of their roles.

Keywords: Military physicians, Stress management, Coping strategies, Military healthcare

Introduction

In military medicine, where the intersection of healthcare and rigours of military service converge, the wellbeing of healthcare providers is a critical determinant of overall mission success.[1,2] This expanded study undertakes a profound inquiry into the intricate dynamics of stress experienced by military doctors to advance our comprehension of the nuanced challenges inherent in their roles and the strategies employed to mitigate the multifaceted impacts of stress. The importance of this study lies in the dual commitment that military physicians uphold – the solemn duty to preserve life and wellbeing, coupled with the challenges of operating in dynamic, often unpredictable, military environments. As frontline responders, military doctors navigate a landscape where the exigencies of battlefield medicine intertwine with the emotional toll of caring for servicemen and women during conflict.[3,4] The importance of their physical and mental resilience cannot be overstated, as it directly correlates with the effectiveness of military healthcare delivery and the overall readiness of the armed forces.[5] Despite the acknowledged significance of understanding

stress in military contexts and the plethora of studies addressing stress in healthcare professionals, a conspicuous gap persists in the focused examination of military physicians.[6,7] This study recognises and addresses this void in the research. The existing literature on stress management for military physicians often overlooks their unique challenges, treating them as extensions of the broader medical or military community.[8,9] This study addresses this gap by specifically examining the distinct stressors faced by military physicians, their impact on wellbeing and the strategies used to navigate these challenges. The study aims to unravel the complexity of stress experienced by military physicians, contributing to both military medicine and broader healthcare and stress management fields. By exposing the intricacies of stress management in this group, the study seeks to inform evidence-based interventions, policies and support structures, ultimately enhancing the resilience and efficiency of military healthcare systems in demanding operational contexts. The research benefits individuals and has broader implications for optimising healthcare delivery in military operations.

Literature review

Military physicians operate in a uniquely demanding environment that requires medical expertise and resilience to navigate the stressors inherent to military healthcare systems.[10,11] The existing literature highlights the complex interplay between military service, medical practice and the psychological wellbeing of these healthcare providers.[12] A key theme is the dual burden military physicians face: managing the clinical demands of their profession while addressing the operational challenges of military service.[13] Brintz[14] provides a foundational analysis of stress in military healthcare providers, identifying operational tempo, deployment-related stress and exposure to combat trauma as primary stressors that distinguish military physicians from their civilian counterparts. Similarly, Shutzberg[15] explores the emotional toll of treating comrades-in-arms, emphasising the added complexity of the 'warrior ethos', where personal relationships with patients blur the traditional doctor–patient dynamic. This emotional entanglement creates a unique stressor, requiring military physicians to balance professional detachment with empathetic care. The dynamic nature of military healthcare settings further complicates stress management. Varpio[7] highlights the importance of adaptability and situational awareness, noting that the rapid transition between peacetime and wartime healthcare delivery demands a specialised skillset, often exacerbating stress levels. The study also underscores the role of targeted training programs in enhancing adaptability and mitigating stress. Research on coping mechanisms among military physicians reveals various strategies to manage these unique stressors. A longitudinal study[16] tracks stress-related outcomes, including burnout, job satisfaction and quality of life. The findings emphasise the interconnectedness of stress, job performance and overall wellbeing, advocating for holistic interventions tailored to the specific needs of military physicians.

This study aims to provide actionable insights for developing targeted interventions, training programs, and mental health support systems by exploring how these professionals navigate the dual demands of military service and healthcare provision. Ultimately, the findings could inform policies and practices that enhance the resilience and wellbeing of military physicians, contributing to the broader fields of military medicine and healthcare.

In summary, the existing literature highlights the unique stressors and coping mechanisms faced by military physicians, underscoring the need for further qualitative exploration. Building on these insights, the following section outlines the methodological approach employed in this study to investigate stress management strategies in this population.

Method

A qualitative research design was deliberately chosen to understand how military physicians cope with military service and healthcare provision challenges. This approach adheres to industry standards, providing a detailed insight into the psychological and professional complexities experienced by military physicians.

Participants and procedures

This study employed a qualitative design, utilising purposive sampling to select 18 military physicians from various branches, ensuring a diverse and representative cross-section of the population. Participants were chosen based on key criteria, including diverse experience levels (ranging from early-career physicians to those with extensive military medical practice), varied deployment histories (considering different numbers of tours and operational settings) and demographic diversity (including age, gender and cultural background). Including participants across ranks, from junior officers to senior medical officers, reflects the hierarchical structure of the military medical community. While the sample size was intentionally

kept small to allow for in-depth qualitative analysis, this limitation is acknowledged and will be discussed further in the discussion section.

Data were collected through semi-structured interviews, allowing participants to share their experiences openly. The interview guide, developed based on a comprehensive literature review, included key questions such as:

- 'Can you describe the most significant stressors you face as a military physician?'
- 'What coping strategies have you found most effective in managing these stressors?'
- 'How do you perceive the role of social support networks in your stress management?'
- 'Have you encountered any challenges in accessing mental health resources or support?'

Each interview lasted between 60 to 75 minutes, allowing for a thorough exploration of participants' experiences. Thematic analysis was used to analyse the data, involving familiarisation with the data, generating initial codes, identifying overarching themes and refining these themes through iterative review. To ensure reliability and validity, member checking was conducted to verify interpretations with participants, peer debriefing was used to gain external perspectives, and an audit trail was maintained to document each step of the research process.

Ethical considerations

Ethical considerations were a central priority throughout the study. Before participating, all potential participants received comprehensive information about the research objectives, procedures and potential implications. Emphasis was placed on voluntary participation, the right to withdraw at any time without consequence and the assurance of confidentiality. Written informed consent was obtained from all participants prior to their involvement in the study.

All data were anonymised immediately after collection by removing participant identifiers, such as names and specific locations, and replacing them with unique codes to maintain confidentiality. Data were stored

Table 1. Characteristics of interviewees in the study on coping strategies among military physicians

Rank	Clinical experience (yrs)	Deployment history	Demographic characteristics
Junior Officer	4	1	Male, age: 30s
Senior Medical Officer	12	3	Female, age: 40s
Junior Officer	3	No	Male, age: 20s
Senior Medical Officer	18	4	Female, age: 40s
Junior Officer	5	2	Male, age: 30s
Senior Medical Officer	15	3	Female, age: 40s
Junior Officer	6	1	Male, age: 30s
Senior Medical Officer	20	5	Female, age: 40s
Junior Officer	8	2	Male, age: 30s
Senior Medical Officer	22	6	Female, age: 50s
Junior Officer	7	3	Male, age: 30s
Senior Medical Officer	25	7	Female, age: 50s
Junior Officer	9	4	Male, age: 30s
Senior Medical Officer	28	8	Female, age: 50s
Junior Officer	10	5	Male, age: 40s
Senior Medical Officer	30	9	Female, age: 50s
Junior Officer	11	6	Male, age: 40s
Senior Medical Officer	32	10	Female, age: 60s

securely in password-protected files, accessible only to the research team. During reporting, care was taken to ensure that no individual could be identified through direct or indirect references.

Given the hierarchical nature of military organisations, power dynamics were carefully managed during interviews to ensure participants felt comfortable sharing their experiences openly. Interviews were conducted in neutral, private settings to minimise perceived pressure or influence from superiors or peers. Participants were assured that their responses would not impact their professional standing or relationships within the military. The interviewer, who was not part of the military hierarchy, emphasised their role as an independent researcher, fostering an environment of trust and openness.

The study protocol, including participant recruitment and data collection, received ethical approval [Approval ID: IR.AJAUMS.REC.1401.186] from the Institutional Review Board (IRB), ensuring adherence to high ethical standards and participant protection guidelines.

While the purposive sampling approach and small sample size allowed for a detailed exploration of stress management strategies among military physicians, it also limited the generalisability of the findings. This limitation will be explicitly addressed in the discussion section, along with recommendations for future research to include larger and more diverse samples to enhance the external validity of the findings.

Characteristics of interviewees

Eighteen participants were chosen, representing diverse demographic characteristics. The group includes junior and senior officers with service ranging from 3 to 32 years, experiencing 0 to 10 deployments. Gender diversity was maintained with male and female participants, and ages 29 to 60 ensured a broad perspective within the military physician community. The study intentionally ensures a representative sample, as detailed in Table 1, showcasing the comprehensive nature of the selected participants.

Results

The findings presented below emerged through thematic analysis, offering a nuanced understanding of how these professionals navigate stressors unique to their professional roles.

1 Adaptive coping strategies

Adaptive coping strategies employed by military physicians emerged as crucial mechanisms for navigating the unique stressors associated with their dual roles in military service and healthcare provision. The study identified several key adaptive coping strategies, highlighting the resilience and resourcefulness of these professionals. These strategies encompassed the following:

1.1 Social support networks

Military physicians consistently sought emotional support from social support networks, including colleagues, friends and family. These networks played crucial roles in fostering camaraderie, offering a valuable outlet for sharing experiences, and navigating the complexities of their professional and personal lives. This underscores the pivotal role of interpersonal connections as a cornerstone for resilience and wellbeing in the demanding context of military medical practice.

1.2 Self-care practices

Participants consistently emphasised the importance of self-care practices in managing the complex demands of their dual roles. Engaging in activities like regular exercise, mindfulness and pursuing hobbies demonstrated their collective awareness of the crucial role personal wellbeing plays in mitigating professional stressors. Regular exercise promoted physical health and tension release, mindfulness practices cultivated mental resilience, and pursuing hobbies offered constructive relaxation. This thematic revelation underscores the proactive and personalised approaches military physicians adopt to safeguard their wellbeing in the demanding contexts of their roles.

1.3 Proactive problem solving

The study highlighted a proactive problem-solving approach as a fundamental coping strategy among military physicians. Participants consistently demonstrated the ability to systematically analyse stressors, showcasing awareness of the intricate challenges in their dual roles. This adaptive strategy went beyond problem identification to actively developing effective solutions. Military physicians exhibited a commitment to addressing challenges in both military and healthcare contexts, illustrating resilience and resourcefulness in navigating their professional responsibilities.

1.4 Effective time management

The study revealed effective time management as a crucial coping mechanism among participants,

particularly for military physicians juggling dual roles. Emphasising the value of time as a resource, participants prioritised organised schedules, consciously balancing military duties and healthcare responsibilities through strategic time allocation. This adaptive strategy showcased a practical approach to workload management and a proactive stance in enhancing productivity. The significance of effective time management underscores its pivotal role in the coping toolkit of military physicians, aiding them in navigating their roles with precision and efficiency.

1.5 Seeking professional support

A notable coping strategy among military physicians was actively seeking professional support. Some participants recognised the value of consulting mental health professionals and utilising counselling services within the military structure. This strategic approach acknowledges the importance of mental wellbeing and reflects a proactive commitment to addressing the unique stressors of military service and healthcare provision. Participants' willingness to engage with professional support demonstrates a positive and forward-thinking attitude towards mental health in the military medical community, contributing to resilience and emphasising the importance of addressing mental health needs as integral components of effective coping strategies.

2 Potential maladaptive coping mechanisms

2.1. Avoidance behaviours

The study found that some participants used avoidance behaviours as a maladaptive coping mechanism, avoiding stressors instead of facing them directly. While this strategy offers temporary relief, it indicates a need for interventions that promote direct engagement with challenges. Recognising avoidance as maladaptive underscores the importance of addressing underlying issues and developing coping strategies that encourage active and constructive confrontation of stressors. This finding emphasises the complexity of coping responses among military physicians and underscores the need for interventions fostering resilience and adaptive strategies to manage stress in their dual roles effectively.

2.2. Substance use patterns

A concerning maladaptive coping strategy among some military physicians was substance use. In isolated cases, participants admitted turning to substances like alcohol or drugs to cope with stress. This finding underscores the urgent need to address potential substance misuse within the military physician community. Substance use as a coping mechanism raises concerns not only for individual wellbeing but also for the overall health and functioning of this professional group. Recognising and addressing substance use patterns is crucial for promoting a healthier and more resilient military medical community, emphasising the necessity for targeted interventions and support systems in this unique professional setting.

2.3. Isolation tendencies

The study identified maladaptive coping, seen as isolation tendencies, in some participants. This pattern involves intentionally withdrawing from social and professional networks, highlighting potential negative impacts on military physicians' wellbeing. Addressing this finding calls for targeted interventions to foster social connectedness within the military physician community, promoting a supportive and collaborative environment. Enhancing social connectedness can contribute to military physicians' overall resilience and wellbeing.

2.4. Denial or minimisation

The study found that some military physicians use denial or minimisation as a maladaptive coping strategy, downplaying the impact of stressors. While offering temporary relief, this strategy risks hindering acknowledgment and resolution of underlying issues. Recognising this as maladaptive underscores the need for interventions encouraging open acknowledgment and constructive processing of stressors. This fosters a more resilient and adaptive approach to coping with the unique challenges of military medical practice.

2.5. Emotional suppression

The study identified emotional suppression as a maladaptive coping mechanism in some participants, indicating difficulty in openly expressing feelings about stressful situations. While offering temporary control, this coping strategy highlights areas for interventions promoting emotional expression and overall wellbeing. Challenges in expressing emotions suggest a need for targeted interventions fostering a supportive environment for military physicians to articulate and process emotions effectively. Addressing emotional suppression can contribute to developing healthier coping strategies and enhancing the emotional resilience of military physicians.

Discussion

This study explores coping strategies among military physicians navigating the dual responsibilities of military service and healthcare provision. It identifies adaptive strategies, such as leveraging social support networks and proactive problem solving, contributing to enhanced professional performance and wellbeing. Conversely, maladaptive mechanisms, including avoidance behaviours and substance use, highlight the need for targeted interventions.

The findings have significant practical implications for mental health interventions and organisational policies. For instance, the emphasis on social support networks suggests that military medical institutions should prioritise fostering peer support systems and mentorship programs. These initiatives could be integrated into training curricula to help physicians build and maintain robust support networks. Additionally, proactive problem-solving skills could be cultivated through scenario-based training modules that simulate high-stress environments, equipping physicians with practical tools to manage stressors effectively.

To address maladaptive coping mechanisms like substance use, institutions should implement tailored training programs focused on prevention, early recognition and intervention. These programs could include workshops on emotional intelligence, stress management techniques and strategies to reduce isolation tendencies. Furthermore, creating a culture of openness and reducing stigma around mental health is essential. Initiatives such as confidential counselling services and regular mental health checks could encourage physicians to seek help without fear of judgment.

While this study provides valuable insights, it is not without limitations. First, the reliance on self-reported data introduces the potential for bias, as participants may underreport maladaptive behaviours or overstate adaptive strategies due to social desirability. Future studies could incorporate mixed-methods approaches, combining self-reports with observational data, to mitigate this bias.

Second, the small sample size, though representative in terms of experience and deployment history, limits the generalisability of the findings. Caution is advised when applying these results to broader populations of military physicians or other healthcare professionals. Future research should aim for larger, more diverse samples to enhance the external validity of the findings.

Lastly, the qualitative nature of the study introduces subjectivity in data interpretation. Employing diverse analytical approaches, such as triangulation with quantitative data or multiple researchers' cross-validation, could strengthen future studies' robustness. Exploring cultural and temporal factors, and addressing negative cases would also provide a more comprehensive understanding of coping strategies in this population.

This study deepens our understanding of how military physicians cope with the unique stressors of their roles, offering a foundation for evidence-based interventions to enhance their wellbeing. The findings underscore the importance of integrating adaptive coping strategies, such as social support and proactive problem solving, into organisational policies and training programs. Simultaneously, addressing maladaptive mechanisms like substance use and avoidance behaviours is critical for effective stress management.

Organisational support plays a pivotal role in shaping coping strategies. Military medical institutions should establish comprehensive programs, including mental health resources, resilience training and initiatives to reduce stigma. A proactive organisational approach that prioritises emotional wellbeing and fosters open discussions can significantly enhance the resilience of military physicians.

In conclusion, this study highlights the intricate interplay of coping strategies and organisational support in military medical practice. By prioritising the wellbeing of military physicians through tailored interventions, cultural shifts and resilience initiatives, we can ensure they are better equipped to manage their dual responsibilities of national security and healthcare provision. This research lays the groundwork for a more supportive environment, contributing to the broader goal of redefining how we address and support the mental health of those serving on the frontlines of both medicine and military service.

Corresponding Author: Mahdi Ghorbankhani, ghorbankhani@ut.ac.ir
Authors: M Ghorbankhani[1], S A Mousavian, A Shahriary, K Salehi
Author Affiliations:
1 University of Tehran

References

1. King EL, Hawkins LE. Identifying and mitigating moral injury risks in military behavioral health providers. Mil Psychol. 2023;35(2):169-179. doi:10.1080/08995605.2022.2093599
2. Soh M, Bunin J, Uijtdehaage S, et al. Well-being at a military medical school and implications for military retention. Mil Med. 2023;188(Suppl 2):19-25. doi:10.1093/milmed/usac120
3. Jain N, Prasad S, Bordeniuc A, et al. Covid-19 and Ukrainian crisis exponentiates the need for the inclusion of conflict and disaster medicine in medical curriculum. J Med Educ Curric Dev. 2022;9:23821205221096347. doi:10.1177/23821205221096347
4. Liu GD, Wang N, Wang HM, et al. Military medical research on internal diseases in modern warfare: new concepts, demands, challenges, and opportunities. Mil Med Res. 2021;8(1):20. doi:10.1186/s40779-021-00313-8
5. Vermetten E, Greenberg N, Boeschoten MA, et al. Deployment-related mental health support: comparative analysis of NATO and allied ISAF partners. Eur J Psychotraumatol. 2014;5:10.3402/ejpt.v5.23732. doi:10.3402/ejpt.v5.23732
6. Ungureanu IM, Iesanu MI, Boboc C, et al. Addressing the challenges in the diagnosis and management of pediatric Wilson's Disease-Case report and literature review. Medicina (Kaunas). 2023;59(4):786. doi:10.3390/medicina59040786
7. Varpio L, Bader-Larsen K, Hamwey M, et al. Delivering patient care during large-scale emergency situations: Lessons from military care providers. PLoS One. 2021;16(3):e0248286. doi:10.1371/journal.pone.0248286
8. Gordon S. The military physician and contested medical humanitarianism: a dueling identity?. Soc Sci Med. 2014;120:421-429. doi:10.1016/j.socscimed.2014.04.025
9. Abbott A, Wang C, Stamm M, Mulcahey MK. Part II: Risk factors for stress fractures in female military recruits. Mil Med. 2023;188(1-2):93-99. doi:10.1093/milmed/usac033
10. Alruwaili A, Khorram-Manesh A, Ratnayake A, Robinson Y, Goniewicz K. Supporting the frontlines: A scoping review addressing the health challenges of military personnel and veterans. Healthcare (Basel). 2023;11(21):2870. doi:10.3390/healthcare11212870
11. Makanjee CR, Zhang J, Bergh AM. Roles and responsibilities in the transition to working independently: A qualitative study of recently graduated radiographers' perspectives in Australia. J Multidiscip Healthc. 2023;16:2471-2483. doi:10.2147/JMDH.S416510
12. Godier-McBard LR, Ibbitson L, Hooks C, Fossey M. Military spouses with deployed partners are at greater risk of poor perinatal mental health: A scoping review. J R Army Med Corps. 2019;165(5):363-370. doi:10.1136/jramc-2018-001069
13. Rochon C. Military physicians' ethical experience and professional identity: A Canadian perspective. J R Army Med Corps. 2019;165(4):236-243. doi:10.1136/jramc-2018-000999
14. Brintz CE, Miller S, Olmsted KR, et al. Adapting mindfulness training for military service members with chronic pain. Mil Med. 2020;185(3-4):385-393. doi:10.1093/milmed/usz312
15. Shutzberg M. The doctor as parent, partner, provider… or comrade? Distribution of power in past and present models of the doctor-patient relationship. Health Care Anal. 2021;29(3):231-248. doi:10.1007/s10728-021-00432-2
16. House S, Crandell J, Stucky C, Kitzmiller R, Jones C, Gittell JH. Relational coordination as a predictor of job satisfaction and intent to stay among nurses and physicians in the military health system. Mil Med. 2023;188(1-2):e316-e325. doi:10.1093/milmed/usab464

Creative Engagement by Wounded, Injured or Ill Australian Defence Force Personnel

G Grey

Abstract

While there has long been an extensive range of medical, pharmaceutical, psychological, physiological, spiritual and physical programs available to ADF personnel seeking health assistance, allied health practices—particularly creative arts interventions—are still relatively new in the wellbeing context.

The Australian Defence Force Arts for Recovery, Resilience, Teamwork and Skills Program (hereafter, ADF ARRTS) is an immersive, non-clinical residential program of creative engagement, funded and delivered by the ADF. It has been held biannually at the University of Canberra's ACT campus since 2015, delving into the disciplines of creative writing, music and rhythm, and visual arts and, for a time, drama.

The Defence Science and Technology Group assessed early programs for any improvements in the psychological wellbeing and recovery of Australian military personnel with service-related injuries, finding that, compared to baseline levels, there were significant improvements in self-reported self-esteem, social functioning, physical functioning and general positive affect, and significant reductions in psychological distress, insomnia and post-traumatic levels. There was no significant change in negative affect levels.[1]

With very encouraging short-term results, as a people-focused program, it remained incumbent on qualitative research into the longer-term effectiveness of program attendance, and on how creative engagement modalities may act to offer improved outcomes for uniformed personnel and veterans.

The subsequent qualitative case study, reported here, clarifies the impacts, benefits, challenges and outputs of how engaging with creativity can shape identity and future directions for wounded, injured and ill personnel.

Keywords: identity, non-clinical, confidence, wellbeing, environment

Introduction

The terms of reference for the recent Australian Royal Commission into Defence and Veteran Suicide laid scope for enquiry into multiple angles of Defence service. In the second of these terms, a subelement required the commissioners to query 'the availability, accessibility, timeliness and quality of health, wellbeing and support services (including mental health support services) to the Defence member or veteran, and the effectiveness of such services'.[2]

Since 2015, 398 wounded, injured and ill personnel have completed the month-long ADF ARRTS exploration into artist educator mentored activities in a no uniform, no rank and no judgement environment, comprising 362 ADF and 36 Australian Capital Territory Emergency Services Agency, Australian Federal Police and recently transitioned Defence personnel.

The program follows an incremental path:

- Week one – Explore: Introduce concepts and methods
- Week two – Develop: Develop ideas and skills
- Week three – Consolidate: Consolidate development while adding refinement
- Week four – Celebrate: Finalise creative project production and present works

Each workday commences with a whole-of-program artistic skills and awareness broadening hour, followed principally by participants engaging with their chosen stream of creative writing, music and rhythm or visual arts.

Throughout the program, participants are encouraged to consider their 'Week five and beyond' strategy for creative engagement continuance and how that might fit into their timetables and home environments practically.

To underscore the non-judgemental approach of program delivery, an adapted academic teaching structure—removing grading—is utilised in mentoring participants via engaging and meaningful creative skills. This is congruent with the already uniformed ethos that training is for skills enhancement to achieve mission outcomes. Mentors draw on the premise that the volunteer participants know how to learn and are willing to be trained.

Materials and methods

The Directorate of Australian Army Health examined the training delivery of the pilot program. They reported that all participants agreed ADF ARRTS should remain as an option of active recovery for wounded, injured and ill Defence personnel, that many participants said they had tried numerous other forms of treatment and this is the first form of rehabilitation they feel has worked for them, and that it has given them a sense of belonging, hope that they can move forward and skills that can be utilised in future endeavours.[3]

To ascertain the viability of creative intervention investment, the long-term outcomes, if any, for injured or ill-serving and career-transitioning personnel required examination. Inclusive, voluntary qualitative research, as a case study of the ADF ARRTS program, focused on the six programs held over the first 3 years. Although not all remained contactable, from the ADF ARRTS programs of 2015 to 2017, there were theoretically 134 participants to draw upon, of which 15% (n=20) committed to the research, comprising personnel from all three ADF services. The research respondents' span of services, ranks, age, length of service and gender were compared to the ADF ARRTS population demographics from all programs and the entire ADF population. With only minor variations across the board, the research group was representative of those wider groups.

The research project sought to ascertain whether creative arts programs lead to long-term outcomes for injured or ill-serving and career-transitioning personnel, and what aspects of program design influence outcomes.

A literature review was applied to creative arts programs,[4-30] wellbeing,[31-36] resilience[37-38] and identity;[10,38-43] none exclusive to the military. In examination of military-centric literature, among others, McGarry et al.,[38] delve deep into military systems of how to unravel the complexities of differing approaches to imbuing or managing resilience in the training and healthcare of armed forces. Yet, it is in the non-military space that much of the applicable literature originates. For example, the studies by Kristen Ørjasæter and her colleagues[9-11] identify the importance of creative arts interventions for identity in mental hospital patients and deliberate on why this may be the case. In the examinations of how to define wellbeing by the World Health Organization and others,[31-33] there is much discussion and some agreement on what factors should be considered.

The researcher—also the ADF ARRTS Artistic Director—had previously deployed to Bougainville to produce, direct and perform entertainment shows for the Peace Monitoring Group. The trust in the Defence mission built through the provision of entertainment by the military musicians, who wore the same uniform as the Peace Monitors, was appreciable. Targeted engagement with the locals built on this trust, as children overcame suspicion to willingly join in the fun, with that effect then flowing to their parents as they eventually joined in. Similar effects were experienced on deployments in Timor Leste and the Solomon Islands where, in addition to concerts, cultural exchanges were arranged with local artists to create two-way engagement. A legacy effect is the realisation that sharing creativity, rather than simply delivering it, has a multiplying effect with direct and positive impacts.

The decision to employ the single case study of previous ADF ARRTS program cohorts evolved for several reasons. First was the ability to survey participants of programs at differing intervals since program participation would indicate trends in program outcome longevity. Second, conducting in-depth interviews encourages rich data that are more likely to provide direct yet diverse advice towards the research question's understanding of what design aspects have influenced outcomes. Third, the authenticity of the data presented would make compelling evidence to satisfy the key questions.

Within the case study, Stake's responsive evaluation model was employed. Responsive evaluation is a general perspective in the search for quality and the representation of quality in a program,[44] and being responsive requires orientation to the experience of personally being there, feeling the activity, the tension, and knowing the people and their values. With a preference towards privileging the voices of ARRTS participants, responsive evaluation fits with both that positioning and a constructivist worldview. The constructivist researcher seeks to understand the inner world of a person through that person's

understanding of that world. Constructivism is closely linked to interpretivism, with the constructivist-interpretivist approach well suited to exploring the research questions.

With a personal conviction of the power of arts to heal born of deployment experiences and later involvement in mentoring on ARRTS, a need to ensure self-reflexiveness was a key researcher commitment. The research design was geared as far as possible to prevent biases, and the lived experience of former program participants is privileged as a core value central to the research. Acknowledging that all research is value-laden with beliefs and views, the relationship already formed between the researcher and participants on ARRTS is considered beneficial for both parties. As Balfour notes in his important recent work on arts and mental health of returning military personnel, the tendency for individuals experiencing mental health issues is to withdraw, and thus creating an environment of trust and participation is 'one of the very large challenges' in this type of research.[26]

Data gathering was in two tranches; initially offered to participants as written or audio survey responses to open-ended questions on the impacts, benefits, challenges and outputs of program participation. All respondents chose to respond in written form. The follow-up survey was completed face-to-face in the locales of all participants, Australia-wide, in a setting of their choice. These interviewees were asked to expand on the initial survey responses and were recorded for professional transcription.

The subsequent analysis of data applied Clarke and Braun's version of thematic analysis, emphasising 'an organic approach to coding and theme development' and 'the active role of the researcher in these processes'.[46] This complements the principle that the research methodology for this project should closely reflect the approach taken in the delivery of the program being researched and acknowledges the value of the interactive face-to-face interviews. As the research responses informed the shape of the themes and subthemes, some appeared in multiple enquiry fields. These cross-cutting outcomes were reported to represent their original intent to maintain response authenticity. For example, throughout the data analysis, the subtheme of 'Confidence' continually emerged as pertinent under 'Impacts' as a natural outcome of participant comfort and through skills growth under the described 'Benefits'. In 'Challenges', confidence factored in the themes of identity and trust, and was also referenced by respondents in influencing their reports of 'Outputs'.

Outcomes

On the questions of impacts, benefits, challenges and outputs of program participation, researched personnel expressed feeling capable and rewarded, and being able to identify as performance musicians or artists was common. Respondents gained enjoyment from their creativity while on the program and through sustained, longer-term benefits, with most (85%; n=17) continuing or revisiting creative engagement at times of their choosing in the three to five years since program attendance. Those who were not actively continuing with creative engagement post-program reported that the enjoyment from their ADF ARRTS experiences made them content that they could turn to artistic pursuits at any time, should they feel the need. This lingering sense of positivity has provided optimism in everyday life long past the residential phase, reinforcing the value of the 'Week five and beyond' approach.

The following topical descriptors outline themes and subthemes revealed, with examples of participant responses to illustrate.

Impacts

Regarding the first question—*What would you identify as the most significant impact on your life as a result of participation in the ADF Arts for Recovery, Resilience, Teamwork and Skills Program?*—dialogue from respondents centred around comparisons of treatment options, the realisation that others are also hurting, the fun of creative engagement, and the exploration of alternative lifestyle options. Note that 'impact' can be twofold for some: the responses can record memories of the program's impact at the time or impact in the longer term, with some reporting on both. Four broad themes were observed from the surveys and interviews, revealing trends across 10 subthemes:

- ***Comfort*** – *Confidence, Acceptance*
- ***Environment*** – *Personalisation, Respite, Location, No rank and no uniform*
- ***Opportunity*** – *Rekindled interests, Something New*
- ***Effect*** – *Expression, Legacy*

The reported impacts of creative engagement have created positive options among the unknowns of a post-Defence future and have also provided important clarity for participants, whether remaining in uniform or career transitioning, exampled in this participant quote:

'Participating in the ADF ARRTS program helped me reengage my right brain. This reconnection to creativity has helped me process difficult emotional memories and led to greater success in psychotherapy. Aside from the neuro-cognitive benefits of the program, it gave me the confidence to take risks. This led to me travelling overseas solo and becoming a yoga teacher. As a result, I'm now running an organisation that provides strategies for trauma management and stress relief. I'd say the program has had a significant impact on my life and the lives of others.'

Benefits

To the second question—*What were the benefits for you from your creative engagement during the ADF Arts for Recovery, Resilience, Teamwork and Skills Program?*—responses focused on the gaining and honing of enjoyable skills, how connecting with mentors and others was beneficial, and finding the time to reflect on life, assess support and value the sharing between new-found friends. As anticipated, there were some similarities with responses to the earlier question on 'impact'—although 'impact' is not necessarily positive, unlike the implication of 'benefit'. Three distinct themes were presented, with eight subthemes revealed:

- ***Skills*** *– Confidence, Possibilities, Enjoyment*
- ***Influences*** *– Mentoring, Connection*
- ***Introspection*** *– Reflection, Support, Sharing*

Seventy per cent of respondents (n=14) specified that the program had impacted positively through using skills, citing enhanced confidence, the exploration of possibilities—the notion, the doing and the influence—and the enjoyment derived from their creative engagement.

It is also strongly reported that the pause for reflection afforded through time away from participants' usual workplace and/or home environments has catalysed revelations on a myriad of life, health and career situations, with these dimensions providing the confidence to make significant life changes. Respondents reported that the atmosphere for considered introspection in creating storied works, coupled with support from staff and mentors, benefited interactions with participants' families and workplaces and out into the communities in which they live. In the words of one participant:

'Doing the ARRTS program gave me the confidence to try more things outside, like I could perform music now and I could study, and it's really helped me through that rather than just go to work, form up, drive a LAV [armoured vehicle] and then go home. It was the free exchanging of ideas that really resonated with me.'

Challenges

With the third question—*What were the challenges for you from your creative engagement during the ADF Arts for Recovery, Resilience, Teamwork and Skills Program?*—and noting that not all challenges are negative, three key themes were observed, reporting trends across nine subthemes:

- ***Personality*** *- Clashes, Limits, Freeness, Departure*
- ***Identity*** *- Dilution of responsibilities, Self-focus, Bare emotions*
- ***Trust*** *- Confidence, Doubt*

Focusing on self and feeling that ADF ARRTS was an excellent opportunity, while developing an understanding of the needs and situations of others created an environment where empathy could be nurtured. Experiencing judgemental thoughts of fellow participants regarding whether they had experienced similar war exposures or even combat was cause for reflection on how to learn and grow egalitarian principles.

Being in creative group situations, with an increasing realisation that a sense of humour can dissipate over time through military service and why that might be the case, was challenging, and the raw emotions elicited through creative activities generated reflections on life and career situations. Although challenging at times, this caused introspection with positive outcomes for some, while it gave rise to anger for others.

Engaging with a process about self, not Defence outputs, was highlighted as a foreign notion. As one participant contemplating the program's parameters of avoiding military 'learned responses' reports:

'This will be one of the difficulties for the program; we, both officers and soldiers, come through a factory, to think inside the square, to do what you're told to do instinctively, whereas the ARRTS is working against that and saying, look, just draw that line wherever you want it to go. I think that's a bit problematic when you've got, I don't know, is it 30-odd people doing the course? And their crutch has been often, I would imagine, the Army or the service—"This is the way you do it".'

Outputs

To the final question—*If you've engaged in creative activities since attendance at the ADF Arts for Recovery, Resilience, Teamwork and Skills Program perhaps you'd like to share what it is you've done?*—dialogue from respondents informed four observed themes:

- **Inspiration and expression**
- **Storytelling routes**
- **Professional channels**
- **Consolidation and collaboration**

With the style of question changing from the topic enquiry of the previous three to one of a more practical response to physical creations, the four themes listed above are consolidated areas of reference flowing from the responses and are not subthemed.

Respondents reported on the results of their creative engagement and provided insight into the wide variety of artistic practice outputs since their ADF ARRTS attendance. Three have joined music-enabling organisations to further their skills and enjoy camaraderie, and two have been involved on stage in theatre productions. Two have become involved as extras for TV and film, and two more have been involved in group activities involving creating objects. One has utilised performing publicly to benefit both him and the recipients, with another five choosing to share their music online. Two have held exhibitions of their artworks at galleries, while another is prolific online with drawings.

Describing their experience on stage, a participant was emphatic:

> *'Being involved in the drama production allowed me to explore the emotions of experiences in Afghanistan through a monologue. It was a form of exposure therapy in a supported creative environment. Having participated in exposure therapy in a clinical setting [hospital PTSD program], I found that doing it in a drama group or on stage was far more beneficial.'*

Discussion

Understanding any long-term outcomes for injured or ill-serving personnel is necessary to refine the delivery of ADF ARRTS, and to inform potential application to other contexts where non-clinical arts exposure may be useful. Moreover, new knowledge on any legacy impacts could provide important insights into the worth of creative immersions for ADF and emergency services leadership, including pre-deployment training for military personnel, training for first responders, arts for veterans or arts for post-natural disaster healing.

Of those who had career transitioned since attending (n=14), 12 (85.7%) were still involved with creative engagement activities, and for those remaining in service (n=6), five (83.3%) were still creating. That personnel remaining in service are continuing creative engagement at a similar rate to those who have departed is valuable new data, and a strong indication of the breadth of program success.

This research project provided a free-flowing, rich tapestry of reflections. Candour was exhibited regarding the effects of uniformed service on work and life decisions, with the guidance-based teaching method proving highly effective in providing participants with meaningful creative skills. This style reflects and builds on the participants' prior knowledge that training is for skills enhancement while introducing the concept that not everything in life must be viewed in pass or fail terms.

It is instructive that responses inevitably trended towards the key topic of identity: the search for identity, the loss of identity, the compromise of identity, re-finding identity or realising, for the first time, that human behaviour naturally contains more than one identity per person. For example, a challenge faced by some participants centred on the nuances of the no-rank program environment and how best to deal with minor changes in verbally addressing other personnel. Behind that was the larger issue of what to do in a setting where the *identity* of rank had been removed. For some, the idea of not *being* a rank was confronting, providing cause to begin deciding who or what their real identity might be. For many, this transpired to the realisation that they have multiple identities, and are *allowed* to do so. This multiparticipant epiphany, likely more than any other result, has created a highly significant indicator of creative arts program success, validating an attendee's faith in themselves for taking the first step to engage. It has allowed participants to conceptualise life after uniformed service, a sometimes-unimagined eventuality for all, very differently.

Limitations

Research was limited to including the first six program cohorts to meet the project goal of ascertaining the longer view of outcomes. This period (2015 to 2017) was closer to the withdrawal of the main body of Australian troops from Afghanistan than later programs. It may have hosted a higher number of

veterans with war service. While the cause of an ARRTS participant's injury or illness is not a factor of program eligibility or completion, conversations among long-term ARRTS program staff indicate that the earlier programs brought with them more anger and aggressive behaviours. Whether this is related to the Afghanistan War timeline has not been tested.

In this research, respondents have not been queried on the subjective topics of life/work/family challenges that may have been catalysts in seeking ARRTS program attendance for respite or pause from those settings. Similarly, information on the type of uniformed service rendered—combat, combat support or non-combat—has not been sought, with no assumptions drawn on a hierarchy of injury, as is appropriate for a study of a non-judgemental program.

Future directions

The research has shown that access to artist-educator-led, non-clinical creative engagement in a vocation born of conformity and uniformity can provide a safe opportunity to explore individualism. With high rates of creative continuum for injured or ill-serving and career-transitioning personnel, it is now appropriate to broaden that brief to a broader ADF population. A new research project: 'Purposeful downtime on deployment: a study of the impacts, benefits, challenges and outputs of creative engagement by ADF personnel on deployment', is now under way.

Conclusion

Reflecting upon creative engagement experiences and enunciating them from very personal perspectives is far removed from the 'learned responses' of the military environment. The creation of circumstances where individuals are drawing on more than one identity, and possibly several, in formulating their responses saw new schemas emerging, initiating shifts in cognitive direction and creating opportunities for change.

While the dominant discourse on identity in the military environment is team-focused, with a strategic emphasis on being 'fit'—'to fight, to work, for life',[37] it is apparent from this research that personnel involved in creative engagement are capable of forming new, individual identities and embracing new options: ones that can focus on self-esteem, self-efficacy and self-expressivity, when steering new paths through recovery to return to work or career transition.

Acknowledgements

The author acknowledges the Australian Defence Force leadership for supporting the continuation of ADF ARRTS, and Head of ADF ARRTS, Brigadier Wayne Goodman and the University of Canberra Centre for Creative and Cultural Research for supporting this research project.

Corresponding Author: Geoff Grey, drgeoffgrey@gmail.com
Authors: G Grey[1]
Author Affiliations:
1 University of Canberra - Faculty of Arts and Design

References

1. Temby P, Johnson K, Pomeroy D, Fischer T. Evaluation of the Australian Defence Force Arts for Recovery, Resilience, Teamwork and Skills (ARRTS) Program. In: Defence Human Sciences Symposium; 2015.
2. Hurley D. Royal Commission in Defence and Veteran Suicide, Letters Patent (8 July 2021). Commonwealth of Australia; 2021. p. 2.
3. Ikin J, Matthews E. Training Evaluation ADF ARRTS Program conducted May 2015. Department of Defence; 2015. Report No.: DAH/OUT/2015/R22346917. Translated by: Department of A. Health. p. 10.
4. Hogan S. Healing Arts: The History of Art Therapy. London: Jessica Kingsley Publishers; 2001.
5. Davis WB, Gfeller KE, Traut MH, editors. An Introduction to Music Therapy: Theory and Practice. 3rd ed. Silver Spring (MD): The American Music Therapy Association, Inc.; 2008.
6. American Music Therapy Association. History of Music Therapy [Internet]. AMTA Website; 2021 [cited 2025 Apr 30]. Available from: https://www.musictherapy.org/about/history/
7. McCaffrey T, Edwards J, Fannon D. Is there a role for music therapy in the recovery approach in mental health? Arts Psychother. 2011;38(3):185–9. https://doi.org/10.1016/j.aip.2011.04.006

8. Ledger A, Edwards J. Arts-based research practices in music therapy research: Existing and potential developments. Arts Psychother. 2011;38(5):312–7. https://doi.org/10.1016/j.aip.2011.09.001
9. Ørjasæter KB, Davidson L, Hedlund M, Bjerkeset O, Ness O. "I now have a life!" Lived experiences of participation in music and theater in a mental health hospital. PLoS One. 2018;13(12):e0209242. https://doi.org/10.1371/journal.pone.0209242
10. Ørjasæter KB, Ness O. Acting Out: Enabling Meaningful Participation Among People With Long-Term Mental Health Problems in a Music and Theater Workshop. Qual Health Res. 2017;27(11):1600–13. https://doi.org/10.1177/1049732316679954
11. Ørjasæter KB, Stickley T, Hedlund M, Ness O. Transforming identity through participation in music and theatre: Exploring narratives of people with mental health problems. Int J Qual Stud Health Well-being. 2017;12(1):1379339. https://doi.org/10.1080/17482631.2017.1379339
12. Lawson J, Reynolds F, Bryant W, Wilson L. It's like having a day of freedom, a day off from being ill: Exploring the experiences of people living with mental health problems who attend a community-based arts project, using interpretative phenomenological analysis. J Health Psychol. 2014;19(6):765–77. https://doi.org/10.1177/1359105313479627
13. Bickerdike L, Booth A, Wilson PM, Farley K, Wright K. Social prescribing: Less rhetoric and more reality. A systematic review of the evidence. BMJ Open. 2017;7(4):e013384. https://doi.org/10.1136/bmjopen-2016-013384
14. Redmond M, Sumner RC, Crone DM, Hughes S. 'Light in dark places': Exploring qualitative data from a longitudinal study using creative arts as a form of social prescribing. Arts Health. 2019;11(3):232–45. https://doi.org/10.1080/17533015.2018.1490786
15. Weinberg MK, Joseph D. If you're happy and you know it: Music engagement and subjective wellbeing. Psychol Music. 2017;45(2):257–67. https://doi.org/10.1177/0305735616659552
16. Zubala A, MacIntyre DJ, Gleeson N, Karkou V. Description of arts therapies practice with adults suffering from depression in the UK: Quantitative results from the nationwide survey. Arts Psychother. 2013;40(5):458–64. https://doi.org/10.1016/j.aip.2013.09.003
17. Lenette C, Weston D, Wise P, Sunderland N, Bristed H. Where words fail, music speaks: The impact of participatory music on the mental health and wellbeing of asylum seekers. Arts Health. 2016;8(2):125–39. https://doi.org/10.1080/17533015.2015.1037317
18. Pennebaker JW. Expressive Writing in Psychological Science. Perspect Psychol Sci. 2018;13(2):226–9. https://doi.org/10.1177/1745691617707315
19. Nicholls S. Beyond Expressive Writing: Evolving Models of Developmental Creative Writing. J Health Psychol. 2009;14(2):171–80. https://doi.org/10.1177/1359105308100201
20. Marxen ME. Pain and knowledge: Artistic expression and the transformation of pain. Arts Psychother. 2011;38(4):239–46. https://doi.org/10.1016/j.aip.2011.07.00321.
21. Stuckey, H. L., & Nobel, J. (2010). The Connection Between Art, Healing, and Public Health: A Review of Current Literature. American Journal of Public Health, 100(2), 254–263. https://doi.org/10.2105/AJPH.2008.156497
22. Bolwerk A, Mack-Andrick J, Lang FR, Dörfler A, Maihöfner C. How art changes your brain: Differential effects of visual art production and cognitive art evaluation on functional brain connectivity. PLoS One. 2014;9(7):e101035.
23. Campion M, Levita L. Enhancing positive affect and divergent thinking abilities: Play some music and dance. J Posit Psychol. 2014;9(2):137–45.
24. Golden TL, Tetreault L, Ray CE, Kuge MN, Tiedemann A, Magsamen S. The state of music-based interventions for mental illness: Thought leaders on barriers, opportunities, and the value of interdisciplinarity. Community Ment Health J. 2021;58(3):487–98.
25. Schnitzer G, Holttum S, Huet V. "My heart on this bit of paper": A grounded theory of the mechanisms of change in art therapy for military veterans. J Affect Disord. 2022;297:327–37.
26. Balfour M. The difficult return: The arts and social health of returning military personnel. Arts Psychother. 2019;62:61–7.
27. Pezzin LE, Larson ER, Lorber W, McGinley EL, Dillingham TR. Music-instruction intervention for treatment of post-traumatic stress disorder: A randomized pilot study. BMC Psychol. 2018;6(1):60.

28. Berberian M, Walker MS, Kaimal G. 'Master My Demons': Art therapy montage paintings by active-duty military service members with traumatic brain injury and post-traumatic stress. Med Humanit. 2019;45(4):353–61.
29. Bullock O. Poetry and trauma: Exercises for creating metaphors and using sensory detail. New Writing. 2021;18(4):409–20.
30. Watt T, Kehoe EJ. Causes and duration of change resulting from art-based activities for members of the Australian Defence Force. J Mil Veterans Health. 2020;28(1):7–15.
31. World Health Organization. Joint meeting of experts on targets and indicators for health and well-being in Health 2020. Geneva: WHO; 2013.
32. Dolan P, Metcalfe R. Measuring subjective wellbeing: Recommendations on measures for use by national governments. J Soc Policy. 2012;41(2):409–27.
33. Alatartseva E, Barysheva G. Well-being: Subjective and objective aspects. Procedia Soc Behav Sci. 2015;166:36–42.
34. Duckworth AL, Weir D, Tsukayama E, Kwok D. Who does well in life? Conscientious adults excel in both objective and subjective success. Front Psychol. 2012;3:356.
35. Dolan P, Metcalfe R. Measuring subjective wellbeing: Recommendations on measures for use by national governments. J Soc Policy. 2012;41(2):409–27.
36. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. J Pers Assess. 1985;49(1):71–5.
37. Binskin M, Moriarty G. Defence mental health and wellbeing strategy 2018–2023 [Internet]. Canberra: Commonwealth of Australia; 2017 [cited 2025 Apr 30]. Available from: https://www.defence.gov.au/Health/_master/HealthUpdates/docs/Defence_Mental_Health_Wellbeing_Strategy_2018-2023.PDF
38. McGarry R, Walklate S, Mythen G. A sociological analysis of military resilience: Opening up the debate. Armed Forces Soc. 2015;41(2):352–78.
39. Hall S, du Gay P. Questions of cultural identity. London: Sage Publications; 1996.
40. Fletcher JD, Chatelier PR. An overview of military training [Internet]. Alexandria (VA): Institute for Defence Analyses; 2000 [cited 2025 Apr 30]. Available from: https://apps.dtic.mil/sti/citations/ADA408439
41. Australian Army. Army land warfare doctrine. Canberra: Australian Army; 2017.
42. Hoskin R. Director of Army leadership philosophy. Canberra: Australian Army; 2018.
43. Savion SM. How do retired officers start anew in civilian society? A phenomenological study of life transition [dissertation]. Washington (DC): George Washington University; 2009. Available from: https://scholarspace.library.gwu.edu/concern/gw_etds/cj82k7352
44. Stake RE. Standards-based & responsive evaluation. London: SAGE Publications Ltd; 2004.
45. Denicolo P, Long T, Bradley-Cole K. Data analysis, meaning interpretation and management/presentation issues. In: Constructivist approaches and research methods: A practical guide to exploring personal meanings. London: SAGE Publications Ltd; 2016. p. 131–56.
46. Clarke V, Braun V. Thematic analysis. J Posit Psychol. 2017;12(3):297–8. https://doi.org/10.1080/17439760.2016.1262613

Do you have an article of interest to our readers?

The Journal of Military and Veteran's Health is a peer reviewed quarterly publication published by the Australasian Military Medicine Association.

Authors are invited to submit articles of relevance to the Editor for consideration for publication in the Journal of Military and Veterans' Health (JMVH).

Categories include:

- Original Research/Original Articles
- Short Communication
- Review Articles
- Reprinted Articles
- Case Studies
- Biographies
- History
- Book Reviews
- Commentary
- View from the Front

See the JMVH website for authors' instructions and submit your article online at www.jmvh.org

JMVH

Stuart Naval Warfare, Ships and Medicine 1603–1714

N Westphalen

Introduction

Previous articles in this series described the development of a cycle from prehistory to the end of the Tudor period to 1900, whereby increasing maritime trade necessitated larger and more efficient ships to transport merchandise and better weapons to defend or attack them, facilitating further trading opportunities.[1,2,3,4,5,6,7] However, it was not until the 18th century that Western medicine had developed sufficiently for its role as an enabler of this cycle to be recognised, thereby making possible—among other things—the European settlement of Australia.[8]

While the technical developments in ships, weapons and medicine often developed independently in multiple regions worldwide, they remained closely linked throughout Western history. This article completes this series by filling the gap regarding the developments in naval warfare, ships and medicine during the Stuart period from 1603 to 1714.

Stuart naval warfare

Besides their dynastic and religious origins, the Stuart wars with Spain (1625–1630, 1654–1660 and 1701–1713), Holland (1652–1654, 1665–1667 and 1672–1674), and France (1627–1629, 1689–1697, and 1702–1713) were also fought for the domination of American, Indian and Far Eastern trade. It was only during the last of these wars that England (Great Britain from 1707) maintained an army in Europe; instead, it fought almost exclusively naval wars, by which its trade provided the funding to fight and support its allies on the continent while eventually bankrupting their opponents. However, these operations were frequently ruined by failures to maintain seamen's health.[9,10]

Although James I's reign (1603–1625) generally only required about 30 warships for English Channel anti-piracy duties during the summer months, lack of money and endemic corruption rendered them more-or-less ineffective. As a result, Charles I's wars with Spain and France comprised a succession of debacles caused by non-seaworthy ships, bad victualling and disease outbreaks, the latter including dysentery, typhus and scurvy. These occurred at levels that had not been seen since the aftermath of the 1588 Spanish Armada, such that a 1625 expedition to Cadiz led to the first English sick lists and the first (albeit extemporised) hospital ships.[11]

Meanwhile, despite Dutch and Portuguese resistance, the English East India Company (EEIC) established its first 'factories' in modern Indonesia in 1601 and in India from 1612. Its huge profits came to fund its 'Indiamen' (see below) such that, unlike the King's ships, these were well-found, manned by adequately-paid crews, and had more and somewhat better-quality victuals and medical supplies. Although this led to the EEIC rather than the navy becoming the repository of England's 17th-century maritime medical expertise, it will be seen how the developments in ventilation, sanitation, personal hygiene, victualling and water quality necessary to reliably keep even their own crews alive lagged until after the 1740s.

During the English Civil Wars from 1641 to 1651, the navy's role was to prevent foreign interference. On coming under Parliament's control in 1644, its status changed from a personal possession of the monarch to an instrument of state, which gave it access to better funding. Besides expanding its size, Parliament marginally improved service conditions (including its medical arrangements), making them somewhat less disparate relative to the EEIC's. These developments helped the English interdict Dutch trade with its colonies during the First Dutch War. In addition, the capture of Jamaica from the Spanish in 1655 provided a base for England to expand its West Indies trade (typically sugar and enslaved people) over the next 150 years at the expense of their Spanish, French and other rivals.[12] These wars also saw battle tactics evolve from melee fighting, during which ships would empty one broadside into an opponent, turn to fire the other and then withdraw to reload, into forming 'lines-of-battle' whereby ships would form a bow-to-stern line to continuously batter their opponents while protecting each other from being raked from forward or aft.[13]

The navy's new tactics and increasing size quickly led to overwhelming numbers of what would now be referred to as Battle Casualties (BCas), which necessitated the first of five Sick and Hurt

Commissions from 1653. High BCas and Disease and Non-Battle Injury (DNBI) rates in the West Indies (the former typically comprising malaria and yellow fever in addition to the usual dysentery, typhus and scurvy), led to the first dedicated English hospital ships from 1655.[14]

Following the Restoration of Charles II in 1660, the RN further expanded during the Second and Third Dutch Wars, both of which required their own Sick and Hurt Commissions. Although the 1688 Glorious Revolution brought England into a succession of continental conflicts, its maritime trade wars continued, which paid for its navy (over 250 ships by 1713) and funded its allies and the army in Europe while eventually bankrupting its opponents. With the end of these wars, the last Sick and Hurt Commission became a permanent Board, tortuously leading to the Admiralty Medical Department (now the RN Medical Director General (Naval)) in 1832.

Figure 1. First Dutch War, Battle of Kentish Knock, 28 September 1652.[15] Note the absence of a 'line-of-battle' formation, which tended to create relatively few BCas.

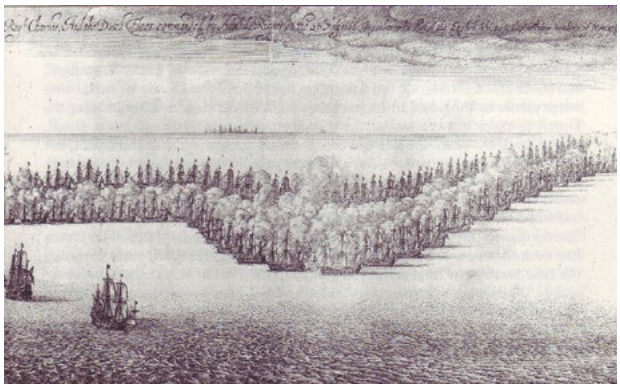


Figure 2. Second Dutch War, St James' Day Battle, 25 July 1666.[16] Although rather stylised, note the 'line-of-battle' formations, which produced more BCas.

Stuart ships

A previous article explained how, by 1600, Portugal, Spain, England, Holland and France had developed ships that could voyage more-or-less anywhere worldwide in search of trade, colonies and/or plunder.[17] These ships enabled the Spanish colonisation of central and south America and the Philippines, and Portuguese colonies in Brazil, Africa, India and the East Indies. The following century saw Portugal lose most of the East Indies to the Dutch, and the English and French taking over many of Spain's Caribbean colonies while establishing new colonies in northeast America.

Previous articles also explained how the same ships were used for warlike and peacetime purposes until the invention of watertight gun ports after 1500 began their differentiation into bespoke warships and merchantmen. By the 1620s, warships were carrying large-calibre cannons on up to three gun decks; their holds were permanently subdivided into dedicated store rooms for food, water and ammunition in lieu of cargo, and their crews included large numbers of seaman-gunners to fight as well as sail their ship. Even so, it also found that small soldier contingents remained useful for guard duties, boarding actions and amphibious raids. Following their formal introduction in 1664, the first English 'sea soldiers' became a permanent force in 1755, titled the Royal Marines from 1802. Besides coming exclusively under Admiralty control, marines were distinguished from Army soldiers in that they performed seamen tasks additional to their military duties, except they could not be ordered aloft.[18]

By the second half of the 17th century, warships themselves had differentiated into those with two or three gun decks that could fight in a battle line (hence 'ships-of-the-line' or 'line-of-battle' ships), and those with only one gun deck known as 'frigates', which were fast enough to act as fleet scouts, and large enough to operate over long distances to attack the enemy and defend their merchant shipping independently.[19,20,21] Meanwhile, merchantmen generally kept their crew sizes small to minimise costs and their holds clear to maximise cargo capacity while carrying small-calibre cannons on their weather decks for self-defence.

The 'Indiaman' was the exception, developed by the EEIC following its foundation in 1600. These were big ships with warship-like gunports and large crews armed with smaller-calibre cannon, but also spacious merchantman-like holds.[22,23] Although they were not naval ships, Indiamen became crucial to English maritime power over the next two centuries. Firstly, their size and armament allowed them to

conduct high-value transoceanic trade with friendly indigenous populations (and to plunder those less friendly) and to attack or defend against their commercial rivals. Secondly, like the triangular transatlantic trade described in a previous article (including the notorious 'middle passage' slave component), the taxes on their cargoes paid for the navy that eventually dominated the seas around Europe, which was used to isolate their competitors from their colonies and markets.[24,25] Finally, the Indiamen's large crews substantially increased the pool of otherwise scarce trained seamen that the navy could employ during wartime.[26]

Figure 3. 70-gun ship-of-the-line HMS Stirling Castle, 1679.[27] Note the two full-gun decks.

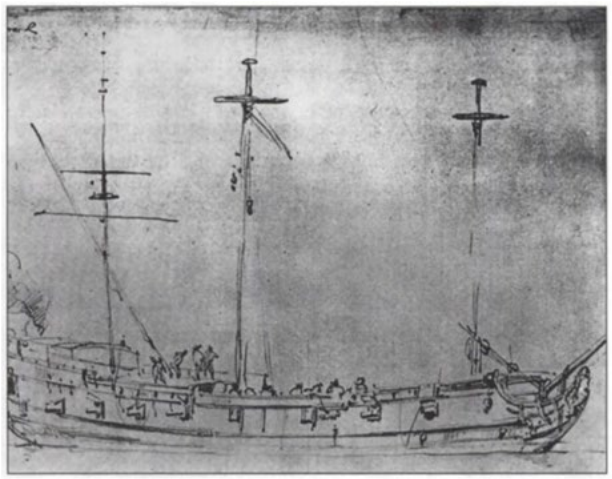


Figure 4. Frigate HMS Drake, c.1707.[28] Note her small size and single-gun deck.

Figure 5. Dutch merchant ship, c.1665.[29] Note her small size, upper deck cannons… and the single below-deck gun (forward, below the foremast shroud chains).

Figure 6. English East Indiaman fighting off a smaller Spanish privateer, 1682.[30] Note her large size and two gun decks (although her cannon would have been smaller than those on a warship).

Stuart naval medicine

Patient care afloat

A previous article described how the institution of Henry VIII's 'Navy Royal' in 1509 created the need for the first English naval sea surgeons.[31] These were recruited by the London Barber-Surgeon's Company on a short-term casual basis for the summer anti-piracy patrols, with wartime augmentation as required (the latter often by 'impressment' or compulsion). Nevertheless, despite its increasing

size and operational scope during the Stuart period, naval surgeons had no permanent employment until 1729.[32]

While the larger ships often had surgeon's mates, it was not until 1652 that all seagoing surgeons had at least one to assist with the workload and provide redundancy irrespective of their ship's size.[33] Apart from the 'loblolly boys' to help feed the sick,[34] their messmates provided seagoing nursing care, while hospital ships only carried additional sailors for nursing duties from 1703. These proto-medical assistants were not formally required aboard warships until 1833, and they had no formal training or career structure until 1884.[35,36]

Despite never having served at sea, John Woodall (c1570–1643) had a central maritime medical role during the early Stuart period. After going to war in France in 1589–90, he spent some time in Germany before his admission to the London Barber-Surgeon's Company in 1599, becoming an examiner in 1626, Warden in 1627 and Master in 1633.[37]

Figure 7. John Woodall, 1639.[38]

A previous article described how, although some Tudor commanders provided financial assistance via an 'imprest' or loan, their surgeons had to provide their own medical equipment and stores.[39] Woodall's maritime medical role began in 1606 when the London Barber-Surgeons Company was granted the right to examine all sea surgeons and to fine those with unsatisfactory medical chests. It delegated this responsibility to Woodall, by which he became the EEIC Surgeon General from 1612 to 1635. This entailed recruiting and examining candidate surgeons, selling them their medical chests and buying back their unexpended stores. Although his duties did not compare to the Dutch East India Company's more extensive medical organisation, they nonetheless resulted in the EEIC rather than the navy providing the first long-term careers for English sea surgeons. Woodall was probably also involved in the barber-surgeons supporting a 1626 petition by navy surgeons for a 'free gift' additional to their 'imprest' in response to the medical failures during Charles I's war with Spain. Woodall thereafter extended his EEIC duties to the navy, even without being appointed (or even paid) to do so.[40]

Despite the split in the English medical profession between surgeons and physicians, Woodall advocated training sea surgeons in internal medicine. To this end, he required his EEIC surgeons to produce the first maritime medical journals, which he used to write *The Surgion's Mate* in 1617 and *The Viaticum, being the Pathway to the Surgion's Chest* in 1628. These were combined into *The Surgeon's Mate or Military and Domestique Surgery* in 1639, which Woodall intended explicitly for naval use. It was not until 1704 that navy surgeons likewise had to submit medical journals with the details of each case, and even then, these were only used to validate their per capita remuneration rather than disseminating any lessons learned.[41]

Woodall's 1617 text was intended for inexperienced surgeons and novice surgeons' mates dealing with medical and surgical conditions at sea and in the tropics. The first section describes the chest contents and their indications for use. The second comprises short notes on acute surgical problems, including wounds, gunshot wounds, burns, abscesses and fractures, and the third likewise regarding medical conditions, including dysentery, enteritis and scurvy. The fourth is a treatise on applying chemistry to disease, concluding with a glossary of alchemist terms.[42]

Although he described the chests' surgical instruments and their use in some detail, Woodall rarely advised incision. He also gave precise instructions on using dental forceps and considered no surgeon's mate competent unless he was proficient at drawing teeth.[43] His account of *Medicines Physicall and Chirurgicall* includes 270 animal, vegetable or mineral items, which were more numerous and somewhat less alchemic than those in the *Mary Rose* medicine chest 70 years earlier.[44] Woodall also assigned a specific place for each item in his chests, rather like the system used by the Australian Royal Flying Doctor Service 300 years later.[45]

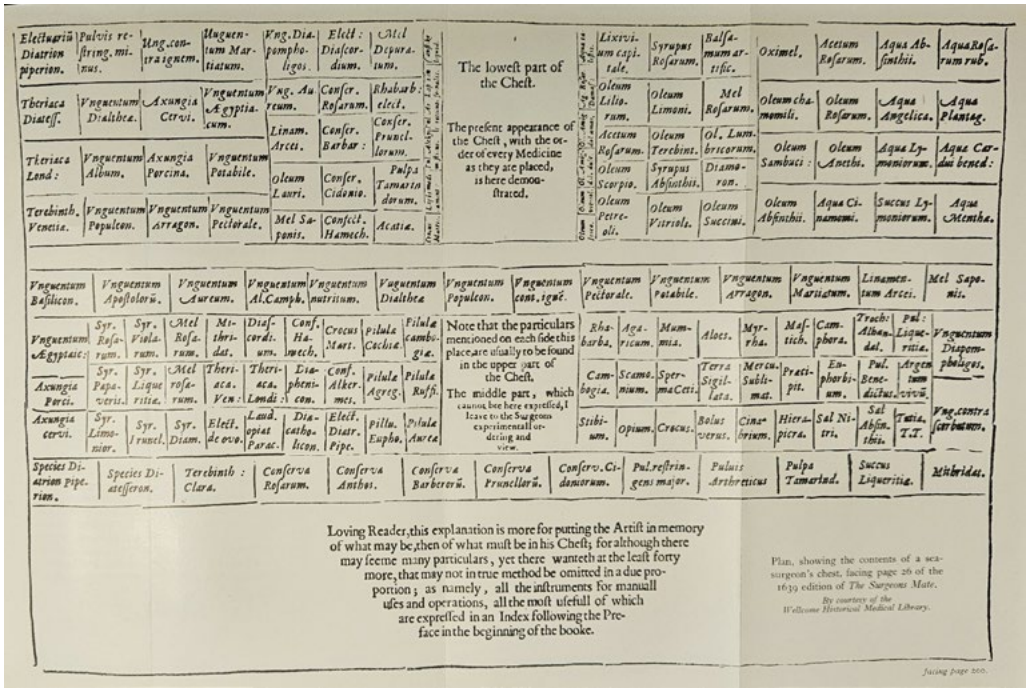


Figure 8. Plan, John Woodall's surgeon's chest, 1617[46]

Woodall's 1616 appointment as surgeon to St Bartholomew's Hospital would have brought him into contact with William Harvey (1578–1657), the first physician to accurately describe the circulatory system in lieu of the errors made by Galen of Pergamon 1400 years previously. Even so, Woodall's medical advice remained based on the physicians' reliance on increasingly complex humoural theories that were not yet discredited. For example, this meant that, despite knowing lemons were an effective antiscorbutic, Woodall advised that any astringent fluid would be suitable.

Following Woodall's death, the London Barber-Surgeons continued to examine navy and EEIC surgeons and their chests until the Society of Apothecaries (established in 1617, the forerunners to modern general practitioners) began supplying their non-surgical items from 1703. By 1713, RN medical chests were being examined twice yearly by its own dockyard surgeons and its first dispenser, Henry Blakey, at the Greenwich Naval Hospital.[47] Even so, it was not until 1804 that RN surgeons had their drugs supplied at service expense, and even then, they still had to provide their own instruments.[48] Meanwhile, the London Barber-Surgeons and its successors continued to examine prospective RN surgeons until 1824.[49]

Although the first wartime seagoing fleet physicians were appointed in 1691,[50] medical conditions such as scurvy, typhus and dysentery remained more-or-less unchecked until after the 1740s. Even so, some progress was made: for example, surgeon Patrick Campbell recommended free uniforms to prevent typhus in 1704, although this was not implemented until the introduction of continuous service in 1857.[51] In the more immediate term, ships began carrying live sheep to provide fresh meat for the sick, with the manger's forecastle location providing the site for ship's sickbays a century later.[52,53]

Patient care ashore

A previous article describes how Henry VIII's dissolution of the monasteries forced the closure of nearly all 'houses of pity', including the mariner's 'masyndews', from 1536. [54] Local parishes, therefore, began funding secular hospitals from the 1550s, supplemented by the monarch's privy purse, levies (such as those on ships entering Bristol for the local mariner's hospital), and lay benefactors such as Sir John Hawkins, who provided a ten-bed mariner's hospital at Chatham in 1594. However, it was only from 1597, when benefactors could make such donations without royal approval, that these hospitals provided even the limited care previously offered by the monasteries.[55,56]

Meanwhile, permanently disabled mariners depended on begging licences or competing with other sick and poor for whatever charitable accommodation remained, until Lord Howard, Sir Francis Drake and Hawkins established the Chatham Chest in 1590. Founded in response to the medical disaster that followed the 1588 Armada campaign, the Chest was an independent mutual benevolent fund to which

every seaman in the royal ships (and junior officers from 1626) contributed sixpence a month. The Chest itself had five keys, one being held by the Treasurer of the Navy, whose political power compared to the other key holders meant there was little to prevent corruption. This abuse was also facilitated by low demand. Although disease levels in the Stuart Navy were often overwhelming, the extent to which victims either died or fully recovered meant permanent disability rates remained low until BCas numbers became overwhelming from the 1650s. Applicant numbers were also reduced by applicants having to attend personally until the 1630s when the Chest began funding acute relief, medical and travel costs. Even then, the Board's decisions were often delayed as it met only once a month. Furthermore these were often arbitrary and inconsistent: although a few received annual pensions of less than £6.13s.4d, they typically only comprised lump sums not exceeding £2 (roughly two month's wages). Even so, the Chest generally functioned as its founders intended until its merger with the Greenwich Hospital naval pensioner scheme (introduced in 1691) in 1814.[57,58,59,60]

Figure 9. The original Chatham Chest, built c.1625.[61] Note the false central lock (the actual lock is in the lid) and four padlock hasps, the keys to which were putatively held by different people.

Meanwhile, temporarily disabled seamen continued to depend on the medical provisions of the *Laws* (also Rules or Rolls) *of Oléron*, introduced in 1190.[62] Although 'Olrums' had obligated English masters (whether of a King's ship or private merchantman) to pay for lodging their sick and injured ashore, actual accommodation was often lacking, especially after the demise of the 'masyndews'. Furthermore, as the navy's peacetime anti-piracy duties expanded from summer to year-round, more personnel spent more time at sea. Although England's southern ports had long had to (mostly) cope with ill and injured mariners, the Armada campaign initiated a period where they would be inundated during wartime by mostly DNBI, with the shipboard disease outbreaks also creating epidemics among the townsfolk. In addition, the new 'line-of-battle' tactics during the First Dutch War also began to create overwhelming numbers of BCas.

In March 1653, repeated 'Olrums' failures led to Parliament sending the London physician Daniel Whistler (1619–1694) wherever he was needed to arrange medical supplies, accommodation (and its payment) and patient transport to London hospitals. By September 1653, he was supported by a four-person Commission for Sick and Hurt Mariners, who, besides naval sick and wounded, was also responsible for prisoners of war and dependents of naval personnel killed in action. Other assistants included the Civil War publisher and nurse Elizabeth Alkin or 'Parliament Joan' (c.1600–c.1655), whose efforts rendered herself destitute. While the war's end brought about the First Commission's demise sometime before 1659,[63] it set the pattern for providing wartime English naval medical services ashore over the next 50 years.

The Second Commission for Sick, Wounded and Prisoners was established on the outbreak of the Second Dutch War in October 1664. Its four members were each assigned a portion of the English coast, with the authority to appoint surgeons, physicians and provost marshals and to requisition half the hospital beds in their area in addition to those in London. Besides the hospitals, this meant the Commissioners had to establish new working relations with the London Barber-Surgeons and its regional counterparts, as well as the Admiralty and the Navy Board. Despite better funding, medical expenses remained excessive: in September 1665, Commissioner John Evelyn (1620–1706) wrote that 5000 sick, wounded and prisoners were dying for lack of food and lodging. Matters were further complicated by high desertion rates among convalescents, thereby exacerbating shortfalls in trained seamen. Although the Second Commission was disbanded at the war's end, its accounts were not passed by the Treasury until 1671, and its books were not closed until 1675.[64]

The Third Commission was established on the outbreak of the Second Dutch War in March 1672, with three of its four members having served on the Second. Although many of its roles remained unchanged, greater emphasis was placed on better account keeping and accommodating casualties in hospitals rather than private lodgings, proving cheaper, less amenable to desertion and providing better care. Even so, having established the first

English naval hospital (at Plymouth in 1672), financial difficulties led to the Commission's dissolution in March 1674.[65]

Figure 10. Plaster statue, shipwrecked sailor, St Bartholomew's Hospital, 17th century.[66]

The Third Commission was replaced by surgeon James Pearse (c.1635–1693), who had served at sea twice in the fleet flagship *Royal Charles*, (including the Battle of Lowestoft in 1665 and the Four Days' Fight the following year), during which the Duke of York (James II 1685–1688) appointed him Fleet Surgeon General.[67] As the Navy Surgeon General (and the Army's from 1681), Pearse oversaw a period of economy over the next 15 years by having all cases treated on board while using civilian hospitals in lieu of private lodgings whenever possible. To this end, he introduced the first naval medical forms, thereby standardising methods and reducing opportunities for corruption. Pearse also appointed the first naval dockyard surgeons, who received a small wage supplemented by twopence per case, as for surgeons afloat. In addition, he assessed the plethora of Chatham Chest applicants from the previous two wars in the face of its now chronic insolvency.

However, the hospitals began to resist accepting naval patients. Although cheaper for Pearse than private lodgings, they cost the hospitals more than civilian patients because their treatment was frequently more complex, and they tended to be long-term or even permanently disabled. Navy patients also diverted the hospitals from providing medical services for people in poverty. This explains the Plymouth Naval Hospital's peacetime survival, which was managed by Pearse's deputy James Yonge (1647–1721), a Mayor of Plymouth and ex-naval surgeon, who had been apprenticed to a sea surgeon at age 10 and gained significant seagoing experience on the Newfoundland fisheries.[68]

Pearse's connections with James II led to his displacement by a four-member Fourth Commission in July 1689, shortly after England's entry into the War of the Augsburg League against France. Having secured the English Channel in 1692, poor-quality victuals soon led to high DNBI rates, which worsened when the RN began operating further afield in the Mediterranean and West Indies. The latter operations against Martinique and Cuba were again ruined by overwhelming rates of malaria and yellow fever, in addition to the usual dysentery, typhus and scurvy.

Meanwhile, the Commissioners spent most of the war managing these cases sans hospital beds, resulting in soaring convalescent desertion rates and private lodging costs.[69] Although the long-term savings gained using naval hospitals had been recognised, a lack of capital to buy or build enough to meet demand lasted until the 1740s. An exception was the RN Hospital at Greenwich, donated by Mary II in 1691 to provide accommodation for elderly and disabled seamen, which made more beds available for shorter-term cases elsewhere. Although the hospital was repurposed in 1869, the Greenwich Crown Charity continues to support former RN personnel and their dependents.[70,71,72]

Figure 11. Greenwich Naval Hospital (the four quadrangular buildings in the foreground; now the Old Royal Naval College).[73]

During the later part of the war, the Fourth Commission was mostly sidelined by the Army-centric William III's royal favourite Willem Van Loon, and the Admiralty dealing directly with the London Barber-Surgeons. On its demise in July 1698, it was replaced by a new Commission of the Register, which did not survive the next outbreak of war in 1702.[74]

Unlike its predecessors, the Fifth Commission included two physicians among its five members, with Dr Charles Morley previously serving as a

physician to the fleet.[75] Although the Channel remained secure, the navy's Mediterranean and West Indies operations were again significantly impeded by DNBI from poor-quality victuals, infectious disease and scurvy. However, the war in Europe meant that, apart from the hospital ships returning these DNBI from overseas, the Commission was predominantly concerned with Army casualties and prisoners. With the war's end, it was re-established as a permanent Sick and Hurt Board with two members in 1713 and one (Navy Board official Francis Gastny) from 1716 to 1724.[76]

Conclusion

Although naval DNBI rates under Charles I were often overwhelming, his seamen were somewhat protected from the degradation endured by their Tudor forebears by the secular civilian hospitals that provided better care from the 1590s. Furthermore, as most cases either fully recovered or died, permanent disability rates were initially low enough to be managed (however imperfectly) by the Chatham Chest.

However, during the Interregnum, more ships with bigger crews travelling further distances over longer periods led to increased DNBI, while new tactics during the Dutch and Spanish wars created more BCas. These combined in 1652 to overwhelm the 'Olrums' provisions that had existed for over 400 years, which led to the first of five wartime Sick and Hurt Commissions. Despite usually lacking medical qualifications, the Commissioners (and Pearse) found that hospitals were less expensive, provided better care and were less amenable to convalescent desertion than private lodgings. However, they also faced increasing resistance therefrom, because naval patients stayed longer and cost more to treat than civilians. Although these considerations led to the first English naval hospitals, the high capital costs to buy or build them before these savings could be realised ensured an ongoing dependence on the older alternatives well into the 18th century.

Meanwhile, at sea, most seamen now recognised the need for high hygiene standards while the EEIC had begun demonstrating the health benefits of better-funded ships and victualling. The EEIC also incidentally provided permanent employment for seagoing surgeons, who were required to document their experiences for future reference. Notwithstanding official delays of up to a century, the navy typically gained many of its medical lessons somewhat sooner informally from the EEIC via the itinerant employment of English mariners and surgeons between the two organisations. Improvements within the navy included the first allowances for medical stores in 1626, having at least one surgeon's mate for each surgeon from 1652, and introducing bespoke hospital ships in 1655. Otherwise, therapeutics had somewhat improved and, by the end of the century, it was accepted that sea surgeons needed the skills to treat non-surgical illnesses.

However, although Woodall and Pearse had independently demonstrated the benefits of a focal naval medical authority, their largely single-handed efforts became false dawns, whose advances were not regained until 1832. This, combined with the ongoing limitations posed by humoural theories of disease, meant the Elizabethan DNBI scourges remained largely unchecked until the 1740s.

Disclaimer

The views expressed in this article are the author's and do not necessarily reflect those of the RAN or any other organisations mentioned.

Corresponding Author: Neil Westphalen, neil.westphalen@bigpond.com
Authors: N Westphalen[1,2]
Author Affiliations:
1 Royal Australian Navy
2 University of New South Wales Canberra at ADFA

References

1 Westphalen N. Warfare, Ships and Medicine: Prehistoric Origins. Journal of Military and Veteran's Health. Jan 2020;28(1):16-28. Available from: https://jmvh.org/article/warfare-ships-and-medicine-prehistoric-origins.

2 Westphalen N. Warfare, Ships and Medicine in Ancient Egypt and Greece. Journal of Military and Veteran's Health. May 2020;28(2):18-30. Available from: https://jmvh.org/article/warfare-ships-and-medicine-in-ancient-egypt-and-greece.

3 Westphalen N. Roman Warfare, Ships and Medicine. Journal of Military and Veteran's Health. 2020 Oct;29(3):11-22. Available from: https://jmvh.org/article/roman-warfare-ships-and-medicine.

4 Westphalen N. Viking Warfare, Ships and Medicine. Journal of Military and Veteran's Health. 2020 Oct;28(4):16-27. Available from: https://jmvh.org/article/viking-warfare-ships-and-medicine.

5 Westphalen N. English Medieval Ships, Warfare and Medicine. Journal of Military and Veteran's Health, 2023 Jan;31(1): 40-48. Available from https://jmvh.org/article/https-doi-ds-org-doilink-03-2023-46493216-jmvh-vol-31-no-1.

6 Westphalen N. Tudor Warfare, Ships and Medicine. Journal of Military and Veteran's Health, 2023 Jul;31(3): 6-17. Available from https://jmvh.org/article/tudor-ships-warfare-and-medicine.

7 Westphalen N. Georgian Warfare, Ships and Medicine. Journal of Military and Veteran's Health. Jul 2024, 32(3):8-21, available from Georgian Naval Warfare, Ships and Medicine 1714–1815 - JMVH.

8 Westphalen N. Naval Medicine and the European Settlement of Australia. In: Stevens D, Reeve J, editors. The Navy and the Nation: The Influence of the Navy on Modern Australia Crow's Nest NSW: Allen and Unwin; 2005. p. 69-83.

9 Rodger NAM. The safeguard of the sea: a naval history of Britain 660-1649. London: WW Norton and Company; 1997. p. 347-426.

10 Rodger NAM. The command of the ocean: a naval history of Britain 1649-1815. London: WW Norton and Company; 2004. p. 1-216.

11 Rodger NAM. The safeguard of the sea: a naval history of Britain 660-1649. London: WW Norton and Company; 1997. p. 347-78.

12 Baumber M. General-at-Sea: Robert Blake and the seventeenth century revolution in naval warfare. London: John Murray; 1989.

13 Baumber M. General-at-Sea: Robert Blake and the seventeenth century revolution in naval warfare. London: John Murray; 1989.

14 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 57, 67.

15 Willaerts A. File: Abraham Willaerts, First Dutch War.jpeg mid-17th century. Available from: https://commons.wikimedia.org/wiki/File:Abraham_Willaerts,_First_Dutch_War.jpeg.

16 Hollar W. File: St. James Day Fight, Pic 2.jpg c.1666. Available from: https://commons.wikimedia.org/wiki/File:St._James_Day_Fight,_Pic_2.jpg.

17 Westphalen N. Tudor Warfare, Ships and Medicine. Journal of Military and Veteran's Health, 2023 Jul;31(3): 6-17. Available from https://jmvh.org/article/tudor-ships-warfare-and-medicine.

18 Brooks R. The Royal Marines: 1664 to the present. London: Constable and Robertson; 2002. p. 3-156.

19 Lavery B. The ship of the line. The line of battle: the sailing warship 1650-1840. Conway's history of the ship. London UK: Conway Maritime Press; 1994. p. 11-26.

20 Gardiner R. The Frigate. The line of battle: the sailing warship 1650-1840. Conway's history of the ship. London UK: Conway Maritime Press; 1994. p. 27-45.

21 French C. Merchant shipping of the British Empire. The heyday of sail: the merchant sailing ship 1650-1830 Conway's history of the ship. London UK: Conway Maritime Press; 1994. p. 10-33.

22 Cotton E, Fawcett C. East Indiamen: the East India Company's maritime service. London: The Batchworth Press; 1949.

23 French C. Merchant shipping of the British Empire. The heyday of sail: the merchant sailing ship 1650-1830 Conway's history of the ship. London UK: Conway Maritime Press; 1994. p. 10-33.

24 Westphalen N. Tudor Warfare, Ships and Medicine. Journal of Military and Veteran's Health. 2023 Jul;31(3): 6-17. Available from https://jmvh.org/article/tudor-ships-warfare-and-medicine.

25 Keay J. The Honourable Company: a history of the English East India Company. London: HarperCollins; 1991.

26 Gardiner R. Guns and gunnery. The line of battle: the sailing warship 1650-1840. Conway's history of the ship. London UK: Conway Maritime Press; 1994. p. 146-63.

27 Van de Velde the Younger W. Portrait of the 'Stirling Castle' 1679. Available from: https://collections.rmg.co.uk/collections/objects/143867.html.

28 Van de Velde the Younger W. HMS Drake by Willem van de Velde the Younger.png c.1707. Available from: https://commons.wikimedia.org/wiki/File:HMS_Drake_by_Willem_van_de_Velde_the_Younger.png.

29 Van de Velde the Younger W. Portrait of a small Dutch merchant ship c.1665. Available from: https://collections.rmg.co.uk/collections/objects/144960.html.

30 Van de Velde the Younger W. The End of the Action between the English Indiaman and Three Spanish Privateers 1682. Available from: https://www.rct.uk/collection/405155/the-end-of-the-action-between-the-english-indiaman-and-three-spanish-privateers.

31 Westphalen N. Tudor Warfare, Ships and Medicine. Journal of Military and Veteran's Health. 2023 Jul;31(3): 6-17. Available from https://jmvh.org/article/tudor-ships-warfare-and-medicine.

32 Lloyd C, Coulter JLS. Medicine and the Navy 1200-1900. vol. 4 (1815-1900). Edinburgh: E & S Livingstone Ltd; 1963. p. 10.

33 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 7-8.

34 Keevil JJ. Medicine and the Navy 1200 1900. vol. 1 (1200-1649). Edinburgh: E and S Livingstone; 1957. p. 219.

35 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 241-2.

36 Hoskins, AH, Watt, JW, Domville, CE, Reid W, 1884 Report of the Lords Commissioners of the Admiralty, of the Committee Appointed to Inquire into the Organisation and Training of the Sick-Berth Staff of the Navy, and the Nursing Staff of the Royal Naval Hospitals, available from http://parlipapers.proquest.com/parlipapers/docview/t70.d75.1884-060338?accountid=12694.

37 Woodall J. In: Kirkup J, editor. The Surgion's Mate. Bath: Kingsmead Press; 1617. p. xiii.

38 Glover G. File: John Woodall by George Glover detail.jpg 1639. Available from: https://commons.wikimedia.org/wiki/File:John_Woodall_by_George_Glover_detail.jpg.

39 Westphalen N. Tudor Warfare, Ships and Medicine. Journal of Military and Veteran's Health. 2023 Jul;31(3): 6-17. Available from https://jmvh.org/article/tudor-ships-warfare-and-medicine.

40 Keevil JJ. Medicine and the Navy 1200 1900. vol. 1 (1200-1649). Edinburgh: E and S Livingstone; 1957. p. 176-8.

41 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 244-5.

42 Woodall J. In: Kirkup J, editor. The Surgion's Mate. Bath: Kingsmead Press; 1617. p. xvi.

43 Castle J, Derham B, Montagu J, Wood R, Hather J. The contents of the barber-surgeon's cabin. In: Gardiner J with Allen MJ, editors. Before the mast: life and death aboard the Mary Rose. 4. Portsmouth UK: The Mary Rose Trust; 2005. pp. 189-225.

44 Keevil JJ. Medicine and the Navy 1200 1900. vol. 1 (1200-1649). Edinburgh: E and S Livingstone; 1957. p. 198.

45 Batstone K. Outback Heroes: 75 years of the Royal Flying Doctor Service. South Melbourne: Lothian Books; 2003. p. 197-9.

46 Keevil JJ. Medicine and the Navy 1200 1900. vol. 1 (1200-1649). Edinburgh: E and S Livingstone; 1957. Facing page 200

47 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 270-6.

48 Lloyd C, Coulter JLS. Medicine and the Navy 1200 1900. vol. 3 (1714-1815). Edinburgh: E and S Livingstone; 1961. p. 14-8.

49 Lloyd C, Coulter JLS. Medicine and the Navy 1200-1900. vol. 4 (1815-1900). Edinburgh: E & S Livingstone Ltd; 1963. p. 23..

50 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 253-4.

51 For details regarding the interactions between sailor's clothing and their health and safety, see Westphalen N. A History of Australian Navy Health Sailor Uniforms and Ranks (Part 1). Journal of Military and Veteran's Health. Apr 2018;26(2):14-24.

52 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. pp. 276, 293.

53 Lloyd C, Coulter JLS. Medicine and the Navy 1200 1900. vol. 3 (1714-1815). Edinburgh: E and S Livingstone; 1961. p. 64-7.

54 Westphalen N. Tudor Warfare, Ships and Medicine. Journal of Military and Veteran's Health. 2023 Jul;31(3): 6-17. Available from https://jmvh.org/article/tudor-ships-warfare-and-medicine.

55 Keevil JJ. Medicine and the Navy 1200 1900. vol. 1 (1200-1649). Edinburgh: E and S Livingstone; 1957. pp. 44-54.

56 For an architectural analysis of the changes during the Tudor period, see Prescott E. Post-Reformation changes. The English medieval hospital c1050-1640. Melksham UK: Cromwell Press; 1992. p. 72-100.

57 Lavery B. Royal tars: the lower deck of the Royal Navy 875-1850. Annapolis, Maryland: Naval Institute Press; 2010. p. 72-7.

58 Powell I. The Chatham Chest under the Early Stuarts. The Mariner's Mirror. 1922;8(6):174-82.

59 Keevil JJ. Medicine and the Navy 1200 1900. vol. 1 (1200-1649). Edinburgh: E and S Livingstone; 1957. p. 193-6.

60 Lewin C. Funding the Chatham Chest, 2003. 23 November 2021. Available from: https://www.theactuary.com/archive/old-articles/part-3/funding-the-chatham-chest.

61 "AAA3310: Chatham Chest." Royal Museums Greenwich, accessed 14 Apr, 2021, https://collections.rmg.co.uk/collections/objects/3284.html.

62 Laws of Oleron. Monumenta Juridica: The Black Book of the Admiralty. 1. Clark, New Jersey: Lawbook Exchange; 2011. p. 86-131.

63 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 1-27.

64 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 96-109.

65 Willoughby CP. Care and diligence: the professional life of James Pearse, sea surgeon, courtier and the founder of naval medicine. Journal of the Royal Naval Medical Service.105(3):202-5.

66 SBHX2/4. Wooden painted statue of a wounded sailor, mid-17th century Barts Health NHS Trust, c.1630-1670. Available from: http://www.calmhosting01.com/BartsHealth/CalmView/Record.aspx?src=CalmView.Catalog&id=SBHX2%2f4&pos=1.

67 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 122-31.

68 Moore N. James Yonge (1646-1721). Dictionary of National Biography. 63 (1885-1900) 1900. Available from https://en.wikisource.org/wiki/Dictionary_of_National_Biography,_1885-1900/Yonge,_James_(1646-1721).

69 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 189-208.

70 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 131-47.

71 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 198-202.

72 Greenwich Hospital: supporting the Royal Navy since 1694. 2021. Available from: https://www.grenhosp.org.uk.

73 A Maritime Masterpiece: Old Royal Naval College at Greenwich 2021. Available from: https://commons.wikimedia.org/wiki/File:Abraham_Willaerts,_First_Dutch_War.jpeg..

74 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 189-208.

75 Keevil JJ. Medicine and the Navy 1200 1900. vol. 2 (1649-1714). Edinburgh: E and S Livingstone; 1958. p. 233-6.

76 Lloyd C, Coulter JLS. Medicine and the Navy 1200 1900. vol. 3 (1714-1815). Edinburgh: E and S Livingstone; 1961. p. 3.

The Evolution of Operational Health Support Provided to United States, United Kingdom and Australian Special Operations Forces from 1940 - 2024

A Robertson

Introduction

Over the last 85 years, medical support to Special Operations Forces (SOF) units has evolved from rudimentary beginnings to highly sophisticated care. While some of this evolution reflects changes in clinical medicine during that period, particularly in civilian trauma management, the progress in health support in other areas reflects the innovative forefront of military medicine. In most instances, SOF units initially adopted these innovations before rolling them out to conventional military units. They have occurred principally in four key areas: 1) the use of combat or patrol medics in providing immediate casualty care; 2) aeromedical evacuation; 3) trauma combat casualty care; and 4) the introduction of specialised trauma equipment and treatments. As with all accounts of special forces operations, histories of medical support to SOF units are often imperfect and suffer from the challenges posed by limited access to suitable unclassified operational information, incompleteness of records and limited personal accounts of the combatants, particularly about medical aspects, which make the accuracy, veracity and effectiveness of medical support to such operations difficult to assess and evaluate.[1] This paper reviews the effectiveness of the medical support to the SOF units of the United States (US), the United Kingdom (UK) and Australia during and after World War II, focusing on those SOF units that operated small teams in the field. The availability of accurate and complete unclassified information on SOF medical operations, particularly over the last 20 years, does limit some of the details that can be provided. However, sufficient data and sources are available to evaluate the effectiveness of the provided medical support.

Early days

The special forces in World War II had limited medical support. Early attempts by the Office of Strategic Services (OSS) personnel in France to use medical staff from local clinics or hospitals proved unsatisfactory, given German military surveillance of these facilities.[2] A series of makeshift hospitals in houses or barns were created, with medical supplies from Allied air drops.[2] Staffed by local doctors and other health staff willing to assist the resistance, these facilities provided temporary safety and could manage most injuries or illness except for the most serious cases.[2] While there was generally no medical personnel with the special forces, such as the Jedburgh teams, in France, small numbers of US and British medical officers operated makeshift hospitals behind German lines in Greece and in support of the partisans in Yugoslavia.[2-4] Although often hampered by a lack of medical supplies, these clandestine facilities were effective in improving morale by saving the lives of both resistance and special forces personnel.[2] Medical officers and orderlies also served with the Long Range Desert Group and Special Air Service Brigade in northern Africa, Italy and the Adriatic, including during the raid on Benghazi in September 1942, often in very austere settings and with limited ability to move casualties to definitive care.[5,6] Medical orderlies usually deployed with the patrols to provide advanced first aid, while the medical officers and senior non-commissioned officers (NCOs) established casualty collecting and aid posts to provide advanced medical care to casualties from the multiple patrols.[6] Evacuation was often difficult, done at night and utilised sea or air platforms, where possible. However, most aeromedical evacuation was reserved for transferring stable patients back to definitive care in their home

countries.[6,7] Highly trained medical officers and orderlies generally proved effective in maintaining combatant health and managing the casualties from special operations.[6]

Medical training and support

With the activation of the US 10th Special Forces Group on 11 June 1952, the US Army Medical Department moved quickly to establish training for SOF medics, with the first course in November 1952.[3] The focus was on training the medics as independent 'physician substitutes' to operate in warfare situations.[3] The assigned Army Medical Officers were instrumental in guiding the medical training and maintaining the medics' clinical proficiency.[3,8] The move of the 10th Special Forces Group to Bad Tölz in Germany enabled the medics to receive more practical training at cooperating military hospitals.[3,8] By 1959, however, with the addition of 77th Special Forces Group in 1953 and 1st Special Forces Group in 1957, there was no central medical guidance being provided on what training was required after completion of initial training and no standardisation between the Groups.[3] While the surgical research laboratory provided some effective 'hands-on' training, the requirement for special forces advanced medical training was becoming more critical, particularly as medics were now preparing to deploy to Laos in 1960.[3] With the support of the Army Surgeon-General, Lieutenant General Leonard Heaton, Advanced Medical Training was commenced at Fort Bragg in 1962.[3,9] During the Vietnam War, these medics carried out triage, immediate advanced first aid, wound surgery and anaesthesia, as well as looking after the needs of the Special Forces Group and their Montagnard allies.[10,11] The medical support to insurgent forces also assisted in maintaining them as a viable fighting force.[12] During Blackjack 21 in October 1966, a special forces surgeon and four medical sergeants were able to successfully provide medical care in the field when aeromedical evacuations were unavailable.[13] Throughout the Vietnam War, special forces operations placed increased responsibility on enlisted SOF medics, particularly where medical evacuation was not immediately available, which required more physician oriented training.[3] During 1967, a special forces clandestine hospital was trialled, which, while not adopted, highlighted the difficulties with medical supply, limited diagnostic equipment, the tactical impact of casualties, and the need for preparatory training for assigned physicians.[2,14] By 1992, the SOF medic was required to have completed 58 weeks of specialist medical and special forces skills training prior to joining a team.[15] In the team, the medic was required to provide comprehensive medical support without logistic, physician or medical evacuation support.[15] The nearest physician support was provided from an often distant battalion headquarters with limited radio communication.[15] The Joint Special Operations Medical Training Center at Fort Bragg in North Carolina now trains medical NCO's with the knowledge and skills required by the SOF to provide the necessary medical treatment, regardless of the conditions.

In the British 22 Special Air Service (SAS) Regiment, medical support in Malaya between 1950 and 1959 was initially self-taught or taught by those soldiers with some health background.[16] As SAS medical officers deployed, they trained a member of the platoon in first aid and could be contacted by radio, with evacuation organised by helicopter.[17] SAS medical officers also parachuted in to attend to casualties, although this was quite hazardous.[17] When the SAS first deployed to Oman in 1958, they were supported by a SAS medical officer on base.[18] A Field Surgical Team (FST) based at the operational headquarters could provide additional support when required, such as during the fighting around Nizwa in November 1958.[18] By 1962, one of the members of the SAS team doubled as a patrol medic, and was acquiring expertise in paramedicine.[16] A medical officer was posted to the SAS Regiment, who had the responsibility for basic medical training of the SAS personnel.[19] The patrol medic training was usually 12 weeks, including a six week placement in the emergency department of a civilian hospital.[20] In August 1970, as part of the SAS deployment to Oman, SAS patrol medics established field clinics to treat local Omanis.[16,21] Immediate care was also provided by patrol medics, with casualties transferred to the Army Field Surgical Unit at the base camp.[16] During the battle of Mirbat in July 1972, SAS medics provided extended trauma care to both military forces and Omani civilians.[20] They eventually received support from the 55 FST, but there was no aeromedical evacuation capability until after the battle.[21,22] By 1973, the UK was looking at how this training could be improved to bring it more in line with US Special Forces medic training.[19] By the 1991 Gulf War, SAS medics were well entrenched in the deployed teams in Iraq, where they treated wounded enemy as well as troop members, although aeromedical evacuation was limited.[16] Royal Army Medical Corps Combat Medical Technicians of Medical Support Unit now provide close medical support for UK Special Forces, having completed the 'Black Serpent' training course.

Created in July 1957, the Australian SAS Regiment was deployed to Borneo in 1965 and 1966 during the Indonesian Confrontation.[23] Their medical support was similar to that provided to the British SAS.[24] Casualties were initially treated by a troop member before being evacuated by a helicopter authorised by the regimental medical officer (RMO).[25] In preparation for deploying to Vietnam in 1966, a patrol medic would do a 6-week course at Healesville School of Army Health and 6 weeks of consolidation training in Papua New Guinea before deploying.[26] This training was supplemented by further medical training at Swanbourne Barracks by the RMO and senior medical NCOs.[27] In Vietnam, casualties were usually evacuated to safety by other members of the team until they could be extracted.[26] SAS medical officers and patrol medics continued to support the SAS during operations after the Vietnam War, including during the United Nations Assistance Mission to Rwanda in 1994, deployment to Kuwait in 1998 and East Timor in 1999.[24,28]

Aeromedical evacuation

While aeromedical evacuation was in its infancy during World War II, the Korean War demonstrated the utility of helicopters in rapidly transferring patients from the battlefield to a health facility that could provide definitive treatment, including lifesaving surgery.[7] Compared to the Second World War, helicopter evacuation, increased antibiotic use and improved surgical techniques almost halved the death rate from wounds.[7] The Vietnam War saw further enhancements in aeromedical evacuation (AME), with US DUSTOFF helicopters able to deliver wounded soldiers to military surgical facilities in a minimum of 20 minutes.[25] Both the US and Australian forces moved to use trained medical assistants to accompany the casualties.[25] In Operation Just Cause in Panama in December 1989, special and conventional force casualties were evacuated to the Joint Casualty Collection Point (JCCP) at the Point Hood Air Base.[29] During the operation, over 99% of casualties who arrived at JCCP survived.[29] During the 1991 Gulf War, the US forces continued to use flight nurses and AME medical staff to accompany patients. However, readily accessible large military hospitals ensured rapid investigation and stabilisation of casualties.[7] In Afghanistan, given longer distances required for the aeromedical evacuations, critical casualties averaged over 3 hours or longer to get to hospital, such as the eight serious casualties from the Kajaki Dam bomb blasts in September 2006.[5] In 2008, the then US Secretary of Defense, Robert Gates, mandated the medical evacuation time between injury and surgical intervention to be less than 60 minutes.[30] While the SOFs were exempt from this restriction due to tactical limitations, the improvements in medical evacuation times contributed to improved outcomes. Enhanced Medical Emergency Response Teams (MERT) were deployed by British Forces in 2006 to stabilise and transport casualties from the point of injury, which reduced morbidity and mortality.[31,32] The enhanced MERT, which generally included a military doctor, nurse and paramedics, could deploy on various aerial platforms and was instrumental in introducing new trauma procedures and equipment into the battlefield.[31] These included the capability to provide blood and plasma transfusions, supply adequate quantities of oxygen and conduct advanced airway and chest procedures to stabilise and transport casualties.[31] The US Air Force utilised PEDRO forward AME teams, which included emergency medical technicians and paramedics rather than physicians.[33,34] Various trauma studies showed that aeromedical platforms that provide advanced medical care were more successful than those providing basic first aid.[34]

Trauma training

From the lessons learned from the Vietnam War, the Gulf War and Somalia, there was an increasing realisation that the civilian trauma training provided to military doctors through the Acute Trauma Life Support (ATLS) course poorly prepared them for modern conflicts, particularly for managing extremity haemorrhage and penetrating wounds in an austere setting.[35-37] During the Vietnam War, the US Wound Data and Munitions Effectiveness Team (WDMET) reviewed over 8000 US casualties between 1967 and 1969.[38,39] Despite the emerging 'golden hour' principle in civilian trauma management, WDMET showed that up to 70% of combat casualties died within the first 5 minutes.[39] There also had been minimal change from Vietnam to the 1991 Gulf War in medical equipment, procedures, drugs or tactics used for battlefield casualties, with SOF medics providing advanced first aid to injured soldiers and major trauma care only being delivered after arrival at a major health facility.[40,41] A review of the US Special Forces casualties during Operation Just Cause in Panama in 1989 highlighted that appropriate control of limb haemorrhages, particularly the use of tourniquets, had the most significant impact on casualty outcomes.[42]

The Tactical Combat Casualty Care (TCCC) project was commenced in 1993 by US Special Forces. The initial guidelines were published in 1996.[43] These guidelines were first taught in late 1996 and rapidly became mandatory for US Special Forces doctors

and medics.[44] In parallel, the British Special Forces community in 1992 reviewed its pre-hospital trauma medical support and developed the Combat Trauma Life Support (CTLS) program.[43,45] The British Army had learned some important lessons from the Falklands War in 1982 about forward trauma care and evacuation and replaced ATLS in the late 1980s, and eventually CTLS, with the Battlefield Acute Trauma Life Support Course (BATLS), pioneered initially by Brigadier Ian Haywood.[46] The Falklands campaign also highlighted the need for Forward Intensive Resuscitation and Surgical Teams.[46] BATLS effectively demonstrated its benefits during British military operations during the 1991 Gulf War. However, low casualty flow rates made it difficult to assess its effectiveness and mass casualty events during the Balkan conflicts in the 1990s.[32,47]

US Special Forces regularly reviewed and progressively adopted TCCC guidelines.[44] The guidelines also accounted for the tactical situation. They were designed to ensure that mission success was achieved by 'doing the right thing at the right time' when responding to casualties.[48] By 2011, US combat medics and corpsmen were being taught trauma care based on the TCCC guidelines, and Australia, Britain, Canada and New Zealand were recommending its use across their respective militaries.[49] TCCC treatment has been a major factor in reducing fatalities in recent conflicts in Iraq and Afghanistan, in concert with improved body armour, definitive surgical treatment and rapid evacuation.[35,49,50] While there are challenges comparing combat casualties between conflicts, the survivability of those injured in battle in Iraq and Afghanistan was 90%, compared to 84% in Vietnam and 80% in World War II.[50,51] Of the conventional forces deaths in the field, 75.7% had nonsurvivable injuries, and 24.3% were potentially survivable, primarily if haemorrhage could be controlled.[51] There was also improved survival from traumatic events throughout these conflicts.[33] In US Special Forces units utilising TCCC guidelines, preventable fatality rates were even lower. In the first 3 years of operations in Iraq and Afghanistan, over 85% of casualties survived, with only 15% of the fatalities due to potentially survivable injuries; 66% of the preventable deaths could potentially have been averted if the TCCC guidelines had been applied consistently.[52] In the 75th Ranger Regiment's operations in Iraq and Afghanistan, 92% of casualties survived, and the number of preventable deaths due to failure to provide appropriate care was less than 3%.[37,49] To further address these potentially survivable casualties, Special Operations Resuscitation Teams (SORTs) were initiated in May 2004 to provide additional critical care support further forward in the field, particularly in restrictive operating environments.[53,54] In mid-2008, the SORTs resuscitated more than 80 casualties in Afghanistan over 4 months.[53] These were subsequently supplemented by Forward Resuscitative Surgical Teams (FRSTs) of five to eight personnel who were trained to provide damage control surgery on unstable casualties who could not be moved.[55] The efficacy of these teams is still being reviewed.[56] By 2009, Australian SAS doctors and medics were being trained in and successfully applying TCCC principles in support of Australian Special Operations Command forces in Afghanistan. They were routinely attached to the US aeromedical wing for special operations.[57,58] Training has been refocused on providing decisive medical intervention to any casualties within 10 minutes ('platinum ten').[57]

In 2015, as the US involvement in Afghanistan and Iraq decreased, the US Special Operations Command sought to develop a systematic approach to Prolonged Field Care (PFC).[59] There was a particular emphasis on using PFC where the SOF are operating in austere, remote environments, usually only with a combat medic, and have minimal access to medical evacuation or definitive clinical care.[30,59] PFC concepts have been progressively introduced in these settings, emphasising pain control, basic anaesthesia and teleconsultation, and the medical equipment required to enact them.[30] These trauma techniques have also become important in conflicts with contested air space, including where surveillance and armed drones are being used, such as the current conflict in Ukraine.[59,60] Clinical outcomes are expected to be worse with PFC than currently achieved.[61]

Pre-hospital casualty care

While the improved training had been overdue, there was also a revolution in pre-hospital casualty care, particularly during the operations in Afghanistan and Iraq, where the special forces were early adopters.[31,40] The US Special Forces were the first to deploy tactical tourniquets and, after increasing extremity haemorrhage deaths in Iraq in 2003, to require combatants to carry them.[31] The British SAS also started deploying with tourniquets.[20] New dressings to stop arterial bleeding, and reflective blankets and chemical heaters to manage hypothermia were also adopted.[31,34] A review in 2016 of US casualties in Afghanistan, including special forces, showed that, despite evidence that explosive devices were increasing the complexity and severity of injuries, reductions in pre-hospital transport time and improvements in trauma treatments had significantly improved casualty survival.[62] Improved

damage control resuscitation on arrival at the acute treatment facility, coupled with surgical haemorrhage control and transfusion with whole blood cells, have also improved clinical outcomes.[63]

Conclusion

Medical support of any military unit requires dedicated, well-trained personnel, an appreciation by the unit leadership of the benefits that arise from this support, and a willingness of both the military and medical hierarchy to adopt new techniques, equipment, training and health delivery arrangements. The review of medical support to US, UK and Australian SOF units highlights a progressive evolution of the support expected and provided since the early part of World War II. This has not been without its hiatuses. During the 1980s and the lead-up to the 1991 Gulf War, military pre-hospital trauma care had stagnated in all three countries.[43,45] The development of tactical or battlefield casualty care in the early to mid-1990s dramatically affected the survivability of battlefield injuries.[33,49] Improved survivability during forward aeromedical evacuations in deployments in Iraq and Afghanistan also improved with the roll-out of enhanced MERT after 2006 and increased use of PEDRO AME teams.[31,64] The maturing of the patrol or combat medic concept and the early introduction of lifesaving techniques and therapeutic goods to stabilise patients, particularly since 2000, has also contributed to improved outcomes.[63] As outlined in the Introduction, the availability of accurate and comprehensive unclassified information on SOF medical operations over the last 20 years limits the detail and the assessment of the full effectiveness of medical support during this period and warrants further research.[1] The new focus on PFC in more recent times indicates that medical support continues to evolve to address future threats to special forces operations, particularly to drone warfare and in contested airspace.[60] On all measures, medical support to special forces operations has improved and become more effective over the last 85 years.

Corresponding Author: Andrew Robertson, andrew.robertson@health.wa.gov.au
Authors:
A Robertson[1]
Author Affiliations:
1 Government of Western Australia – Department of Health

References

1. Grob-Fitzgibbon B. Those Who Dared: A Reappraisal of Britain's Special Air Service, 1950–80. The International History Review. 2015 May 27;37(3):540-64.
2. Cloutier MG. Medical care behind enemy lines: a historical examination of clandestine hospitals. Military medicine. 1993 Dec 1;158(12):816-8.
3. Dorogi LT. Early Special Forces Medical Training: 1952–1971. J Spec Oper Med. 2007;7(1):73-80.
4. Talbot N. Mitchiner Memorial Lecture 1974: Guerrilla Surgeon, The Story of Major Lindsay Rogers, MBE, FRCS, RAMC. BMJ Military Health. 1975 Aug 1;121(3):112-25.
5. Nichol J, Rennell T. Medic: Saving Lives - from Dunkirk to Afghanistan. Penguin Books; 2009.
6. Robinson JT. Land Forces Adriatic. BMJ Military Health. 1945 Jul 1;85(1):41-7.
7. Austin TK. Aeromedical evacuation: The first 100 years. Australian Defence Force Health. 2002 Apr;3(1):43-6.
8. Himma E. The Medic-10th Special Forces Group (Airborne). Medical Bulletin of the U.S. Army, Europe. 1964 May 1;21(5):150-153.
9. "Surgeon General Honored." Military Medicine. 1962;127(10): 849.
10. Mullins JF. Special Forces Medic: The Early Days, Vietnam. Weider History Group, Inc.; 2004.
11. Vance CR. Some Current Aspects of the Army Medical Service Mission. Military Medicine. 1964 May 1;129(5):393-6.
12. Clancy T, Stiner C, Koltz T. Shadow warriors: Inside the special forces. Pan Macmillan, 2002.
13. Stanton SL. Green Berets at War: U.S. Army Special Forces in Southeast Asia, 1956-1975. Presidio, 1985.
14. Wade Jr DR, Erskine JF. The medical support of guerrilla forces. Military Medicine. 1969 Mar 1;134(3):211-4.
15. Moloff AL, Bettencourt B. The Special Forces medic: unique training for a unique mission. Military medicine. 1992 Feb 1;157(2):74-6.

16. Connor K. Ghost force: The secret history of the SAS. Cassell & Co.; 2002.
17. Archer TC. Medical problems of the operational infantry soldier in Malaya. Journal of the Royal Army Medical Corps. 1958 Jan 1;104(1):1-3.
18. Brothwood J. Oman 1958. BMJ Military Health. 1960 Jan 1;106(2):64-8.
19. Hedges K. Medical Aspects of the Special Air Service. BMJ Military Health. 1973 Apr 1;119(2):94-112.
20. Ryan C. The history of the SAS. Coronet; 2019.
21. Cole R, Belfield R. SAS Operation Storm. Hachette UK; 2011.
22. Asher M. The regiment: The definitive story of the SAS. Penguin Books; 2007.
23. Dennis P, Grey J. Emergency and confrontation: Australian military operations in Malaya & Borneo 1950-66. Allen & Unwin; 1996.
24. Horner D, Thomas N. In Action with the SAS. Allen & Unwin; 2009.
25. O'Keefe B, Smith FB. Medicine at war: medical aspects of Australia's involvement in Southeast Asia, 1950-1972. Allen & Unwin; 1994.
26. McKay G. On Patrol with the SAS: Sleeping with Your Ears Open. Allen & Unwin; 2007.
27. Taske, J. Tales from the RAP. Journal of the Australian Special Air Service Association. 2007;33-34:74-76.
28. Royal Australian Army. 1998 – The Australian Army in Profile. Defence Public Affairs Organisation; 1998.
29. Green B. Challenges of aeromedical evacuation in the post-Cold-War era. Air & Space Power Journal. 2001 Dec 1;15(4):14.
30. Keenan S, Riesberg JC. Prolonged field care: beyond the "golden hour". Wilderness & environmental medicine. 2017 Jun;28(2_suppl):S135-9.
31. Blackbourne LH, Baer DG, Eastridge BJ, Kheirabadi B, Kragh Jr JF, Cap AP, Dubick MA, Morrison JJ, Midwinter MJ, Butler FK, Kotwal RS. Military medical revolution: prehospital combat casualty care. Journal of Trauma and Acute Care Surgery. 2012 Dec 1;73(6):S372-7.
32. Ford M, Hodgetts T, Williams D. Innovation strategies for defence: the successful case of Defence Medical Services. The RUSI Journal. 2017 Mar 4;162(2):52-8.
33. Penn-Barwell JG, Roberts SA, Midwinter MJ, Bishop JR. Improved survival in UK combat casualties from Iraq and Afghanistan: 2003–2012. Journal of trauma and acute care surgery. 2015 May 1;78(5):1014-20.
34. Glassberg E, Nadler R, Erlich T, Klien Y, Kreiss Y, Kluger Y. A decade of advances in military trauma care. Scandinavian Journal of Surgery. 2014 Jun;103(2):126-31.
35. Maughon JS. An inquiry into the nature of wounds resulting in killed in action in Vietnam. Military medicine. 1970 Jan 1;135(1):8-13.
36. Bellamy RF. How shall we train for combat casualty care?. Military Medicine. 1987 Dec 1;152(12):617-21.
37. Kotwal RS, Montgomery HR, Kotwal BM, Champion HR, Butler FK, Mabry RL, Cain JS, Blackbourne LH, Mechler KK, Holcomb JB. Eliminating preventable death on the battlefield. Archives of surgery. 2011 Dec 1;146(12):1350-8.
38. Trunkey DD. Trauma. Scientific American. 1983;249(2): 28-35.
39. Stein TM. Mass shootings. In Hogan DE, Burstein JL, editors. Disaster medicine. Lippincott Williams & Wilkins; 2007.
40. Kolata G. A Nation at War: Military Medicine; Armed With New Tools and Tactics, Doctors Head to the Battlefield. New York Times. 2003 March 30: B3.
41. McCarthy M. US military revamps combat medic training and care. The Lancet. 2003 Feb 8;361(9356):494-5.
42. Mucciarone JJ, Llewellyn CH, Wightman JM. Tactical combat casualty care in the assault on Punta Paitilla Airfield. Military medicine. 2006 Aug 1;171(8):687-90.
43. Butler Jr FK, Hagmann J, Butler EG. Tactical combat casualty care in special operations. Military medicine. 1996 Aug 1;161(suppl_1):3-16.

44. Butler Jr FK, Holcomb JB, Giebner SD, McSwain NE, Bagian J. Tactical combat casualty care 2007: evolving concepts and battlefield experience. Military Medicine. 2007 Nov 1;172(suppl_1):1-9.
45. Navein JF, Dunn RL. The Combat Trauma Life Support course: resource-constrained first responder trauma care for Special Forces medics. Military medicine. 2002 Jul 1;167(7):566-72.
46. Batty CG. Changes in the care of the battle casualty: lessons learned from the Falklands campaign. Military medicine. 1999 May 1;164(5):336-40.
47. Riley B, Mahoney P. Battlefield trauma life support: its use in the resuscitation department of 32 Field Hospital during the Gulf War. Military medicine. 1996 Sep 1;161(9):542-6.
48. Butler Jr FK. Tactical combat casualty care: beginnings. Wilderness & environmental medicine. 2017 Jun;28(2_suppl):S12-7.
49. Butler Jr FK, Blackbourne LH. Battlefield trauma care then and now: a decade of Tactical Combat Casualty Care. Journal of Trauma and Acute Care Surgery. 2012 Dec 1;73(6):S395-402.
50. Holcomb JB, Stansbury LG, Champion HR, Wade C, Bellamy RF. Understanding combat casualty care statistics. Journal of Trauma and Acute Care Surgery. 2006 Feb 1;60(2):397-401.
51. Eastridge BJ, Mabry RL, Seguin P, Cantrell J, Tops T, Uribe P, Mallett O, Zubko T, Oetjen-Gerdes L, Rasmussen TE, Butler FK. Death on the battlefield (2001–2011): implications for the future of combat casualty care. Journal of trauma and acute care surgery. 2012 Dec 1;73(6):S431-7.
52. Holcomb JB, McMullin NR, Pearse L, Caruso J, Wade CE, Oetjen-Gerdes L, Champion HR, Lawnick M, Farr W, Rodriguez S, Butler FK. Causes of death in US Special Operations Forces in the global war on terrorism: 2001–2004. Annals of surgery. 2007 Jun 1;245(6):986-91.
53. Riesberg JC. The Special Operations Resuscitation Team: robust Role II medical support for today's SOF environment. Journal of Special Operations Medicine. 2009 Jan 1;9(1):27-32.
54. Baker JB, Modlin RE, Ong RC, Remick KN. The SOF Truths for Army Special Operations Forces Surgical Teams. Journal of Special Operations Medicine. 2017 Jan 1;17(4):52-5.
55. Pilgrim CH, Hendel S, Eatough N, Graves M. Treatment at point of injury-forward movement of surgical assets to address noncompressible truncal haemorrhage. Journal of Military and Veterans Health. 2022 Jan 1;30(1):41-50.
56. Beckett A, Parker P, Naveed A, Williams P, Tien H. Effect of special operational forces surgical resuscitation teams on combat casualty survival: A narrative review. Transfusion. 2022 Aug;62:S266-73.
57. Masters C. No Front Line: Australian special forces at war in Afghanistan. Allen & Unwin; 2017.
58. Pronk D. The Combat Doctor. Pan Macmillan; 2022.
59. Shackelford SA, Del Junco DJ, Riesberg JC, Powell D, Mazuchowski EL, Kotwal RS, Loos PE, Montgomery HR, Remley MA, Gurney JM, Keenan S. Case-control analysis of prehospital death and prolonged field care survival during recent US military combat operations. Journal of trauma and acute care surgery. 2021 Aug 1;91(2S):S186-93.
60. Freedman L. Modern Warfare: Lessons from Ukraine. Penguin Books; 2023.
61. Hodgetts TJ, Naumann DN, Bowley DM. Transferable military medical lessons from the Russo-Ukraine war. BMJ Mil Health. 2023 Jul 4: 1-4. doi:10.1136/military-2023-002435.
62. Kotwal RS, Howard JT, Orman JA, Tarpey BW, Bailey JA, Champion HR, Mabry RL, Holcomb JB, Gross KR. The effect of a golden hour policy on the morbidity and mortality of combat casualties. JAMA surgery. 2016 Jan 1;151(1):15-24.
63. Holcomb JB. Major scientific lessons learned in the trauma field over the last two decades. PLoS medicine. 2017 Jul 5;14(7): 1-4, e1002339.
64. Olson Jr LC, Bailey CJ, Mabry LR, Rush LS, Morrison MJ, Kuncir CE. Forward aeromedical evacuation: a brief history, lessons learned from the Global War on Terror, and the way forward for US policy. Journal of trauma and acute care surgery. 2013 Aug 1;75(2):S130-6.

AUSTRALASIAN MILITARY MEDICINE ASSOCIATION

BECOME AN AMMA MEMBER TODAY

Further your knowledge of Military Medicine and Veterans' Health

Only $164 per year

(Full Membership)
Student memberships only $33!

Enter discount code JMVH for $40.00 discount

Annual Membership spans 1 July - 30 June; Financial Year

Other great Membership benefits:

- Interact with peers, community and the fellowship.
- Stay connected with the Australian and New Zealand Army, Navy and Air Force.
- Receive a copy of AMMA's publication, Journal of Military and Veterans' Health (JMVH) published four times annually. We welcome contributions from new authors and reviewers.
- As a member you are entitled to access reduced registration fees to attend AMMA education opportunities, including the Annual Conference and Workshops.
- Member-only access to recordings of lectures presented at AMMA Conferences and Workshops – from 2022.
- Take advantage of your membership to gain access to the Awards & Grants available. These are awarded annually and open to all members.
- All new members receive a membership certificate and welcome pack, and will be acknowledged and welcomed at AMMA's Annual General Meeting held in conjunction with the annual conference.
- All members can nominate any AMMA member for a position on the AMMA Council.
- Opportunity to purchase AMMA Merchandise.

Merrelyn Telfer
AMMA Secretariat
secretariat@amma.asn.au

To join, please view amma.asn.au/membership and enter the discount code JMVH

Efficacy of Yoga for Managing Sleep Problems among Military Veterans: A Systematic Review

R Carballo Afonso, D González-Devesa, L Iglesias Vieites, C Ayán Pérez

Abstract

Purpose: Yoga is considered a potential alternative treatment for sleep disorders in military veterans.

This study aims to conduct a systematic review and meta-analysis to critically assess the best available evidence on yoga's effects in managing sleep problems among military veterans.

Material and methods: A systematic search was conducted across four electronic databases (Scopus, Web of Science, SPORTDiscus and MEDLINE/PubMed), covering from their inception until October 2024. The methodological quality of the included studies was assessed using the Physiotherapy Evidence Database (PEDro) and the Quality Assessment Tool for Before-After Studies with No Control Group scales.

Results: A total of eight studies met the inclusion criteria and were analysed. The main outcomes assessed were subjective sleep quality (n = 6), subjective insomnia (n = 2), and objective sleep status (n = 1). The meta-analysis, with data from 75 participants, indicated a significant improvement in subjective sleep quality after yoga interventions compared with baseline (Hedges' g 0.40; 95% CI 0.12; 0.69, p<0.001). Overall, yoga positively affected both subjective sleep quality and subjective insomnia. While yoga appears safe for military veterans, its efficacy in improving objective sleep in this population has been underexplored.

Conclusion: The efficacy of yoga for sleep problems in military veterans is uncertain, primarily due to limited single-arm studies. Preliminary findings indicate potential benefits for insomnia, but more rigorous research is needed to assess its effectiveness.

Keywords: Insomnia; Physical Activity; Posttraumatic Stress Disorder; Exercise.

Introduction

Sleep disturbance is a primary complaint among military veterans.[1] These sleep problems often begin during or immediately after their military service and persist over time. The primary cause is typically inadequate coping mechanisms and/or poor stress regulation resulting from military experiences, leading to difficulty in falling or staying asleep.[2]

Among military veterans, untreated sleep problems significantly increase the risk of psychological distress, mental health disorders,[2] and the development of cardiovascular disease.[3] Despite these serious risks, sleep problems remain largely overlooked in primary care settings,[1] even as the demand for sleep medicine services among veterans has increased substantially.[4] In this context, identifying low-cost, non-specialised adjunctive interventions may help healthcare providers optimise treatment outcomes.

In this regard, complementary and integrative health approaches, such as yoga, may be considered an alternative treatment for sleep problems in military veterans.[4] However, before adopting yoga as therapy for this population, health professionals must carefully evaluate its potential benefits and risks. This requires systematic reviews to summarise existing scientific evidence.

Yoga has proven to be an effective complementary approach for veterans with post-traumatic stress disorder (PTSD), alleviating symptoms like hyperarousal and emotional dysregulation.[5] It also helps manage chronic neck pain, a common issue in this population,[6] promoting both mental and physical wellbeing.

To date, the effectiveness of yoga as an alternative therapy for veterans has been reviewed through studies on mindfulness interventions, primarily focused on overall health outcomes, with few

addressing its impact on sleep problems.[7–9] To the authors' knowledge, no comprehensive review solely on yoga and sleep issues has been published so far. Therefore, this study aims to conduct a systematic review and meta-analysis to critically assess the best available evidence on yoga's effects in managing sleep problems among military veterans.

Material and methods

The protocol for this systematic review was registered on Open Science Framework (OSF, https://doi.org/10.17605/OSF.IO/8KYW6). The review followed the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines[10] to ensure transparency and rigour.

Search strategy

A systematic search was conducted across four electronic databases (Scopus, Web of Science, SPORTDiscus, and MEDLINE/PubMed), covering from their inception until October 2024. Additionally, a manual search was performed, reviewing the first 200 references from Google Scholar and the PEDro database.

Eligibility criteria

Studies exploring the effects of yoga on sleep-related outcomes in military veterans were considered for inclusion. The selection process followed the Population, Intervention, Comparison, and Outcome (PICO) framework (Table 1). Only research articles published or accepted for publication in peer-reviewed journals were included for the initial screening, while abstracts from conference proceedings, books, theses and dissertations were excluded. Additionally, the availability of an abstract was required for screening eligibility.

Study selection

The Rayyan software (QCRI, Qatar) was used to remove duplicate references before screening.[11] Two reviewers independently screened the titles and abstracts of the identified studies to assess their eligibility. Following this independent assessment, the reviewers compared their selections to reach a consensus based on the predefined inclusion criteria. Once an agreement was reached, full texts of potentially relevant studies were obtained. In cases where there was uncertainty about whether a study met the inclusion criteria, a third reviewer was consulted, and consensus was achieved in alignment with the inclusion criteria.

Data extraction

Data on sample characteristics, interventions, outcomes assessed, key findings, adverse events and participant dropouts were initially extracted from the original reports by one researcher. A second investigator then reviewed and verified the extracted information. The summarised data was compiled and presented in Table 2.

Table 1. Search strategy and inclusion/exclusion criteria based on PICO (Population, Intervention, Comparison and Outcome).

Databases	Search terms	PICO	Inclusion criteria	Exclusion criteria
MEDLINE/ PubMed/ Web of Science/ SPORTDiscus/ Scopus	("Yoga") AND ("Veteran*" OR "Militar*" OR "Soldier" OR "Army" OR "Defense" OR "Air Force" OR "Navy" OR "Marine" OR "Troops" OR "Special Forces")	**Population**	Military Veterans	· Studies that included mixed samples, unless separate data, were available specifically for the military veterans subgroup.
		Intervention	Yoga programme	· Studies that implemented interventions based on a single exercise training session. · Studies that combined yoga with other physical therapy.
		Comparison	Baseline measurement, control group or other structured interventions	· No comparison between baseline measurement, structured interventions or control condition results.
		Outcome	Sleep-related measures	· Studies lacked data regarding the effects of yoga intervention on sleep-related outcomes.

Table 2. Descriptive characteristics of the included studies.

First Author (Year), design and Country	Sample	Intervention
Mathersul et al. (2023) **Desing:** RCT **Country:** USA	**Participants (n):** 85 veterans with PTSD (EG: 41; CON: 44) **Gender:** EG: 33M + 8F; CON: 41M + 3F **Age, *years* (mean; SD):** EG: 57.4 ± 12.6 CON: 56.4 ± 12.9	**Duration:** 6-week **EG** **Type:** Sudarshan kriya yoga **Frequency:** Initial 5-day workshop, then 2 days/week **Volume:** 60 min/session **Intensity:** NR **CON** **Type:** Cognitive processing therapy **Frequency:** 2 days/week
Groessl et al. (2023) **Desing:** RCT **Country:** USA	**Participants (n):** 29 veterans with PTSD (EG: 14; CON: 15) **Gender:** EG: 14M; CON: 11M + 4F **Age, *years* (mean; SD):** EG: 51.9 ± 13.5 CON: 40.1 ± 10.7	**Duration:** 12-week + 6-week follow-up **Frequency:** 1 day/week **Volume:** 75 min/session **EG** **Type:** Yoga and mantram repetition **Activities:** 15 min of instruction on mantram + 1h yoga **Intensity:** NR **CON** **Type:** Relaxation intervention **Activities:** Classroom instruction and group discussion
Zaccari et al. (2020) **Desing:** Single arm **Country:** USA	**Participants (n):** 27 veterans with PTSD **Final sample (n):** 17 **Gender:** 10M + 7F **Age, *years* (mean; SD):** M: 56.1 ± 9.47 F: 58 ± 4.32	**Duration:** 10-week **EG** **Type:** Trauma-informed Yoga **Activities:** The facilitator was a Recreational Therapist and a Registered Yoga Teacher **Frequency:** 1 day/week **Volume:** 60 min/session **Intensity:** NR
Groessl et al. (2020) **Desing:** RCT **Country:** USA	**Participants (n):** 152 veterans with chronic low-back pain **Final sample (n):** 150 **Gender:** EG: 55M + 20F; CON: 56M + 19F **Age, *years* (mean; SD):** EG: 53.3 ± 12.7 CON: 53.6 ± 13.9	**Duration:** 12-week + 6-months follow-up **EG** **Type:** Hatha Yoga **Activities:** Included yoga postures, movement sequences, and breathing techniques. 15–20 min of home practice was recommended on days without formal sessions. **Frequency:** 2 days/week **Volume:** 60 min/session **Intensity:** Moderate **CON** **Type:** Delayed-treatment **Activities:** Received ongoing usual care

Outcomes	Results	Dropouts, Adverse Events and ITT
Subjective Sleep: · PCL-C (score) - Nightmares - Insomnia · CAPS-5 (score) - Nightmares - Insomnia · Diary - Quality - Latency - Duration - Number awakens - Wake duration - Efficiency **Objective Sleep (Actigraphy):** · Fragmentation · Latency · Duration · Number of awaken · Wake duration · Efficiency	**Intra-group *(p < 0.05)*** ↑ Quality (diary) in EG and CON ↓ Latency (diary) in EG and CON ↓ Wake duration (diary) in EG and CON ↓ Nightmares (PCL-C/CAPS-5) in EG and CON ↓ Insomnia (PCL-C/CAPS-5) in EG and CON **Inter-group *(p < 0.05*)** > Nightmares reduction in CON than EG > Insomnia reduction in EG than CON	**Dropouts:** *EG*: 1 Lost, 6 scheduling conflicts, 2 travel problems, 1 death in family, 1 illness *CON:* 6 Lost, 2 scheduling conflicts, 3 did not like treatment, 2 wanted to focus on other things, 1 incarcerated, 1 admitted to inpatient psychiatry **Adverse events:** CON: 1 reported being distressed by the assignments. 1admitted to hospital for suicidal ideation. **ITT:** Yes
Subjective Sleep: · ISI (score)	**Intra-group *(Cohen's d)*** ↓ ISI in EG [-2.7 (1.6; -7.0); d = 0.37] after intervention and ↑ after follow-up period ↓ ISI in CON [-0.3 (-3.1; 2.5); d= 0.08] and ↑ after follow-up period **Inter-group-** NR	**Dropouts:** ***Intervention period:*** *EG*: 1 lost to follow-up *CON:* 3 lost to follow-up ***Follow-up period:*** *EG*: 2 lost to follow-up *CON:* 3 lost to follow-up **Adverse events:** NO **ITT:** No
Subjective Sleep: · PSQI (score)	**Intra-group *(p < 0.05)*** ↓ PSQI score (13.88±4.87 vs 12.06±4.98)	**Dropouts:** 10 lost to follow-up **Adverse events:** NR **ITT:** No
Subjective Sleep: · PSQI (score)	**Intra-group *(p < 0.05)*-**NR **Inter-group *(p < 0.05)*-** NO	**Dropouts:** ***Intervention period:*** *EG*: 6 transportation, 4 non-yoga injury, 3 work, 3 other medical, 2 housing/homeless, 1 back pain, 1 type of yoga *CON:* 1 completely withdrew; 3 did not wait 6 months to use yoga ***Follow-up period:*** *EG*: 3 lost to follow-up *CON:* 8 lost to follow-up **Adverse events:** NO **ITT:** Yes

Cushing et al. (2018) **Desing:** Single arm **Country:** USA	**Participants (n):** 23 veterans with PTSD **Final sample (n):** 18 **Gender:** 9M + 9F **Age, *years* (mean; SD):** 43 ± 9.7	**Duration:** 6-week **EG** **Type:** Vinyasa Yoga **Activities:** 10-min warm-up inclusive of 3–5 min of meditation; Standing yoga 25 min; Balancing yoga 10 min; Mat yoga 10 min; Resting position 5 min **Frequency:** 1 day/week **Volume:** 60 min/session **Intensity:** NR
McCarthy et al. (2017) **Desing:** Single arm **Country:** Australia	**Participants (n):** 30 veterans with PTSD **Final sample (n):** 28 **Gender:** 27M + 1F **Age, *years* (mean; SD):** 63.5±7.6	**Duration:** 8-week **EG** **Type:** Hatha yoga **Activities:** Conducted by a practitioner with relevant qualifications in physiotherapy, yoga and mindfulness practices, and were supplemented with an audiovisual recording that provided practice instructions for home use. **Frequency:** 1 day/week **Volume:** 60 min/session **Intensity:** NR
King et al. (2014) **Desing:** Single arm **Country:** USA	**Participants (n):** 15 cancer survivor veterans **Final sample (n):** 14 **Gender:** 13M + 1F **Age, *years* (mean; SD):** 65.64±5.15	**Duration:** 8-week **EG** **Type:** Yoga for People with Cancer & Chronic Illness program **Activities:** 2 days/week, as well as direction to complete 15 min of daily home practice at least five days per week. During application, substantial individualized modifications to the yoga protocol were necessary. **Frequency:** 2 days/week **Volume:** 75 min/session **Intensity:** NR
Staples et al. (2013) **Desing:** Single arm **Country:** USA	**Participants (n):** 15 veterans with PTSD **Final sample (n):** 12 **Gender:** 10M + 2F **Age, *years* (mean; SD):** 62.2 ± 2.2	**Duration:** 6-week **EG** **Type:** KHYF Yoga **Activities:** 3 min for self-awareness by "checking in" with the body, mind and breath; 40 min of postures with breath awareness; and 5-10 min of full body relaxation with a focus on extending the exhale and a guided visualization. **Frequency:** 2 days/week **Volume:** 60 min/session **Intensity:** NR

>: Greater; <: Lower; ↑: Increment; ↓: Decrement; BMI: Body Mass Index; CAPS-5: Clinician-Administered PTSD Scale for DSM-5; CON: Control Group; KHYF: Krishnamacharya Healing and Yoga Foundation; ISI: Insomnia Severity Index; ITT: Intent-to-treat; F: Female; IG: Intervention Group; M: Male; NO: Not Observed; NR: Not Reported; PCL-C: Posttraumatic Stress Disorder Checklist–Civilian Version; PROMIS: Patient- Reported Outcomes Measurement Information System; PSQI: Pittsburgh Sleep Quality Index; PTSD: Posttraumatic Stress Disorder.

Subjective Sleep: · PSQI (score)	**Intra-group *(p < 0.05)*** ↓ PSQI score (13±4.8 vs 9.7±3.9)	**Dropouts:** 5 conflicts with work or school schedules **Adverse events:** NR **ITT:** No
Subjective Sleep: · PSQI (score)	**Intra-group *(p < 0.05)*** ↓ PSQI score (12.4±3.7 vs 11.19±4.1)	**Dropouts:** 1 lost to follow-up, 1 declined further participation in view of the need for surgery related to an intercurrent illness. **Adverse events:** NR **ITT:** No
Subjective Sleep: · PROMIS (score) - Insomnia	**Intra-group *(p < 0.05)***-NO	**Dropouts:** 1 completely withdrew **Adverse events:** NO **ITT:** No
Subjective Sleep: · PSQI (score) - Sleep quality - Sleep latency - Sleep duration - Sleep efficiency - Sleep disturbance - Sleep medications - Day time dysfunction - Total score	**Intra-group *(p < 0.05)*** ↓ PSQI total score (14.6±2.6 vs 13.3±3.8) ↓ PSQI day time dysfunction score (1.9±0.8 vs 1.4±0.8)	**Dropouts:** 3 withdrew during intervention **Adverse events:** NO **ITT:** No

Quality appraisal

The methodological quality of the studies was assessed by two authors using quality assessment tools appropriate for the study type. This included the PEDro scale and the NIH Quality Assessment Tool for Before-After (Pre-Post) Studies with No Control Group. The PEDro scale, as reported in previous studies,[12] scores methodological quality from 0 to 10. Studies with PEDro scores below 4 were classified as having 'poor' methodological quality, those scoring between 4 and 5 were considered of 'fair' quality, scores from 6 to 8 were categorised as 'good' quality, and scores of 9 or 10 indicated 'excellent' quality.[13] The NIH Quality Assessment Tool for Before-After (Pre-Post) Studies assigns an overall score that is categorised as 'low' (75–100%), 'moderate' (25–75%), or 'high' (0–25%). This score is calculated as the sum of the scores for each criterion divided by 12.[14]

Statistical analysis

We conducted the meta-analysis calculations using Microsoft Excel and the Meta-Essentials Workbooks,[15] employing Hedges' g to determine the effect size for quantitative dependent variables. We applied a random-effects model in all analyses to account for potential heterogeneity across studies, utilising the inverse variance method.

To evaluate statistical heterogeneity and inconsistency, we used the I^2 statistic. An I^2 value of 0% indicates no detectable heterogeneity, while higher values signify increasing heterogeneity. Alongside 95% confidence intervals (CI), we also calculated prediction intervals to represent the magnitude and consistency of the effects.

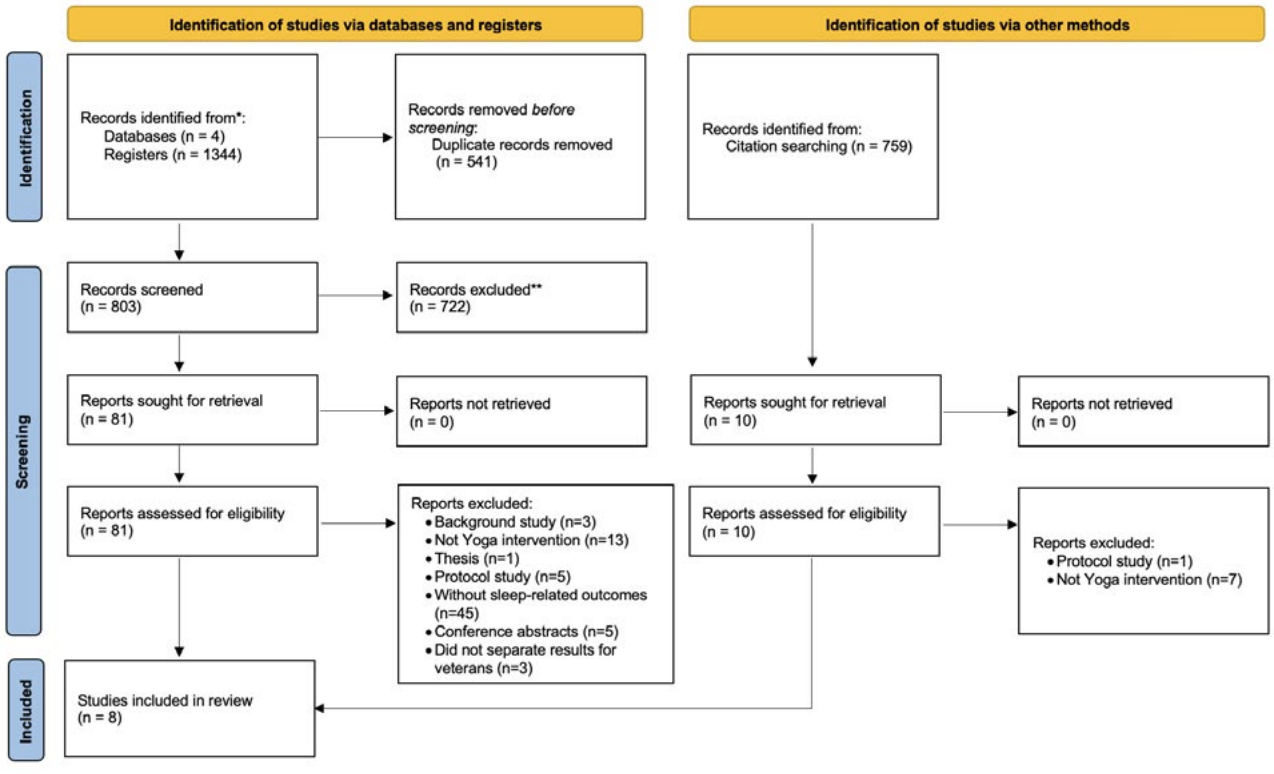
Results

Design and samples

Out of the 1344 records initially obtained, a total of eight studies, three randomised controlled trials (RCTs),[16–18] and five single-arm studies[19–23] were finally analysed (Figure 1). All the investigations were published between 2013 and 2023. A summary of their main characteristics is provided in Table 2.

The total sample size from across all investigations was 376 participants; the smallest and largest study sample included 15[20,22] and 152[16] participants, respectively. According to the obtained data, most participants were male, comprising approximately 76% of the total. Six studies focused on veterans with post-traumatic stress disorder (PTSD),[17–19,21–23] one on cancer survivor veterans[20] and another on veterans with chronic low-back pain.[16]

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews) study flow diagram.



Interventions characteristics

The types of yoga included yoga with mantra repetition, Sudarshan Kriya yoga, trauma-informed yoga, Hatha yoga, Vinyasa yoga, KHYF yoga, and the Yoga for People with Cancer & Chronic Illness program. Yoga interventions lasted between 6[18,19] and 12 weeks,[16,17] with sessions ranging from one to two times per week. Session durations varied from 60 to 75 minutes. No study controlled the session's intensity, although Groessl et al.[16] indicated it was moderate.

Main outcomes

Subjective sleep quality

Six of the eight included studies analysed the effects of yoga on subjective sleep quality[16,18,19,21–23] and five of them reported significant intra-group improvements after intervention.[18,19,21–23]

Only two studies analysed inter-group differences. Notably, one study[13] did not find the effects of yoga to be superior to control conditions. In contrast, Mathersul et al.[15] reported a greater reduction in nightmares in the group that underwent cognitive processing therapy compared to the group that practised Sudarshan Kriya yoga.

The meta-analysis comparing pre- and post-intervention results in four yoga studies[19,21–23] (n = 75) revealed a significant positive effect of yoga on subjective sleep quality (Hedges' g = 0.40; 95% CI: 0.12–0.69, p < 0.001), with low heterogeneity (I^2 = 18.32%), as shown in Figure 2.

Subjective insomnia

Three studies analysed the effects of yoga on insomnia and two reported significant intra-group improvements after intervention.[17,18] However, King et al.[20] did not observe any statistically significant changes in insomnia.

Two studies analysed inter-group differences,[17,18] but only Mathersul et al.[18] reported a significantly greater reduction in insomnia in the group that practised Sudarshan Kriya yoga than those who underwent Cognitive Processing Therapy.

Objective sleep

Sudarshan Kriya yoga program did not significantly impact objective sleep outcomes according to the results reported in the only study investigating this outcomes.[18]

Dropouts and adverse events

Ninety dropouts were observed across all the studies included, 55 occurring in the yoga groups. The primary reasons for dropouts included health issues, transportation and/or discontinued intervention. No study reported any adverse effects related to the yoga program.

Figure 2. Evaluation of Methodological Quality.

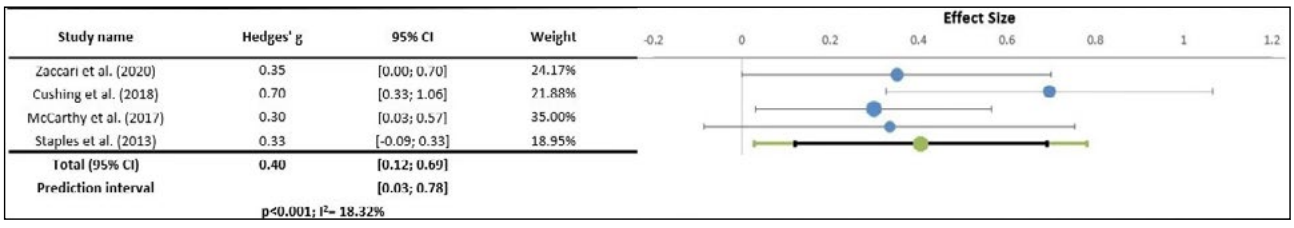


Table 3. Evaluation of methodological quality (PEDro scale) of RCT studies.

Scale Items	1	2	3	4	5	6	7	8	9	10	11		Score
Mathersul et al. (2023)	1	1	0	1	0	0	1	0	1	1	1	6	
Groessl et al. (2023)	1	1	1	1	0	0	1	0	1	1	1	7	
Groessl et al. (2020)	1	1	1	1	0	0	0	1	1	1	1	7	

Ítems: 1. Eligibility criteria and source 2. Random allocation 3. Concealed allocation 4. Baseline comparability 5. Blinding of participants 6. Blinding of therapists 7. Blinding of assessors 8. Adequate follow-up (. 85%) 9. Intention-to-treat analysis 10. Between-group statistical comparisons 11. Reporting of point measures and measures of variability

Table 4. Evaluation of the Quality Assessment Tool for Before-After Studies with No Control Group scales.

Scale Items	1	2	3	4	5	6	7	8	9	10	11	12	Score	Quality rating
Zaccari et al. (2020)	Y	Y	Y	CD	N	N	Y	NR	N	Y	N	N	5	M
Cushing et al. (2018)	Y	Y	Y	N	N	Y	Y	NR	N	Y	Y	N	7	M
McCarthy et al. (2017)	Y	Y	Y	N	N	CD	Y	N	Y	Y	N	N	6	M
King et al. (2014)	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	N	8	M
Staples et al. (2013)	Y	Y	Y	N	N	Y	Y	N	Y	Y	N	N	7	M

Key: Y = Yes, N = No, NR = Not reported, CD = Cannot determine, NA = Not applicable, M = Moderate

Items: 1. Study question 2. Eligibility criteria and study population 3. Study participants representative of clinical populations of interest 4. All eligible participants enrolled 5. Sample size 6. Intervention clearly described 7. Outcome measures clearly described, valid, and reliable 8. Blinding of outcome assessors 9. Followup rate 10. Statistical analysis 11. Multiple outcome measures 12. Group-level interventions and individual-level outcome efforts

Methodological quality

The three randomised studies analysed had good methodological quality, with scores ranging from 6[18] to 8.[16,17] However, no studies were blinded to participants or therapists (Table 3). The non-experimental studies showed moderate methodological quality, with scores from 5[23] to 8.[20] Although the samples were generally representative of the studied population, they were small (Table 4).

Discussion

Yoga has demonstrated effective management of sleep disturbances across various conditions.[24,25] However, the findings of this review do not fully support these results. For instance, most of the analysed studies reported data on the effects of yoga on sleep quality, with the majority showing significant intragroup improvements for this outcome. This finding was confirmed after meta-analysing data from four investigations. This result is somewhat expected, as it has been suggested that yoga enhances sleep quality by increasing melatonin levels, reducing hyperarousal, and addressing stress-related cardiac and respiratory abnormalities.[26] However, when yoga was compared to control conditions, its effects were inferior to simple relaxation exercises. Additionally, cognitive therapy proved to be more effective in improving sleep quality. Notably, other therapies, such as simple walking, have been shown to have greater effects than yoga in adults suffering from sleep disturbances.[27] Together, these findings suggest that yoga might not be the most suitable therapy to recommend for managing sleep quality in military veterans. These results also highlight the challenge of improving sleep quality through exercise therapy in this population, as previously observed.[28,29]

In this line, mixed results were observed for insomnia, as not all analysed studies reported significant improvements. Furthermore, its effects were not superior to those of relaxation exercises. However, yoga appeared to be more effective than cognitive therapy in managing insomnia. This is a noteworthy finding, as both the A/DOD Clinical Practice Guidelines and the recommendations from the American Academy of Sleep Medicine, the American College of Physicians and the National Institutes of Health identify cognitive behavioural therapy for insomnia (CBT-I) as the first-line treatment for adults with insomnia. Additionally, the Department of Veterans Affairs has invested significantly in disseminating CBT-I as a preferred treatment option for veterans.[30] Given that healthcare systems should adopt evidence-based clinical practice standards for treating insomnia among military veterans,[31] healthcare providers might consider the potential benefits of prescribing yoga to this population as a complementary therapy.

Yoga is a feasible intervention for the treatment of diverse symptoms such as PTSD or low-back pain among military veterans.[32,33] Indeed, yoga is a complementary therapy that seems to be widely accepted by military veterans.[34] However, in this review, a considerable number of dropouts were reported, most of them related to health issues or lack of transportation, which calls into question the feasibility of recommending yoga practice among military veterans with sleep problems. In this regard, implementing hybrid yoga sessions—combining remotely delivered and in-person formats—could enhance adherence by addressing common barriers military veterans face, such as transportation challenges, time constraints and financial limitations.[35] This flexible approach may improve accessibility and encourage long-term engagement in yoga-based interventions.

This appears to be the first review of the efficacy of yoga for managing sleep problems among military veterans. Its primary strength lies in its novelty. However, a key methodological limitation is the lack of studies incorporating objective sleep assessments. While subjective measures, such as self-reports, provide valuable insights into individuals' perceptions and psychological influences on sleep, objective methods, like actigraphy, offer quantifiable and replicable data that enhance assessment accuracy.[36] Future research should integrate both subjective and objective sleep measures to ensure a more comprehensive evaluation.

Despite its originality, several limitations should be acknowledged. Firstly, only a small number of studies were included. Secondly, there was a lack of comparison groups, and heterogeneity was high, preventing the possibility of conducting a meta-analysis. Thirdly, participants in the reviewed studies were predominantly male, limiting the applicability of the findings to the female population. Finally, excluding grey literature and potential publication bias may have also influenced the results.

Conclusion

The available scientific evidence on the effects of yoga on managing sleep problems among military veterans comes from a reduced number of studies, most of them using a single-arm design. Preliminary findings cast doubt upon the efficacy of yoga for improving sleep quality, while its practice can help manage insomnia. Further studies that accurately test the feasibility of this therapy in this population are strongly needed.

Conflicting interests: The authors declare that there is no conflict-of-interest.

Funding: This research received no specific grant from public, commercial or not-for-profit funding agencies.

Corresponding Author: Rocío Carballo Afonso, rociocarballo@uvigo.gal
Authors: R Carballo Afonso[1], D González-Devesa[2], L Iglesias Vieites[3], C Ayán Pérez[1]
Author Affiliations:
1 Universidad de Vigo - Didácticas Especiáis
2 Universidad Católica de Ávila
3 Independent researcher

References

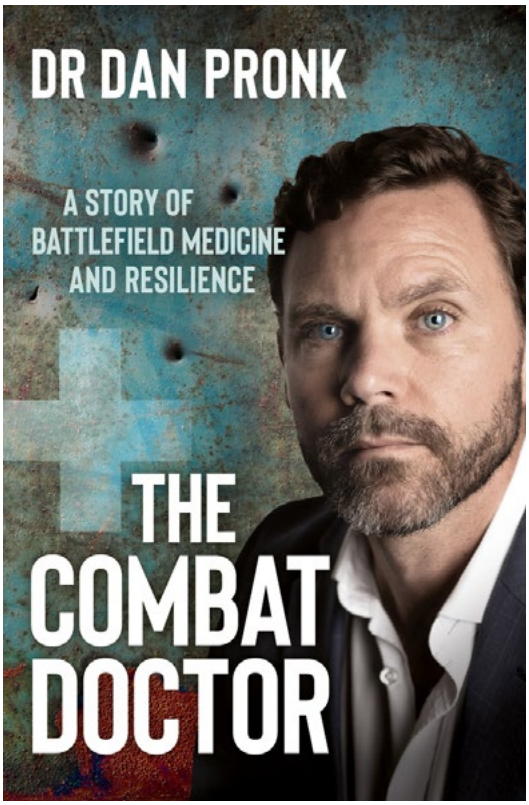
1. Hughes JM, Ulmer CS, Gierisch JM; Mid-Atlantic VA MIRECC Workgroup, Howard MO. Single-Item Measures for Detecting Sleep Problems in United States Military Veterans. J Gen Intern Med. 2018;33(5):698-704. doi:10.1007/s11606-017-4250-4
2. Hughes JM, Ulmer CS, Hastings SN, Gierisch JM; Mid-Atlantic VA MIRECC Workgroup, Howard MO. Sleep, resilience, and psychological distress in United States military Veterans. Mil Psychol. 2018;30(5):404-414. doi:10.1080/08995605.2018.1478551
3. Ulmer CS, Bosworth HB, Germain A, et al. Associations between sleep difficulties and risk factors for cardiovascular disease in veterans and active duty military personnel of the Iraq and Afghanistan conflicts. J Behav Med. 2015;38(3):544-555. doi:10.1007/s10865-015-9627-4
4. Folmer RL, Smith CJ, Boudreau EA, et al. Prevalence and management of sleep disorders in the Veterans Health Administration. Sleep Med Rev. 2020;54:101358. doi:10.1016/j.smrv.2020.101358
5. Cramer H, Anheyer D, Saha FJ, Dobos G. (2018). Yoga for posttraumatic stress disorder - a systematic review and meta-analysis. BMC psychiatry. 2018;18(1):72.
6. Li Y, Li S, Jiang J, Yuan S. Effects of yoga on patients with chronic nonspecific neck pain: A PRISMA systematic review and meta-analysis. Medicine, 2019;98(8):e14649. doi: 10.1097/MD.0000000000014649
7. Elwy AR, Johnston JM, Bormann JE, Hull A, Taylor SL. A systematic scoping review of complementary and alternative medicine mind and body practices to improve the health of veterans and military personnel. Med Care. 2014;52(12 Suppl 5):S70-S82. doi:10.1097/MLR.0000000000000228
8. Marchand WR, Sandoval K, Lackner R, et al. Mindfulness-based interventions for military veterans: A systematic review and analysis of the literature. Complement Ther Clin Pract. 2021;42:101274. doi:10.1016/j.ctcp.2020.101274
9. Staples JK, Gibson C, Uddo M. Complementary and Integrative Health Interventions for Insomnia in Veterans and Military Populations. Psychol Rep. 2023;126(1):52-65. doi:10.1177/00332941211048473
10. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi:10.1136/bmj.n71

11. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. Syst Rev. 2016;5(1):210. doi:10.1186/s13643-016-0384-4
12. Maher CG, Sherrington C, Herbert RD, Moseley AM, Elkins M. Reliability of the PEDro scale for rating quality of randomized controlled trials. Phys Ther. 2003;83(8):713-721.
13. Cashin AG, McAuley JH. Clinimetrics: Physiotherapy Evidence Database (PEDro) Scale. J Physiother. 2020;66(1):59. doi:10.1016/j.jphys.2019.08.005
14. National Heart Lung and Blood Institute. Quality Assessment Tool for Before-After (Pre-Post) Studies With No Control Group. 2014. Available from: http://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools/before-after
15. Suurmond R, van Rhee H, Hak T. Introduction, comparison, and validation of meta-Essentials: a free and simple tool for meta-analysis. Research Synthesis Methods. 2017;8(4), 537–553. doi: 10.1002/jrsm.1260
16. Groessl EJ, Liu L, Schmalzl L, et al. Secondary Outcomes from a Randomized Controlled Trial of Yoga for Veterans with Chronic Low-Back Pain. Int J Yoga Therap. 2020;30(1):69-76. doi:10.17761/2020-D-19-00036
17. Groessl EJ, Hafey C, McCarthy A, et al. Yoga Plus Mantram Repetition to Reduce Chronic Pain in Veterans With Post-Traumatic Stress Disorder: A Feasibility Trial. Glob Adv Integr Med Health. 2023;12:27536130231220623. doi:10.1177/27536130231220623
18. Mathersul DC, Schulz-Heik RJ, Avery TJ, Allende S, Zeitzer JM & Bayley PJ. US Veterans Show Improvements in Subjective but Not Objective Sleep following Treatment for Posttraumatic Stress Disorder: Secondary Analyses from a Randomised Controlled Trial. Depression and Anxiety, 2023;1:1–13. doi:10.1155/2023/7001667
19. Cushing RE, Braun KL, Alden C-Iayt SW, Katz AR. Military-Tailored Yoga for Veterans with Post-traumatic Stress Disorder. Mil Med. 2018;183(5-6):e223-e231. doi:10.1093/milmed/usx071
20. King K, Gosian J, Doherty K, et al. Implementing yoga therapy adapted for older veterans who are cancer survivors. Int J Yoga Therap. 2014;24:87-96.
21. McCarthy L, Fuller J, Davidson G, Crump A, Positano S, Alderman C. Assessment of yoga as an adjuvant treatment for combat-related posttraumatic stress disorder. Australas Psychiatry. 2017;25(4):354-357. doi:10.1177/1039856217695870
22. Staples JK, Hamilton MF, Uddo M. A yoga program for the symptoms of post-traumatic stress disorder in veterans. Mil Med. 2013;178(8):854-860. doi:10.7205/MILMED-D-12-00536
23. Zaccari B, Callahan ML, Storzbach D, McFarlane N, Hudson R, Loftis JM. Yoga for veterans with PTSD: Cognitive functioning, mental health, and salivary cortisol. Psychol Trauma. 2020;12(8):913-917. doi:10.1037/tra0000909
24. Wang WL, Chen KH, Pan YC, Yang SN, Chan YY. The effect of yoga on sleep quality and insomnia in women with sleep problems: a systematic review and meta-analysis. BMC Psychiatry. 2020;20(1):195. doi:10.1186/s12888-020-02566-4
25. de Orleans Casagrande P, Coimbra DR, de Souza LC, Andrade A. Effects of yoga on depressive symptoms, anxiety, sleep quality, and mood in patients with rheumatic diseases: Systematic review and meta-analysis. PM R. 2023;15(7):899-915. doi:10.1002/pmrj.12867
26. Zhu J, Chen X, Zhen X, et al. Meta-analysis of effects of yoga exercise intervention on sleep quality in breast cancer patients. Front Oncol. 2023;13:1146433. doi:10.3389/fonc.2023.1146433
27. Tang MF, Chiu HY, Xu X, et al. Walking is more effective than yoga at reducing sleep disturbance in cancer patients: A systematic review and meta-analysis of randomized controlled trials. Sleep Med Rev. 2019;47:1-8. doi:10.1016/j.smrv.2019.05.003
28. Stegner AJ, Almassi NE, Dougherty RJ, et al. Safety and efficacy of short-term structured resistance exercise in Gulf War Veterans with chronic unexplained muscle pain: A randomized controlled trial. Life Sci. 2021;282:119810. doi:10.1016/j.lfs.2021.119810
29. Rezaei S, Kheiri A, Esmaeili M, Mahmoudi A. Efecto de ocho semanas de ejercicios deportivos en el agua sobre los trastornos del sueño y la alexitimia de los veteranos inactivos. Iran J War Public Health 2023;15(3):285-293

30. Bramoweth AD, Tighe CA, Berlin GS. Insomnia and Insomnia-Related Care in the Department of Veterans Affairs: An Electronic Health Record Analysis. Int J Environ Res Public Health. 2021;18(16):8573. doi:10.3390/ijerph18168573
31. Ulmer CS, Bosworth HB, Beckham JC, et al. Veterans Affairs Primary Care Provider Perceptions of Insomnia Treatment. J Clin Sleep Med. 2017;13(8):991-999. doi:10.5664/jcsm.6702
32. Kale I, Krese K, Walker S, Stelsel S, Athota L, Wanicek-Squeo MT,... & Etingen, B. Re-Branding Yoga: The Development of a 'High Intensity Stretching'Program for Veterans with Chronic Low Back Pain. Archives of Physical Medicine and Rehabilitation, 2024;105(4):e19-e20.
33. Bollaert RE, Bennett MM, Davis KE, et al. Yoga for Veterans with PTSD: Intervention Feasibility, Changes in PTSD Symptom Severity, and Psychological and Physiological Health-Related Fitness Outcomes. Int J Yoga Therap. 2024;34(2024):Article 9. doi:10.17761/2024-D-23-00082
34. Resnick A, Bergman A, Oberman R, Taylor S L, Chuang E, Cummings K,& Chang ET. Knowledge and Attitudes Towards Use of Complementary and Integrative Health Therapies for Veterans with Opioid Use Disorder in the Veterans Health Administration. OBM Integrative and Complementary Medicine, 2024;9(1):1-14.
35. Gonzalez C, Chang DG, Rutledge T, Groessl EJ. Promoting Adherence to a Yoga Intervention for Veterans With Chronic Low Back Pain. Global Advances in Integrative Medicine and Health. 2025;14, 27536130251323247.
36. Haddad M, Abbes Z, Abdel-Salam ASG. Bridging the gap: investigating discrepancies between subjective and objective sleep assessment in university students. Biological Rhythm Research. 2025;56(1):63-74.

Book Review – *The Combat Doctor: A Story of Battlefield Medicine and Resilience*

D Cronshaw



The Combat Doctor: A Story of Battlefield Medicine and Resilience

By Dan Pronk

Reviewed by Darren Cronshaw

Note: Content within this review and book regarding trauma and mental health challenges may be distressing to some people. Support is available through your Chain of Command, Chaplaincy, Health Centre, Lifeline 13 1144 or Open Arms 1800 011 046.

The Combat Doctor is a first-hand riveting account by Dr Dan Pronk of the resilience called for in joining, integrating with, serving in and transitioning from special forces and battlefield medicine.

One of Pronk's early teenage ambitions was to become a pro triathlete. However, he later channelled that energy into a self-directed training regime for Special Air Service Regiment (SASR) selection. While studying medicine on an Army scholarship and then serving at 5RAR in Darwin, he regularly did 150 kilometres of pack-marching a week and 1000 push-ups a day, practised night navigation and, just prior, carefully dosed up on vitamins. Lessons from selection were significant, for example, framing testing not as competition with other candidates but as challenges with teammates to rely on support. The paradigm change was not to ask, 'Did I beat them?' but 'Would I want this person on my team at war?' (p.52) Testing was as much about character, resilience and perseverance as skills and confidence. Pronk passed selection and uniquely became a Combat Doctor, qualified and equipped to join the fight—as he described it—to either take life or save it.

This does raise an ethical question for me as a chaplain reading the book. Like that of a medic or doctor, my role is as a non-combatant and protected person under the Geneva Convention (Protocol I, 8 June 1977, Art 43.2). I am allowed to carry weapons and, if necessary, use them to defend myself or those in my care. I take seriously my need to understand and be trained in weapons I may carry. But medical and religious personnel do not have the right to participate in hostilities, or if we do participate directly in combat, then we lose our protected status. Thus I am cautious about any inference that I could ever be an active shooter and chaplain, and medics may have the same hesitancy.

The book describes how Pronk integrated with and served alongside SF operators. He did not have the opportunity to go on and complete the Reinforcement Cycle of training (REO) to qualify as an operator. Yet he served as a Combat Doctor at the 2nd Commando

Regiment (2 CDO) and SASR for 5 years, including four tours of Afghanistan. This exposed him to teams for whom he grew great respect. He described the transport in and sometimes evacuation out of battles, some of the taskings, some of the saved lives, and some lives he could not save. In one episode, Pronk performed a chest opening cut in an airborne helicopter with a combat knife, doing what was necessary rather than what was protocol, but saved the digger's life. Yet he transparently explains the moral injury of not being able to save a civilian child and the grief of losing colleagues and mates who were in his medical care. It is only natural that grief and mourning go on for years.

Pronk insightfully explains battlefield medicine, including the development of tactical combat casualty care (TCCC) as a life-saving intervention, and the role of the teams of Voodoo Medics as SF medics and doctors on standby for MEDIVAC became known. Towards the end of his last deployment, Pronk realised a well-trained medic or operator could deal with most life-threatening wounds as well as he could. Pronk realised on his last deployment that his best role was focusing on improving medical capability across the team, commenting: 'I realise now that one's contribution to an organisation is more accurately measured by what they have left behind rather than what they achieved while they were there'. (p.302) This also focuses on the work of medics in training others in TCCC and more advanced training for Combat First Aiders. It is also encouraging to Chaplains to not seek to be the point of contact for welfare and wellbeing, but to upskill the chain of command and colleagues across a unit to offer an umbrella of care to one another and one's teams.

The Combat Doctor's story of transition to civilian life and his family experience is also insightful. He details some career and family challenges other members will empathise with: navigating posting hick-ups, returning from deployment, restlessness and desiring another deployment fix, being demoted back because of lack of promotion courses, DHA housing, wife saying, 'It's time', transition to civilian life, PTSD diagnosis, drinking more and the revenge cycle trap. He was determined not to lose any more time with family—he said he invested in relationships as the dead cannot. He had asked his wife Kristy what she did in Adelaide during his second deployment when his children were aged 3 and newborn, and she replied, 'I cried'. (p.158). In transition he explained:

> *'I had lost both my identity and my purpose. In my mind I had become irrelevant and inconsequential. After the experiences I'd had in uniform, the world around me seemed shallow and preoccupied with minutiae. I craved the understanding and acceptance of my former tribe, but I had abandoned them. They had remained on the SOCOMD train, and I had chosen to get off. There was no going back and seemingly no way forward.' (p.313)*

Pronk reframed his challenges as an opportunity for post-traumatic growth. He sought out new skills in meditation and identified sources of resilience for himself and others that he and colleagues wrote about in The Resilience Shield. Some psychological 'demons' still surfaced, but he realised that it was not that part of him died on the battlefield of Afghanistan, but part had been born, awakened, learning much about himself. He has built a successful post-Army career in medical leadership and entrepreneurship. He was also 'Dr Dan' on the TV show SAS Australia.

The Combat Doctor is highly recommended reading for those interested in resilience, mental health, battlefield medicine and special forces, including those who command and support SF in various ways. It is a tribute to the stoicism and resilience of SF operators and their partnering 'Voodoo Medics'.

Publisher details: Dan Pronk, The Combat Doctor: A Story of Battlefield Medicine and Resilience (Sydney: Pan Macmillan, 2022). He also wrote Average 70kg D**khead: Motivational Lessons from an Ex-Army Special Forces Doctor (reviewed in JMVH) and, with SASR colleagues Ben Pronk and Tim Curtis wrote The Resilience Shield: SAS Resilience Techniques to Master Your Mindset and Overcome Adversity (previously reviewed in Grounded Curiosity by Chris Booth).

The views expressed in this article are those of the author and do not necessarily reflect the position of the Australian Army, the Department of Defence or the Australian Government.

Corresponding Author: Darren Cronshaw, darren.cronshaw@defence.gov.au dcronshaw@acom.edu.au
Author: D Cronshaw[1,2]
Author Affiliations:
1 Australian Army - Chaplaincy
2 Australian College of Ministries

JMVH Article: *'Dual Loyalty and the Medical Profession for Australian Defence Force Medical Officers'*

N Westphalen

The October 2022 JMVH article regarding Australian Defence Force (ADF) medical officers' dual loyalty to military patients and commanders1 is important because, aside from their conduct in extreme circumstances, it also pertains to how they perform their day-to-day clinical and other duties. While commending the author's work to that end, it requires further elaboration.

Two 'loyalties'… or three 'mandates'?

In his seminal official WWI medical history, Arthur Graham Butler referred to military medical services as having a triple mandate as follows (italics added):

> 'To the military command, it [the Australian Army Medical Service] owed service to promote and conserve man-power for the purpose of war. *To the nation at large, it was responsible for promoting by intelligent anticipation the efforts of the civil institution whose duty it should be to prepare for useful return to civil life the soldiers unfitted for further military service.* By Humanity, as represented by the nations who had subscribed to the International Convention of Geneva and The Hague, it was charged with minimising so far as possible the individual sufferings of the combatants of both sides. These three strands of purpose, inextricably interwoven as they were, in a self-contained and consistent scheme of medical service nevertheless furnished each as an end in itself—all *three* entering at every stage into the medical problem, and now one, now another, providing its dominating motive.'[2]

The author's article is not unusual: in omitting Butler's 'civilian transition' mandate, it has not considered the need for military health services to engage with operational commanders for additional reasons besides those pertaining to largely reactive clinical care.

To this end, the 'civilian transition' mandate has three elemental components from an occupational medicine perspective, each requiring bespoke attention while overlapping with the other two mandates:

- **Primary prevention** to reduce the incidence of avoidable work-related illness and injury.
- **Secondary prevention** through holistic and timely treatment and workplace-based rehabilitation to restore as much normal function as quickly as possible.
- **Facilitating the eventual transition of all ADF members to the civilian community** by effective and timely handover of their ongoing treatment to the Department of Veteran's Affairs, and enabling their compensation entitlements.

Butler recognised these three components when he wrote:

> 'Most writers who deal with the part of medicine in the war tacitly accept … that the one essential feature of the work of the medical service in the late war was to bring about a greatly diminished incidence of disease. As will be shown, close study of facts and figures makes clear that this attitude must be modified.
>
> The many problems associated with civilian participation in military activities on the one hand, and with the reinstatement as civilians of the wastage from warfare on the others, will be found… [within] the chapters of this section. They do so along two lines—positive, in the vast domain of 'reparative' treatment, surgical and medical; and negative, in the only less arduous and exacting work of the military boards and the military machinery for implementing the system of [medical] "category".'[3]

Hence, Butler anticipated the Royal Australasian College of Physicians' 2019 *Health Benefits of Good Work*™ Position Statement,[4] which explains how:

- absence from work leads to *poorer* health
- waiting for recovery *delays* recovery
- longer time off work makes it *less* likely that patients will *ever* return to work
- the most common health conditions are *not* 'cured' by treatment alone
- keeping patients in good work is a *therapeutic intervention* and, therefore, *part of their treatment.*

Therefore, the author's analysis of ADF medical officers' humanitarian' and 'command' mandates is incomplete, as it does so in isolation from their 'civilian transition' mandate, the conduct of which must entail them working with patients and their commanders together to achieve the best outcomes for both. To this end, previous articles have explained how occupational and environmental physicians are subject matter experts to this end, and why the ADF's health services have not been fit for purpose in their current form—least of all regarding their 'civilian transition' mandate—at least since the early 2000s.[5,6,7,8,9,10,11,12,13,14,15] It also seems reasonable to assert that they have since been validated by the 2019 Productivity Commission inquiry into veterans' health services[16] and the 2024 Defence and veteran suicide Royal Commission.[17]

Butler's Quo *Vadimus?*

The author's focus on ADF medical officer's 'patient' and 'command' mandates is partly reflected in Butler's final chapter entitled *Quo Vadimus*?, which concluded (italics added):

> 'The Army Medical Service seems to be at the parting of the ways. One road might lead it to complete devotion to military ends—the winning of war at any price [i.e., the "command" mandate]. If that happened, the task of keeping alive the principle of humanity *and of safeguarding the social interests of the state* and the individual [i.e., the "treatment" and "civilian transition" mandates] would be left more and more to the voluntary and civil organisations. On the other hand, in spite of the military commitments of ruthless warfare, it may *retain its triple responsibility*. Which way it goes must depend on the extent to which medicine, as a social group, tends to give its soul as well as its body to "total ruthlessness", or, (on the other hand) to cooperate with social civil influences in maintaining the human ideal…'[18]

It should be noted that Butler wrote this rather despairing passage during a second 20th-century worldwide cataclysm that saw the perversion of medical science perpetuate even greater evils than the previous conflict.[19,20] [21,22] Even so, the 2020 Brereton inquiry into alleged atrocities by Special Air Service Regiment personnel demonstrates the need for military medical officers to actively engage with commanders to at least bear witness to such incidents should they occur. [23] One might hope that doing so would not only help meet the national reputation management imperative at the higher political and strategic level, but also reduce mental health issues for personnel who not only witness but are directed to instigate egregiously preventable barbarities. The ability to stand one's ground in such circumstances necessitates strong character and mature judgement, supported by formal training that is currently lacking.

Conclusion

In short, the author's article is incomplete, as the challenges posed by ADF medical officers—even regarding their day-to-day work—pertain to balancing three mandates rather than two 'loyalties'—not just treating patients or facilitating operational capability, but also facilitating their patients' eventual civilian transition. The last of these mandates necessitates engagement with ADF commanders that is not recognised by only considering the other two.

Furthermore, Butler's 'quo vadimus?' question poses a false choice for ADF medical officers, as they have an essential role in preventing war crimes in extreme circumstances and bear witness should they fail.

I trust this letter can be considered a constructive elaboration of the issues raised by the article, and I look forward to answering any queries.

Disclaimer

The views expressed in this letter are mine alone. They do not necessarily reflect those of the ADF's health services or any other organisations mentioned. Likewise, any factual errors are my responsibility.

Yours sincerely
Dr Neil Westphalen

FAFOEM OCCUPATIONAL AND ENVIRONMENTAL MEDICINE RACP
FACAsM Fellow Australasian College of Aerospace Medicine

References

1 Vinson M. Dual loyalty and the medical profession for Australian Defence Force medical officers. Journal of Military and Veteran's Health. Oct 2022;30(4):26-30.

2 Butler AG. The Western Front. The Australian Army Medical Services in the War of 1914-1918. Vol 2. Canberra: Australian War Memorial. 1940. p. 263.

3 Butler AG. The Western Front. The Australian Army Medical Services in the War of 1914-1918. Vol 2. Canberra: Australian War Memorial. 1940. p. 263.

4 Butler AG. The Western Front. The Australian Army Medical Services in the War of 1914-1918. Vol 2. Canberra: Australian War Memorial. 1940. p. 263. 019. Available from: https://www.racp.edu.au/advocacy/division-faculty-and-chapter-priorities/faculty-of-occupational-environmental-medicine/health-benefits-of-good-work.

5 Westphalen N. 'Military health support' in the Australian Defence Force. Journal of Military and Veteran's Health. Oct 2021;29(4):16-26. Available from: https://jmvh.org/article/military-health-support-in-the-australian-defence-force.

6 Westphalen N. Casualty evacuation in the Australian Defence Force. Journal of Military and Veteran's Health. Jan 2020;28(1):29-38. Available from: https://jmvh.org/wp-content/uploads/2020/04/AMMA-JMVH-Jan-2020.pdf.

7 Westphalen N. Humanitarian aid / disaster relief in the Australian Defence Force: Health Aspects. Journal of Military and Veteran's Health. 2021 Jul;28(3):15-25. Available from: https://jmvh.org/article/humanitarian-aid-disaster-relief-ha-dr-in-the-australian-defence-force-health-aspects.

8 Westphalen N. Military medicine capabilities in the Australian Defence Force. Journal of Military and Veteran's Health, May 2020;28(2):39-49. Available from: https://jmvh.org/article/military-medicine-capabilities-in-the-australian-defence-force.

9 Heslop DJ, Westphalen N. Medical CBRN defence in the Australian Defence Force. Journal of Military and Veteran's Health. Jan 2019;27(1):66-73. Available from: https://jmvh.org/wp-content/uploads/2019/01/Compensation-in-the-Australian-Defence-Force.pdf.

10 Westphalen N,. Assessing medical suitability for employment and deployment in the Australian Defence Force. Journal of Military and Veteran's Health Jul 2018;26(2):42-48. Available from: http://jmvh.org/wp-content/uploads/2018/08/AMMA-JMVH-July-2018.pdf.

11 Westphalen N. Compensation in the Australian Defence Force. Journal of Military and Veteran's Health. Jan 2019;27(1):58-65. Available from: https://jmvh.org/wp-content/uploads/2019/01/Compensation-in-the-Australian-Defence-Force.pdf.

12 Westphalen N. Rehabilitation in the Australian Defence Force. Journal of Military and Veteran's Health. Oct 2019;27(4):7-14. Available from: https://jmvh.org/wp-content/uploads/2019/10/AMMA-JMVH-October-2019.pdf.

13 Westphalen N. Occupational and environmental medicine in the Australian Defence Force. Journal of Military and Veteran's Health. Jan 2017;25(1):44-52. Available from: http://jmvh.org/wp-content/uploads/2017/02/reprint.pdf.

14 Westphalen N. Health promotion in the Australian Defence Force. Journal of Military and Veteran's Health. Jan 2021;29(1):52-60. Available from: https://jmvh.org/article/health-promotion-in-the-australian-defence-force.

15 Westphalen N. Primary Health Care in the Australian Defence Force. Journal of Military and Veteran's Health Jul 2018;25(4):84-89. Available from: http://jmvh.org/wp-content/uploads/2017/11/AMMA-JMVH-October-2017.pdf.

16 Productivity Commission. A better way to support veterans: overview and recommendations, Report No. 93, 2019. Available from: https://www.pc.gov.au/inquiries/completed/veterans/report/veterans-overview.pdf.

17 Royal Commission into Defence and Veteran Suicide 2022. Available from: https://defenceveteransuicide.royalcommission.gov.au.

18 Butler AG. The Western Front. The Australian Army Medical Services in the War of 1914-1918. Vol 3. Canberra: Australian War Memorial. 1943. p. 999.

19 Walker AS. Clinical problems of war. Australia in the War of 1939-45. Vol 1. Canberra: Australian War Memorial; 1952. p. 2.

20 O'Keefe B, with Smith FB. Medicine at war: medical aspects of Australia's involvement in Southeast Asia 1950-1972. Edwards P, editor. St Leonards NSW: Allen and Unwin—Australian War Memorial. 1994. p. xxiv.

21 Marks JH, Bloche MG. The Ethics of Interrogation — The U.S. Military's Ongoing Use of Psychiatrists. New England Journal of Medicine. 2008 Sep;(359):1090-2. Available from: https://www.nejm.org/doi/full/10.1056/NEJMp0806689.

22 Annas G, Crosby S, Glantz L. Guantanamo Bay: A medical ethics–free zone? New England Journal of Medicine. 2013 Jul;(369):101-3. Available from: https://www.nejm.org/doi/full/10.1056/NEJMp1306065.

23 Willacy M, Blucher A. Whistleblower and former SAS medic says he feels vindicated by findings of the IGADF Afghanistan war crimes inquiry: ABC News. 20 Nov 2020 [updated 21 Nov 2020; cited 2020 27 Nov]. Available from: https://www.abc.net.au/news/2020-11-20/dusty-miller-says-he-feels-vindicated-by-igadf-inquiry/12900482.

Reply: *A Valuable Historic Perspective*

Thank you for your interest in and reflection on 'Dual loyalty and the medical profession for Australian Defence Force Medical Officers' published in the *JMVH* October 2022 issue.[1] The elaboration regarding Bulter's civilian transition mandate is valuable and reconciles well with considerations of dual loyalty in military medical settings.

Dual loyalty scenarios are abundant in military and civilian medical practice, and both settings warrant careful attention from military medical officers.[2] The dual loyalty encountered by Australian Defence Force (ADF) Medical Officers during the transition of ADF members to civilian employment is perhaps comparable to that encountered in broader civilian settings during which patients receive medical review for their given occupation. Namely, there remains an ethical standard of open disclosure regarding third-party obligations as a component of patient consent during these medical consultations.[3] Overall, ADF medical officer liaison between a serving ADF member and the ADF organisation during a member's transition to civilian life can be considered a dual loyalty scenario.

Medical officer input during a member's transition to civilian employment is valuable, and I note the intent to achieve the best outcomes for both patients and commanders. This is an area of active research and review. The Royal Commission into Defence and Veteran Suicide established a correlation between medical transition from the ADF and increased suicidality. It offered recommendations regarding the procedural fairness of military employment classification review boards and the provision of service opportunities for non-deployable ADF members.[4] Occupational and environmental physicians have a role in supporting ADF members' transition to civilian employment. There are also broader shared responsibilities among ADF general practitioners, nurses, medics and allied health professionals. Regardless of whether a medical officer supporting an ADF member transitioning to civilian employment is an occupational and environmental physician, general practitioner or both, dual loyalty remains an extant consideration while they liaise between a transitioning member and the ADF organisation.

Once in a civilian setting, a general practitioner can provide ongoing care for transitioned ADF members and may include a Medicare rebated post-discharge health assessment.[5] A general practitioner may refer the transitioned member for additional specialist care, including ongoing consultation with an occupational and environmental physician.

The latter segment of the letter regarding Butler's 'Quo Vadimus?' considers a valuable historical resource for the practice of military medicine and considerations of dual loyalty during World War I. Butler specifically considers the triple mandate of the Australian Army Medical Service within the broader context of the conflict and notes that despite ruthlessness on both sides, 'the Geneva Convention was observed to an extent far greater than the propaganda of either side admitted'.[6] Presently, Australia's obligations to uphold ratified International Humanitarian Law remain an ongoing consideration for all ADF members, including medical officers.

Conflict of Interest

The author is a serving member of the Royal Australian Navy. The opinions expressed herein are those solely of the author and do not reflect those of the Australian Defence Force or the Department of Defence.

References

1. Vinson M. Dual loyalty and the Medical Profession for Australian Defence Force Medical Officers. Journal of Military and Veterans Health. 2022;30(4):26-30.
2. Benatar SR, Upshur RE. Dual loyalty of physicians in the military and in civilian life. Am J Public Health. 2008;98(12):2161-2167.
3. Royal Australasian College of Physicians. Ethical Guidelines for Occupational and Environmental Physicians. Sydney, NSW Royal Australasian College of Physicians; 2016.

4. Royal Commission into Defence and Veteran Suicide. Final Report Volume 2 – Serving the nation, and Defence culture and leadership. Canberra, ACT; 2024.
5. Reed RL, Masters S, Roeger LS. The Australian Defence Force Post-discharge GP Health Assessment. Aust Fam Physician. 2016;45(3):94-97.
6. Butler A. Official History of the Australian Army Medical Services, 1914–1918. Canberra: Australian War Memorial 1943.

DVA Support for Veterans Living with Chronic Pain

The Department of Veterans' Affairs (DVA) recognises that chronic (persistent) pain is a common health issue in the veteran community. DVA will fund pain treatment for all Veteran Gold Card holders, White Card holders with an accepted condition that is reasonably related to their chronic pain.

This includes funding veterans consultations with GP's, allied health, pain specialists and multidisciplinary pain management programs. Pain related medications are funded through the Repatriation Pharmaceutical Benefits Scheme (RPBS) and a range of pain alleviating devices and Aids are available through the Rehabilitation Aids Programme (RAP).

Individual or group care?

Pain Management Programs (PMP's) are structured programs delivered by accredited providers that aim to support people with chronic pain with more effective self-management. PMP's are not considered a preventative approach. Effective PMPs adopt a whole person model, and include the following elements:

- multidisciplinary teams, comprising of medical and allied health professionals
- education on chronic pain, its development and management
- pain coping strategies
- self-efficacy beliefs and self-management
- improved function and goal setting
- lifestyle changes that minimise pain
- managing associated mental health symptoms.
- improved general physical health and fitness

PMP's are considered best practice for the treatment of chronic pain and can take many forms. For some, a group program may be effective, with the added benefits of socialisation and learning from peers. Some people with chronic pain can find it difficult to participate in a group program due to co-morbidities, interpersonal skills or psychological barriers. Others may be disruptive to other participants. For these people, a suitable program can be delivered by appropriately trained individual practitioners in their care team, such as their GP, psychologist, physiotherapist and others. There are many online programs that also provide effective support.

Veterans may prefer group PMPs which include other veterans or first responders, which are available in some regions.

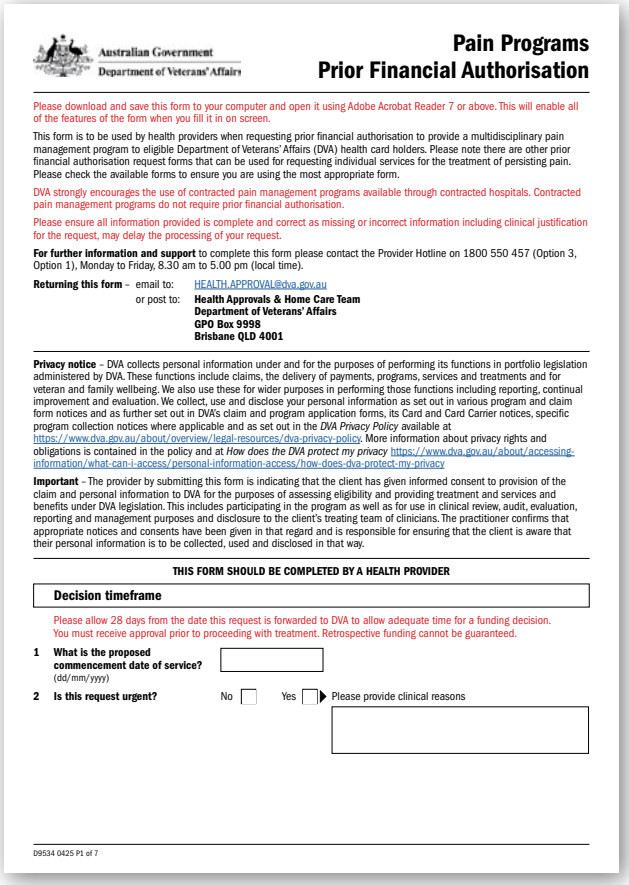
Veterans can access multidisciplinary PMP's in several ways:

- DVA contracted hospital-based programs – www.dva.gov.au/get-support/providers/programs/hospitals has a list of contracted hospitals – check those in your region who provide inpatient and outpatient program options. No prior approval through DVA is required. Occasionally, the hospitals will check eligibility of the veteran with DVA.
- Open Arms group pain management programs - see www.openarms.gov.au/get-support/treatment-programs-and-workshops
- Community based programs – referral and request for the program via prior approval – see below.
- Individualised multidisciplinary treatment delivered in an interdisciplinary way – refer to relevant allied health using the treatment cycle and relevant care plans.
- Free online or local pain programs – www.painaustralia.org.au/find-support/getting-the-right-care-1/painaustralia-pain-programs keeps a list of options in your state and online. Referral requirements vary (e.g. Some are self referral or clinical referral).

How is prior approval used to ask DVA to fund a community pain management program for a veteran?

If you refer a veteran with chronic pain to a community pain program, they will be assessed for suitability to be involved. The provider can seek prior approval using the pain program prior financial authorisation form. Forms can be found at www.dva.gov.au/pain-programs-prior-authorisation

Using the form allows DVA to determine eligibility, check the proposed multidisciplinary PMP meets best practice guidelines, and that the proposed program has considered the needs of the veteran in regard to approach and intensity.



Australian Government
Department of Veterans' Affairs

Pain Programs
Prior Financial Authorisation

Please download and save this form to your computer and open it using Adobe Acrobat Reader 7 or above. This will enable all of the features of the form when you fill it in on screen.

This form is to be used by health providers when requesting prior financial authorisation to provide a multidisciplinary pain management program to eligible Department of Veterans' Affairs (DVA) health card holders. Please note there are other prior financial authorisation request forms that can be used for requesting individual services for the treatment of persisting pain. Please check the available forms to ensure you are using the most appropriate form.

DVA strongly encourages the use of contracted pain management programs available through contracted hospitals. Contracted pain management programs do not require prior financial authorisation.

Please ensure all information provided is complete and correct as missing or incorrect information including clinical justification for the request, may delay the processing of your request.

For further information and support to complete this form please contact the Provider Hotline on 1800 550 457 (Option 3, Option 1), Monday to Friday, 8.30 am to 5.00 pm (local time).

Returning this form – email to: HEALTH.APPROVAL@dva.gov.au
or post to: **Health Approvals & Home Care Team**
Department of Veterans' Affairs
GPO Box 9998
Brisbane QLD 4001

Privacy notice – DVA collects personal information under and for the purposes of performing its functions in portfolio legislation administered by DVA. These functions include claims, the delivery of payments, programs, services and treatments and for veteran and family wellbeing. We also use these for wider purposes in performing those functions including reporting, continual improvement and evaluation. We collect, use and disclose your personal information as set out in various program and claim form notices and as further set out in DVA's claim and program application forms, its Card and Card Carrier notices, specific program collection notices where applicable and as set out in the *DVA Privacy Policy* available at https://www.dva.gov.au/about/overview/legal-resources/dva-privacy-policy. More information about privacy rights and obligations is contained in the policy and at *How does the DVA protect my privacy* https://www.dva.gov.au/about/accessing-information/what-can-i-access/personal-information-access/how-does-dva-protect-my-privacy

Important – The provider by submitting this form is indicating that the client has given informed consent to provision of the claim and personal information to DVA for the purposes of assessing eligibility and providing treatment and services and benefits under DVA legislation. This includes participating in the program as well as for use in clinical review, audit, evaluation, reporting and management purposes and disclosure to the client's treating team of clinicians. The practitioner confirms that appropriate notices and consents have been given in that regard and is responsible for ensuring that the client is aware that their personal information is to be collected, used and disclosed in that way.

THIS FORM SHOULD BE COMPLETED BY A HEALTH PROVIDER

Decision timeframe

Please allow 28 days from the date this request is forwarded to DVA to allow adequate time for a funding decision.
You must receive approval prior to proceeding with treatment. Retrospective funding cannot be guaranteed.

1 **What is the proposed commencement date of service?** (dd/mm/yyyy)

2 **Is this request urgent?** No ☐ Yes ☐ Please provide clinical reasons

D9534 0425 P1 of 7

What other DVA programs can support a veteran with Chronic pain?

Coordinated Veterans' Care

The Coordinated Veterans Care (CVC) program helps fund GP Practices to provide care coordination for veterans with a chronic health condition that is complex and at risk of unplanned hospitalisations. GPs, practice nurses, Aboriginal health workers or contracted community nurses can be used to undertake the care coordination.

Health providers can use the CVC Toolbox at www.dva.gov.au/coordinated-veterans-care to check if a veteran is eligible, download care plan templates and more.

Veteran Home Care

Veterans Home Care (VHC) arrangements can provide in-home care and household services for eligible veterans who are limited due to their pain.

The VHC offers domestic assistance, personal care, respite care (in-home, residential and/or emergency short-term relief) and home and garden maintenance.

Veterans can contact the VHC Assessment Agency on 1300 550 450 or visit: www.dva.gov.au/vhc for an assessment of services required.

Open Arms

Chronic pain and mental health conditions are closely linked for both the veteran and their families. Open Arms – Veteran and Families Counselling (Open Arms) provides free confidential support 24/7 to veterans and their families.

Providers can refer a patient to Open Arms by:

- Phone – call 1800 011 046 with the patients clinical and contact details.
- Self-referral – the patient can call Open Arms directly on 1800 011 046.
- Email – complete and email the form available on the Open Arms website.
- Fax – send a completed referral to 07 3550 9998.

For more information and resources visit: www.openarms.gov.au/health-professionals

How can I learn to better support veterans with chronic pain?

VETs HeLP

VETs HeLP is an e-learning platform for health professionals providing easy access to a range of free educational resources that support delivery of high-quality healthcare to veterans and their families, including on chronic pain.

The platform offers accredited CPD opportunities, including interactive webinars, online case scenarios, podcasts and more. Access at https://medcast.com.au/veterans-health

www.jmvh.org