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Posttraumatic stress disorder in serving Australian Defence Force members 2002–2023: a systematic evidence review

Dunya Tomic [a], Jennifer Wild [b,c,d], Zoë Jenkins [c], Helen Kelsall [a], Natasha Kinsman [a], Alex Collie [a], Shanthakumar Wilson Rajaratnam [e] and Karen Walker-Bone [a]

[a]Monash Centre for Occupational and Environmental Health, School of Public Health and Preventive Medicine, Monash University, Melbourne, Australia; [b]Department of Psychiatry, Phoenix Australia Centre for Posttraumatic Mental Health, University of Melbourne, Melbourne, Australia; [c]Directorate of Health Research, Joint Health Command, Department of Defence, Canberra, Australia; [d]Department of Experimental Psychology, University of Oxford, Oxford, UK; [e]School of Psychological Sciences, Monash University, Melbourne, Australia

ABSTRACT

Background: Defence forces globally face recruitment and retention challenges, with posttraumatic stress disorder (PTSD) often contributing to early discharge.

Objective: To systematically review the extent of research on PTSD among Australian Defence Force (ADF) members, focusing on epidemiology, comorbidities, screening tools, and treatment outcomes to establish the evidence base and inform longitudinal research over the life course.

Method: Following PRISMA-ScR guidelines, five databases were searched (2002–2023). Studies were included if they examined PTSD among current-serving ADF members. Screening and risk of bias assessments were conducted independently by two reviewers. Data were charted using a standardised form to extract study design, population, outcomes, and key findings.

Results: Forty-three studies met inclusion criteria (20 low risk, 17 moderate risk, 6 high risk of bias). Twenty studies reported prevalence, eight examined comorbidities, four evaluated screening tools, and three investigated treatments. PTSD prevalence from structured diagnostic interviews ranged 2-8%, aligning with international estimates. Research on comorbidity identified associations with problem gambling, musculoskeletal disorders, hypertension, and depression. Risk factors included deployment frequency and adverse childhood events. A brief depression screen showed utility for detecting PTSD. Treatment evidence for diagnosed PTSD comprised one randomised controlled trial demonstrating non-inferiority of massed prolonged exposure therapy, and an observational study which found that baseline anger was associated with treatment outcomes.

Conclusions: Research on PTSD among ADF members is extensive for prevalence but limited for treatments and longitudinal outcomes. The synthesised evidence reveals associations with physical health conditions and risk-taking behaviours that may compound over time, yet critical gaps include absence of incidence data and limited understanding of symptom trajectories across military careers and civilian transition. Future research should adopt two-phase epidemiological approaches with extended follow-up to establish incidence and PTSD symptom trajectories, prioritise treatment intervention studies, and investigate whether early intervention targeting risk factors prevents PTSD onset and persistence.

Trastorno de estrés postraumático en miembros en servicio de las Fuerzas de Defensa Australianas, 2002-2023: una revisión sistemática

Antecedentes: Las fuerzas de defensa a nivel mundial enfrentan desafíos en el reclutamiento y la retención de personal, y el trastorno de estrés postraumático (TEPT) suele contribuir a las bajas tempranas.

Objetivo: Realizar una revisión sistemática sobre el alcance de la investigación del TEPT entre los miembros de las Fuerzas de Defensa Australianas (ADF en su sigla en inglés), centrándose en la epidemiología, las comorbilidades, las herramientas de detección y los resultados del tratamiento para establecer la base de evidencia y fundamentar la investigación longitudinal a lo largo del ciclo vital.

Método: Siguiendo las directrices PRISMA-ScR, se realizaron búsquedas en cinco bases de datos (2002-2023). Se incluyeron los estudios que examinaron el TEPT entre los miembros en servicio activo de las ADF. Dos revisores realizaron de forma independiente la selección de estudios y la evaluación del riesgo de sesgo. Los datos se tabularon mediante un formulario estandarizado para extraer el diseño del estudio, la población, los resultados y los hallazgos clave.

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HIGHLIGHTS

- PTSD prevalence among current-serving ADF members ranges from 2-8% based on structured diagnostic interviews, aligning with international estimates.
- Critical research gaps exist, including absence of incidence data and limited understanding of PTSD symptom trajectories across military careers.
- Future priorities include two-phase epidemiological designs with longitudinal follow-up to establish incidence and trajectories of PTSD onset, progression and recovery; treatment intervention studies; and investigation of whether targeting risk factors prevents onset and persistence of PTSD.

CONTACT Karen Walker-Bone Karen.Walker-Bone@monash.edu Monash Centre for Occupational and Environmental Health, School of Public Health and Preventive Medicine, Monash University, 553 St Kilda Road, Melbourne, Australia

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Resultados: Cuarenta y tres estudios cumplieron los criterios de inclusión (20 de bajo riesgo, 17 de riesgo moderado y 6 de alto riesgo de sesgo). Veinte estudios informaron sobre la prevalencia, ocho examinaron las comorbilidades, cuatro evaluaron las herramientas de detección y tres investigaron los tratamientos. La prevalencia del TEPT, según entrevistas diagnósticas estructuradas, osciló entre el 2% y el 8%, en consonancia con las estimaciones internacionales. La investigación sobre comorbilidad identificó asociaciones con la ludopatía, trastornos musculoesqueléticos, hipertensión y depresión. Los factores de riesgo incluyeron la frecuencia de despliegue y las experiencias adversas en la infancia. Una prueba breve de detección de depresión demostró su utilidad para detectar el TEPT. La evidencia sobre el tratamiento del TEPT diagnosticado comprendió un ensayo controlado aleatorizado que demostró la no inferioridad de la terapia de exposición prolongada masiva y un estudio observacional que halló que la ira basal se asociaba con los resultados del tratamiento.
Conclusiones: La investigación sobre el TEPT entre los miembros de ADF es extensa en cuanto a la prevalencia, pero limitada en cuanto a tratamientos y resultados longitudinales. La evidencia sintetizada revela asociaciones con afecciones de salud física y conductas de riesgo que pueden agravarse con el tiempo; sin embargo, existen importantes lagunas, como la ausencia de datos de incidencia y la comprensión limitada de las trayectorias de los síntomas a lo largo de las carreras militares y la transición a la vida civil. Las investigaciones futuras deberían adoptar enfoques epidemiológicos en dos fases con un seguimiento prolongado para establecer la incidencia y la evolución de los síntomas del TEPT, priorizar los estudios de intervención terapéutica e investigar si la intervención temprana dirigida a los factores de riesgo previene la aparición y la persistencia del TEPT.

1. Introduction

Post-traumatic stress disorder (PTSD) is widely studied in military populations (Crocq & Crocq, 2000), particularly among veterans in the United States and United Kingdom, with less focus on serving members in jurisdictions such as Australia (Creamer et al., 2011). Understanding PTSD in military populations is crucial for improving identification, prevention, and management as military services worldwide focus on recruitment and retention. This systematic review aims to distil the research undertaken on PTSD in serving ADF members from 2002 to 2023 to establish the evidence base and inform longitudinal research over the life course.

2. Methods

This systematic evidence review builds on a comprehensive scoping review of published research involving Australian Defence Force (ADF) members from 2002 onwards, commissioned by the ADF. The review protocol was developed by the research team in accordance with PRISMA-ScR guidelines, refined through stakeholder consultation and prospectively registered with INPLASY (Ref: INPLASY202420076).

2.1. Search strategy

The search strategy was devised by an Information Scientist and subject matter experts (Supplementary data). The search was conducted on 24 April 2023, and was limited to studies published in English from 1 January 2002. Five electronic databases were searched: Web of Science, Medline, Embase, PsycInfo, and Cochrane Central Register of Controlled Trials. Additional exploration for relevant studies was undertaken by searching the bibliographies of retrieved studies.

2.2. Study selection

Retrieved papers were de-duplicated and imported into Covidence. For title and abstract screening, 5% of potentially eligible papers were initially screened by two reviewers together, with the remainder screened independently by both reviewers. Discrepancies (approximately 15%) were resolved through discussion. Full-text screening followed the same approach: an initial 5% were screened by three reviewers together, with the remainder screened independently by two reviewers. Discrepancies (approximately 15%) were resolved through discussion with the third reviewer.

The primary source of discrepancies at both stages related to determining whether military members were current-serving or had transitioned from service. For example, some studies examined participants where potentially traumatic exposures (e.g. deployment) occurred 10–15 years previously, with mental health data collected more recently from samples including both current-serving and transitioned members. From the 171 papers meeting eligibility criteria for the main catalogue, papers addressing at least one aspect of PTSD were identified independently by two reviewers with no discrepancies.

Eligibility criteria were developed using the PICO framework (Schardt et al., 2007). Inclusion criteria were: study population included current-serving ADF members at the time of exposure (e.g. deployment) or at the time of the study, and could include members who had transitioned out of service since

the start of the study (ex-serving); health outcomes related to PTSD; and published in English. No restrictions were placed on study design in order to capture the breadth of available evidence on PTSD among ADF members, with the exception of excluding non-empirical papers (e.g. opinion pieces, narrative reviews, commentaries). Accordingly, case series were eligible for inclusion where they met the above criteria. Additional exclusion criteria were families of serving members; non-Australian military members; and studies including non-Australian military members in which data about ADF members were not presented separately.

2.3. Risk of bias

A risk of bias assessment was conducted using Joanna Briggs Institute criteria (Joanna Briggs Institute, 2024) for each type of relevant study design to determine an overall rating of low, moderate or high risk of bias. The overall assessment relied on the assessment of critical domains (some studies with overall rating of high risk of bias may have only had one high risk rating in a critical domain, whilst others may have had multiple unclear ratings in several domains). Domains related to methodology, such as incomplete follow-up (degree of attrition), were considered critical. Risk of bias for each of the studies was independently assessed by two authors, with discrepancies in the overall risk of bias assessment resolved through discussion with a third reviewer.

2.4. Data extraction

A data extraction form was developed and data from five studies extracted independently by three authors who then convened and assessed consistency and applicability of the studies. Minor adjustments were made, leaving the final categories: study type; participant details; intervention/exposure; comparator; outcome; health domain; inclusion and exclusion criteria; and findings. For the included PTSD studies, data were extracted twice independently and entered into a Microsoft Excel spreadsheet. Two further independent authors checked all the extractions for the included studies (no major discrepancies identified). Where available, measures of precision such as 95% confidence intervals (CI) for estimates (e.g. odds ratios, risk ratios) were extracted and used to inform interpretation of the findings. This allowed consideration of imprecision in the reported associations. Studies utilising overlapping participant populations were identified and documented during data extraction. Given that this review employs narrative rather than quantitative synthesis, no studies were excluded on the basis of shared populations. Potential overrepresentation of findings from shared populations was considered in the synthesis of findings.

3. Results

Of 1980 studies screened, 43 studies were identified for inclusion (Figure 1) amongst which 41 included current-serving members (Table 1). There were 24 cohort studies; 12 cross-sectional studies; two randomised controlled trials (RCTs); two studies of the accuracy of diagnostic tests; and one case series. The largest study included 24,481 ADF members and the smallest included eight members. Of the included studies, 34 had participant cohorts that overlapped with at least one other study (Table 1), primarily drawn from large-scale ADF health surveys such as the Australian Gulf War Veterans' Health Study and Middle East Area of Operations (MEAO) Prospective Health Study. Seven studies represented unique cohorts with no identified overlap. Twenty-three of the 41 included studies of current-serving members incorporated a comparator or control group. These included: non-deployed ADF members (Bleier et al., 2011; Creamer et al., 2006; Ikin et al., 2004; 2017; Kelsall et al., 2004; 2006; 2009; 2014; McGuire et al., 2009a; McKenzie et al., 2004; 2015; Syed Sheriff et al., 2020; Wright et al., 2019; Zheng et al., 2016); ADF members without PTSD (Abouzeid et al., 2012); civilian comparators (Syed Sheriff et al., 2019; Wade et al., 2017); other ADF subgroups (Davy et al., 2015; Howard et al., 2021; Orme & Kehoe, 2011; Varker et al., 2022); and in RCTs, inclusive of one pilot RCT, a comparison intervention (Dell et al., 2023b; Metcalf et al. 2022). In two studies, the assessment of PTSD was amongst ex-serving members (Forbes et al., 2005; Forbes et al., 2016). These studies will be discussed separately.

3.1. Quality assessment

Amongst the included studies, six were rated at high risk of bias (Cash et al., 2018; Cowlishaw et al., 2020; Dell et al., 2023b; Rayner & Viney, 2010; Runge et al., 2020; Waller et al., 2012). Three of the high risk of bias studies reported significant loss to follow-up resulting in remaining samples not representative of the broader deployed military population (Cash et al., 2018; Rayner & Viney, 2010; Waller et al., 2012), one of which used a case series design with a very small, highly selected clinical sample (Cash et al., 2018). Similarly, the fourth study (Dell et al., 2023a) had significant loss to follow-up: 67% attrition at the first follow-up and 78% by the final follow-up, reducing the validity of the identified trajectory classes and their generalisability. The fifth study relied on retrospective self-reported outcome measures and failed to adjust for exposure to trauma

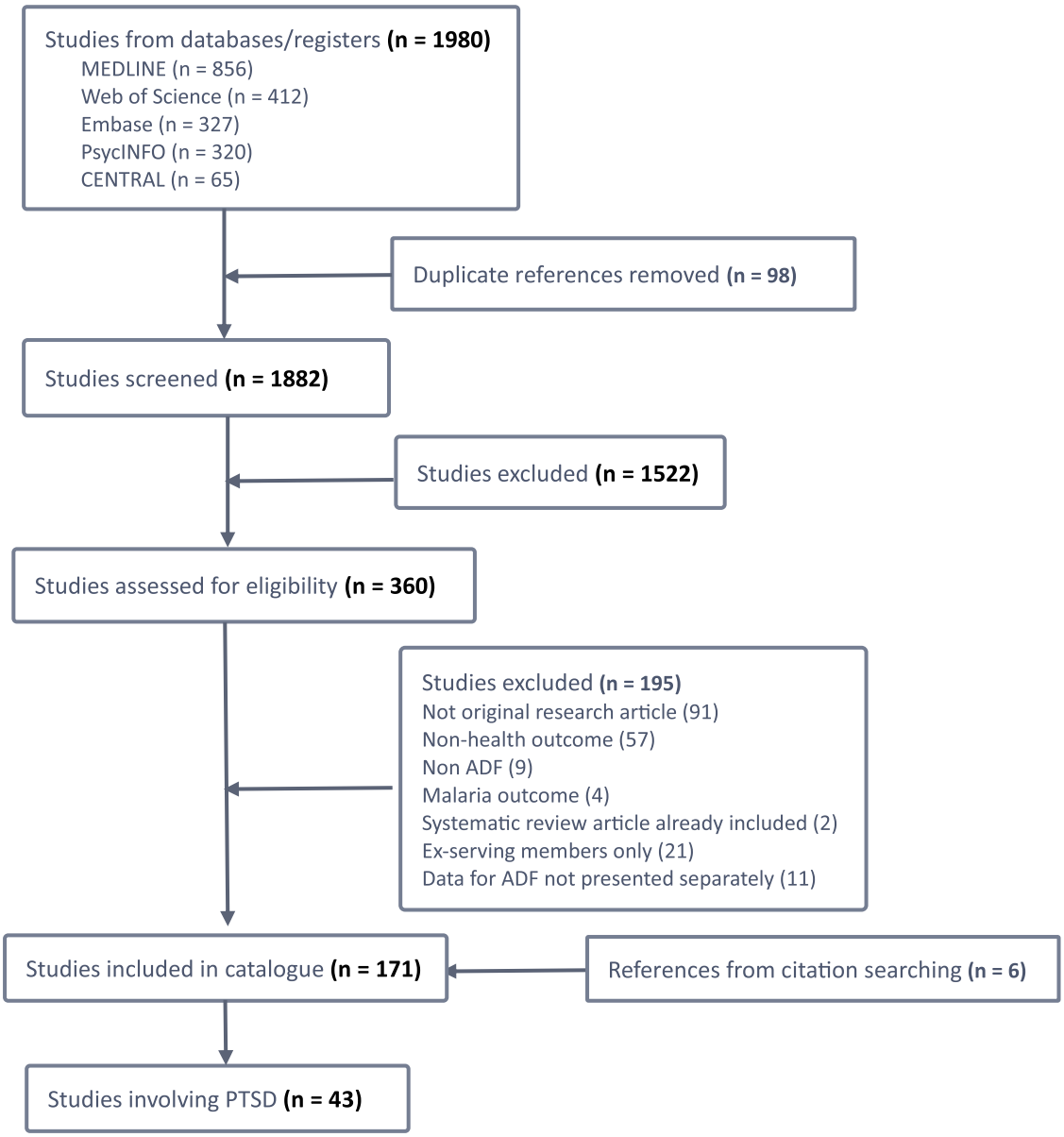

Figure 1. PRISMA flowchart of study selection.

(Runge et al., 2020). The sixth study used a screening rather than diagnostic threshold (PCL-C ≥ 30) to measure PTSD prevalence and did not address non-completion bias in prevalence analyses (Cowlishaw et al., 2020). Seventeen studies were assessed at moderate risk of bias (Cash et al., 2018; Creamer et al., 2006; Forbes et al., 2005; Graham et al., 2020; 2022; Howard et al., 2021; McGuire et al., 2009b; McKenzie et al., 2015; Metcalf et al., 2022; Orme & Kehoe, 2011; 2014; Searle et al., 2017; Steele et al., 2014; Steele & Fogarty, 2017; Syed Sheriff et al., 2020; Varker et al., 2022; Wade et al., 2017; Waller et al., 2016) and the remaining 20 at low risk of bias. Table 1 gives a description of the studies, the PTSD assessment measure, and risk of bias status. Supplementary Tables 1–6 in Supplementary File 2 give the reasons for risk of bias status for each study, with studies grouped by design (studies of PTSD prevalence were assessed using the specific JBI risk of bias tool for prevalence studies). Supplementary Tables 1–4 in Supplemental File 3 summarises key study characteristics and results.

3.2. Epidemiology and metrics

Twenty-one studies assessed PTSD among current serving ADF members (Supplementary Table 1 in Supplemental File 3). One study (Hooff et al., 2014) employed a two-phase design with stratified subsampling to estimate prevalence rates of mental health disorders across the entire ADF. However, since PTSD was grouped in a broader anxiety disorder category with only aggregate rates reported, this study is excluded from the present PTSD-specific analysis. Twenty studies reported PTSD prevalence, eight of which administered structured diagnostic interviews.

Table 1. Description of the 41 included studies reporting PTSD measures in current serving ADF members.

Author, year	Study type	Participants (*n*)	Cohort overlap	Serving status*	Sex	Members	Comparator or control group	Outcomes	PTSD diagnostic method	Risk of bias
Abouzeid et al. (2012)	Cohort	1456	Australian Gulf War Veterans' Health Study	Mixed	Male	ADF members with PTSD who served during the Gulf War	ADF members without PTSD	Prevalence of PTSD; association between hypertension and PTSD	CIDI	Low
Bleier et al. (2011)	Cohort	5911	Solomon Islands, Timor-Leste, Bougainville deployment studies	Mixed	Male, female	Serving and ex-serving ADF members deployed to Bougainville, Solomon Islands, Timor-Leste	Non-deployed ADF members, frequency matched	Distribution of PCL-C scores; association between deployment and PTSD	PCL-C $\geq$ 30	Low
Cash et al. (2018)	Quasi-experimental	8	N/A	Current serving	Male	Army members	N/A	Outcomes of CBT treatment on PTSD symptoms	PCL-5 (no cut-off analysed)	High
Cowlishaw et al. (2020)	Cross-sectional	1324	MEAO Prospective Health Study	Current serving	Male, female	ADF members deployed to MEAO	N/A	Prevalence of PTSD; association between gambling problems and PTSD	PCL-C $\geq$ 30	High
Cowlishaw et al. (2022)	Cohort	742	PTSD outpatient programme	Mixed	Male, female	ADF members and veterans who participated in PTSD outpatient programme	N/A	Outcomes of PTSD treatment in association with anger	PCL-5 (no cut-off analysed)	Low
Creamer et al. (2006)	Cohort	2215	Australian Gulf War Veterans' Health Study	Mixed	Male	Navy members who served during the Gulf War	Non-deployed Navy members, age-matched	Prevalence of PTSD; association between separation from military service and PTSD	CIDI	Moderate
Davy et al. (2015)	Cross-sectional	921	MEAO Prospective Health Study	Current serving	Female	ADF service females with dependent children who were deployed to Middle East	ADF service females without dependent children who were deployed to Middle East	Distribution of PCL-C scores; association between parenting status and PTSD	PCL-C (no cut-off analysed)	Low
Dell et al. (2023a)	Cohort	5329	N/A	Current serving	Male, female	ADF new full-time general entry enlistees and appointed Officers entering Navy, Army, or Air Force	N/A	Trajectory of PCL-4 scores; various associations of PCL-4 score trajectories	PCL-4 (no cut-off analysed)	High
Dell et al. (2023b)	RCT	138	N/A	Mixed	Male, female	Current or former ADF members with PTSD and Criterion A trauma receiving MPE	Current or former ADF members with PTSD and Criterion A trauma receiving SPE	Outcomes of MPE on PTSD symptoms	CAPS-5	Low
Graham et al. (2020)	Cohort	16,991	MEAO Prospective Health Study	Current serving	Male, female	ADF members	N/A	Prevalence of PTSD; value of physical symptom scale in PTSD screening	CIDI	Moderate
Graham et al. (2022)	Cohort	1871	MEAO Prospective Health Study	Current serving	Male, female	ADF members deployed to MEAO	N/A	Prevalence of PTSD; Longitudinal association between physical symptoms and PTSD	PCL-C $\geq$ 53	Moderate
Howard et al. (2021)	Cohort	480	PTSD outpatient programme	Mixed	Male, female	Current and ex-serving ADF members with PTSD	Current and ex-serving ADF members with CPTSD	Response to treatment of those with PTSD and CPTSD	ICD-11	Moderate
Ikin et al. (2004)	Cohort	1456	Australian Gulf War Veterans' Health Study	Mixed	Male	ADF members who served during the Gulf War	Non-deployed ADF members, frequency matched	Prevalence of PTSD	CIDI	Low
Ikin et al. (2017)	Cohort	1456	Australian Gulf War Veterans' Health Study	Mixed	Male	ADF members who served during the Gulf War	Non-deployed ADF members, frequency matched	Prevalence of PTSD	CIDI	Low
Kanesarajah et al. (2016)	Cross-sectional	11,411	MEAO Prospective Health Study	Current serving	Male, female	ADF members deployed to Iraq or Afghanistan	N/A	Prevalence of PTSD; association between unit cohesion and PTSD	PCL-C $\geq$ 50	Low
Kelsall et al. (2004)	Cohort	1456	Australian Gulf War Veterans' Health Study	Mixed	Male, female	ADF members who served during the Gulf War	Non-deployed ADF members, frequency matched	Prevalence of PTSD	Clinically diagnosed	Low
Kelsall et al. (2006)	Cross-sectional	1456	Australian Gulf War Veterans' Health Study	Mixed	Male	ADF members who served during the Gulf War	Non-deployed ADF members, frequency matched	Association between chronic fatigue and PTSD	CIDI	Low

(*Continued*)

Table 1. Continued.

Author, year	Study type	Participants (*n*)	Cohort overlap	Serving status*	Sex	Members	Comparator or control group	Outcomes	PTSD diagnostic method	Risk of bias
Kelsall et al. (2009)	Cohort	1871	Australian Gulf War Veterans' Health Study	Mixed	Male, female	ADF members who served during the Gulf War	Non-deployed ADF members, frequency matched	Association between multi-symptom illness and PTSD	CIDI	Low
Kelsall et al. (2014)	Cross-sectional	1381	Australian Gulf War Veterans' Health Study	Mixed	Male	ADF members who served during the Gulf War	Non-deployed ADF members, frequency matched	Association between musculoskeletal disorders and PTSD	CIDI	Low
McGuire et al. (2009b)	Cohort	500	Solomon Islands deployment studies	Mixed	Male, female	ADF members deployed to Solomon Islands	Non-deployed ADF members, frequency matched	Prevalence of PTSD	PCL-C ≥ 50	Moderate
McKenzie et al. (2004)	Cross-sectional	1424	Australian Gulf War Veterans' Health Study	Mixed	Male	ADF members who served during the Gulf War	Non-deployed ADF members matched by age, sex, and branch	Prevalence of PTSD	PCL-C ≥ 50	Low
McKenzie et al. (2006)	Cross-sectional	1232	Australian Gulf War Veterans' Health Study	Mixed	Male	Navy members who served during the Gulf War	N/A	Association between hazardous alcohol use and PTSD	CIDI	Low
McKenzie et al. (2010)	Cohort	1204	Australian Gulf War Veterans' Health Study	Mixed	Male	Navy members who served during the Gulf War	N/A	Prevalence of PTSD	CIDI	Low
McKenzie et al. (2015)	Cohort	1204	Australian Gulf War Veterans' Health Study	Mixed	Male	Navy members who served during the Gulf War	Non-deployed ADF members matched by age, service, and rank	Association between depression and PTSD	CIDI	Moderate
Metcalf et al. (2022)	RCT	59	N/A	Transition	Male, female	ADF members transitioning from the military receiving attention control training	ADF members transitioning from the military receiving placebo attention training	Outcomes of attention control training on PTSD symptoms	PCL-5 ≥ 33	Moderate
Orme and Kehoe (2011)	Cohort	182	Timor-Leste deployment studies	Current serving	Male	Army reservists deployed to Timor-Leste	Army regulars deployed to Timor-Leste	Distribution of PCL-C scores	PCL-C (no cut-off analysed)	Moderate
Orme and Kehoe (2014)	Cohort	448	Solomon Islands, Timor-Leste deployment studies	Current serving	Male	Army reservists deployed to Timor-Leste or Solomon Islands	N/A	Distribution of PCL-C scores	PCL-C (no cut-off analysed)	Moderate
Rayner and Viney (2010)	Cohort	94	N/A	Current serving	Male, female	Navy survivors of HMAS Westralia fire	N/A	Prevalence of PTSD	PCL-C ≥ 50	High
Runge et al. (2020)	Cross-sectional	1226	Timor-Leste deployment studies	Mixed	Male, female	ADF members deployed to Timor-Leste	N/A	Distribution of PTSD symptoms (categorised)	PCL-C (no cut-off analysed)	High
Searle et al. (2017)	Cohort	1122	MEAO Prospective Health Study	Current serving	Male, female	ADF members deployed to Afghanistan	N/A	Prevalence of PTSD; Association between antecedent trauma and PTSD	PCL-C ≥ 50	Moderate
Searle et al. (2019)	Diagnostic test accuracy	24,481	ADF Mental Health Prevalence and Wellbeing Study	Current serving	Male, female	Serving ADF members	N/A	Value of K10 and PHQ9 in PTSD screening	CIDI	Low
Steele et al. (2014)	Diagnostic test accuracy	421	Iraq 2007–08 Army cohort	Current serving	Male	Army members deployed to Iraq	N/A	Value of PCL-Short in PTSD screening	PCL-C ≥ 30	Moderate
Steele and Fogarty (2017)	Cohort	212	Iraq 2007–08 Army cohort	Current serving	Male	Army members deployed to Iraq	N/A	Value of anger and sleep difficulty scales in PTSD screening	PCL-C (no cut-off analysed)	Moderate
Syed Sheriff et al. (2019)	Cross-sectional	1356	ADF Mental Health Prevalence and Wellbeing Study	Current serving	Male	Male ADF members aged 18–60 years	Civilian men in same age range	Prevalence of PTSD; association between childhood mental health and PTSD	CIDI	Low
Syed Sheriff et al. (2020)	Cohort	1009	MEAO Prospective Health Study	Current serving	Male	ADF regular members deployed to Afghanistan	MEAO male regular ADF population not deployed to Afghanistan	Prevalence of PTSD; association between childhood trauma and PTSD	PCL-C ≥ 53	Moderate
Varker et al. (2022)	Cross-sectional	12,806	N/A	Mixed	Male, female	ADF military personnel	ADF veterans	Prevalence of PTSD; association between anger and PTSD	PCL-5 ≥ 33	Moderate
Wade et al. (2017)	Cross-sectional	447	N/A	Mixed	Male, female	Male ADF members	Male members of Australian general community	Prevalence of PTSD	CIDI	Moderate

Waller et al. (2012)	Cohort	3037	Timor-Leste, Bougainville deployment studies	Mixed	Male, female	ADF members deployed to Bougainville and Timor-Leste	N/A	Prevalence of PTSD; Association between various stressors and PTSD	PCL-C ≥ 50	High
Waller et al. (2016)	Cohort	1119	Solomon Islands, Timor-Leste, Bougainville deployment studies; MEAO Prospective Health Study	Mixed	Male, female	ADF members	N/A	Prevalence of PTSD; change in PTSD symptoms	PCL-C ≥ 50	Moderate
Wright (2019)	Cohort	1356	Australian Gulf War Veterans' Health Study	Mixed	Male	ADF members who served during the Gulf War	Non-deployed ADF members, frequency matched	Association between quality of life and PTSD	PCL-C (no cut-off analysed)	Low
Zheng (2016)	Cross-sectional	3954	Timor-Leste, Bougainville deployment studies	Mixed	Male, female	ADF members deployed to Bougainville and Timor-Leste	Non-deployed ADF members	Association between childhood adversity and PTSD	PCL-C ≥ 30	Low

*Mixed serving status was assigned to studies with veteran or military comparison groups in addition to current serving members. ADF = Australian Defence Force; CAPS-5 = Clinician-Administered PTSD Scale for DSM-5; CBT = cognitive behavioural therapy; CIDI = Composite International Diagnostic Interview, Version 3.0; CPTSD = complex post-traumatic stress disorder; ICD-11 = International Classification of Diseases, 11th revision; K10 = Kessler Psychological Distress Scale; MEAO = Middle East Area of Operations; MPE = massed prolonged exposure; NS = not specified; PCL-C = PTSD Checklist – Civilian Version; PCL-4 = Four-item PTSD Checklist; PCL-5 = PTSD Checklist for DSM-5; PHQ = Patient Health Questionnaire; PTSD = post-traumatic stress disorder; RCT = randomised controlled trial; SPE = standard prolonged exposure.

The remaining 12 studies administered self-report questionnaires to assess PTSD symptoms. In 10 studies, PTSD definition was based on the PTSD Checklist – Civilian Version (PCL-C), scores for which ranged from 17 to 85 (17 = no symptoms; 85 = severe symptoms). Probable PTSD was defined by a threshold score, but selected thresholds varied considerably (i.e. ≥ 30, ≥ 50, and ≥53) with thresholds relevant to screening often being applied to estimate prevalence rates in selected samples. Reported prevalence estimates for probable PTSD, based on the PCL-C, ranged from just under 2% (Searle et al., 2017) to 18% (Rayner & Viney, 2010). The highest prevalence estimate of 18% was reported in a study of 94 Navy survivors of the multiple fatality HMAS Westralia fire (Rayner & Viney, 2010) in which only half the sample ($n = 50$) completed the questionnaire, amongst whom $n = 9$ (18%) met criteria for probable PTSD. The next highest prevalence estimate of 11.3% (95% CI 9.6–13.1%) was derived from a study using the lowest PCL-C threshold of ≥30 to define probable PTSD (Cowlishaw et al., 2020). Nine studies used the Composite International Diagnostic Interview, Version 3.0 (CIDI) to define PTSD, with estimates ranging from 2.16 to 8% (Abouzeid et al., 2012; Creamer et al., 2006; Graham et al., 2020; Ikin et al., 2004; 2017; Kelsall et al., 2004; McKenzie et al., 2010; Syed Sheriff et al., 2019; Wade et al., 2017).

Six studies reported the distribution of PCL-C scores (Supplementary Table 1 in Supplemental File 3) (Bleier et al., 2011; Davy et al., 2015; Graham et al., 2022; Orme & Kehoe, 2011; 2014; Waller et al., 2016). Overall, most ADF members fell well below clinical cut off for PTSD. Mean PCL-C scores reported in four studies were low, ranging from 19.9 to 25.8, while two studies reported median PCL-C scores between 17 and 23, values well below the thresholds used to define PTSD caseness.

Two studies (Dell et al., 2023a; Runge et al., 2020), both rated high risk of bias, categorised ADF members by PTSD brief screening scores and trajectories (Supplementary Table 1 in Supplemental File 3). One prospective cohort study surveyed 5329 ADF members using the four-item PTSD Checklist (PCL-4) at four time-points during their early military career (Dell et al., 2023a). The analysis identified four distinct trajectories of PTSD symptoms: a majority 'resilient' trajectory (82.5%) followed by 'recovery' (9.6%), 'worsening' (5.8%), and 'chronic subthreshold' (2.3%). However, this study was assessed as high risk of bias due to substantial attrition that compromised the validity of the trajectories and their generalisability. The second study, also rated at high risk of bias due to outcomes measured retrospectively and failure to adjust for trauma exposure, included 1226 members, 8% were reported

as having severe symptoms of PTSD using the PCL-C, however, the threshold score used for this was not stated (Runge et al., 2020).

One study reported on PTSD and complex PTSD (CPTSD), with CPTSD defined as PTSD symptoms plus difficulties with affect regulation, sustaining relationships, and feeling self-diminished (Supplementary Table 1 in Supplemental File 3). This study found that among 480 current and ex-serving members participating in a treatment programme for military-related PTSD, 78.2% were classified with CPTSD and 21.8% with PTSD (moderate risk of bias) (Howard et al., 2021).

3.3. Co-morbidities and associations

A number of studies explored co-morbidities and correlates of PTSD symptoms (Supplementary Table 2 in Supplemental File 3). Reasonably strong associations were found for comorbid hypertension, musculoskeletal disorders (MSD), and problem gambling. In the Australian Gulf War Veterans' Health Study (1990–1991), the odds of 'probable' hypertension (based on physician review of self-reported diagnosis) were almost trebled (OR 2.90, 95%CI 1.19–7.09) in those with PTSD compared to those without (Abouzeid et al., 2012). In Gulf War veterans, the odds of having arthritis or rheumatism (OR 2.98, 95%CI 1.21–6.86), or joint problems (OR 1.97, 95%CI 1.05–3.70) was associated with CIDI-defined PTSD; whilst having any MSD, back or neck problems was associated with PTSD in randomly-sampled ADF comparison group members (Kelsall et al., 2014). A 2020 study found a 6-fold increase in the odds of problem gambling (OR 6.88, 95%CI 3.21–14.74) among those with PTSD symptoms in the past month compared to those without, although the wide confidence interval reflects imprecision in estimating the exact magnitude of this association (Cowlishaw et al., 2020).

Another five publications reported PTSD comorbidities amongst members deployed during the Gulf War (Supplementary Table 2 in Supplemental File 3). Among male Navy members, more than five-fold increased odds of PTSD were reported in those with comorbid depression compared with those without (OR 5.66, 95%CI 3.16–10.12) (McKenzie et al., 2015). In another study, PTSD was associated with poorer quality of life, ($\beta = -0.21$, $p < .001$) (Wright et al., 2019). In a third study, 353 (25.6% of the sample) Gulf War veterans with multi-symptom illness (defined as recent symptoms in three or more of four categories (psycho-physiological, cognitive, arthro-neuromuscular, fatigue)) had increased odds of PTSD (OR 9.77, 95% CI 5.39–18.59) (Kelsall et al., 2009). In the fourth study, harmful or hazardous alcohol use ($n =$ 309, 25.7% of the sample) was associated with risk of PTSD (OR 1.8, 95%CI 0.99–3.3) (McKenzie et al., 2006). Amongst 2215 male Navy members (Gulf War veterans and comparison group), an elevated annual relative risk (RR) of separation from service was associated with PTSD (RR 1.45, 95%CI 1.06–1.98) (Creamer et al., 2006). Finally, amongst a broader study population including 12,806 members, there was increased odds of problem anger in those with PTSD symptoms above screening cut-off (greater than or equal to 33) on the PTSD checklist for DSM-V (PCL-5) as compared to those without (OR 21.68, 95%CI 17.69–26.58) (Varker et al., 2022).

Among ADF members deployed on peace-keeping missions to Solomon Islands, Timor-Leste, or Bougainville, there was an association between increased deployment frequency and PTSD symptoms (Bleier et al., 2011) (Supplementary Table 2 in Supplemental File 3). Amongst ADF members deployed to MEAO, there was a bidirectional relationship between number of physical symptoms and PTSD symptoms (Graham et al., 2022). A cross-sectional analysis of 11,411 members deployed to Iraq or Afghanistan found that those reporting poorer unit cohesion had increased odds of PTSD symptoms (OR 2.54, 95%CI 1.88–3.42) compared to those reporting more cohesion (Kanesarajah et al., 2016).

Three studies explored the relationship between childhood experiences and PTSD (Supplementary Table 2 in Supplemental File 3). Amongst 1356 current-serving members, there were increased odds of PTSD symptoms in those who reported experiencing childhood anxiety (17.2%) (OR 3.94, 95%CI 2.36–6.58) and depression (3.9%) (OR 7.01, 95%CI 2.98–16.49) (Syed Sheriff et al., 2019). Self-reported childhood trauma (41.9%) was found to be associated with an increased risk of post-deployment probable psychological disorders (including PTSD, anxiety, depression and alcohol use disorders) (Syed Sheriff et al., 2020). Similar results were found in a study of 3564 members deployed to Timor-Leste or Bougainville in which self-reported childhood adversity (29.5%) was associated with increased PTSD symptoms post-deployment (OR 2.06, 95%CI 1.67–2.55) (Zheng et al., 2016).

Two studies investigated a range of social and cultural factors associated with PTSD symptoms (Supplementary Table 2 in Supplemental File 3). A cross-sectional study, rated at high risk of bias, suggested that cultural stressors (e.g. language barriers, working with military of different cultures) and work frustration were associated with PTSD, as defined by PCL-C scores ≥50 (Waller et al., 2012). A prospective cohort study of early-career members, rated at high risk of bias, found that family or friend social support (OR 0.83, 95%CI 0.73–0.94) and ADF peer social support (OR 0.78, 95%CI 0.67–0.91) were protective factors predicting 'resilient' as compared to 'worsening' PCL-4 score trajectories (Dell et al., 2023a).

Two studies reported the absence of hypothesised associations with PTSD (Supplementary Table 2 in Supplemental File 3). Among female service members deployed to MEAO, dependent children did not increase PTSD risk relative to those without children (Davy et al., 2015). Similarly, while prior trauma exposure was associated with post-deployment PTSD among 1122 ADF members deployed to Afghanistan, this relationship was attenuated to non-significance when controlling for pre-existing PTSD (Searle et al., 2017).

3.4. Screening and diagnostic tools

Screening and diagnosis of PTSD was explored in four studies (Supplementary Table 3 in Supplemental File 3), all rated as moderate risk of bias, except for Searle et al (Searle et al., 2019) which was rated as low risk of bias. Steele et al (Steele et al., 2014) evaluated the performance of a 4-item version of the 17-item PCL-C questionnaire (termed the PCL-Short) and found that it correlated more strongly with the full PCL-C (r = 0.87) than did the Primary Care – PTSD Screen (PC-PTSD) for screening PTSD symptoms. As the PCL-Short is derived directly from the full PCL-C, this strong correlation is expected and reflects shared variance rather than independent validation of the short form. Another study assessed the value of two physical symptom scales, constructed using items from a 67-item health symptom checklist, in screening for 30-day PTSD (Graham et al., 2020). Clinical interviews were used as the reference standard. While these physical symptom scales improved sensitivity when added to the PCL-C (AUC 0.90–0.92), they are not specific PTSD measures and should be interpreted as indicators of associated risk rather than substitutes for purpose-designed PTSD screening tools. It should also be noted that PTSD prevalence in this sample was very low (2.16%), which means the reported AUC may overestimate the classification performance of these scales.

Another study investigated the effectiveness of the Kessler Psychological Distress Scale (K10) and the 9-item Patient Health Questionnaire (PHQ9) for identifying probable psychological disorders including PTSD among 24,481 current-serving members (Supplementary Table 3 in Supplemental File 3) (Searle et al., 2019). The area under the receiver operating characteristic curve (AUROC) for detecting 30-day PTSD was 0.84 and 0.88 for the K10 and PHQ9 respectively. The PHQ depression cut-off of 6 was optimal for detecting PTSD, while the K10 performed optimally at a score of 17. These instruments were designed for broader psychological distress rather than PTSD specifically, so their predictive ability indicates associated symptomatology rather than fit-for-purpose PTSD screening. Another study found that a sleep difficulties scale added modest predictive value to PCL-C scores (Steele & Fogarty, 2017), but like the other non-PTSD-specific measures, its utility is complementary rather than sufficient for independent PTSD screening.

3.5. Treatment outcomes

One RCT has been carried out to investigate treatment for PTSD in ADF members (Supplementary Table 4 in Supplemental File 3). A non-inferiority RCT, rated at low risk of bias, evaluated the efficacy of a two-week massed prolonged exposure (MPE) programme compared with 10-week standard prolonged exposure (SPE) (Dell et al., 2023b). The single-blinded, multisite trial randomised 71 members with PTSD to SPE and 63 to MPE and used the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) to measure PTSD symptom severity. MPE remained non-inferior to SPE at 12-month follow-up (95% CI – 6.82 to +3.92) and more than 50% of both the MPE (53.2%) and SPE groups (54.1%) no longer fulfilled diagnostic criteria for PTSD at 12 months.

A pilot RCT, rated at moderate risk of bias, recruited 59 treatment-seeking ADF members with subclinical PTSD symptoms who were transitioning from the military (Supplementary Table 4 in Supplemental File 3). They were randomised to receive four weekly sessions of attention-control training or placebo attention training (Metcalf et al., 2022). Participants who received attention-control training reported being significantly less bothered by their PTSD symptoms.

Anger has been the focus of two treatment studies (Supplementary Table 4 in Supplementary File 3). One low-risk study of 742 ADF members receiving accredited PTSD outpatient treatment found that higher baseline anger levels were associated with poorer PTSD treatment outcomes (Cowlishaw et al., 2022). The treatment programmes combined individual therapy (including trauma-focused interventions) with group therapy (including psychoeducation) although the extent of anger-specific interventions varied across programmes. This study demonstrates an association between baseline anger and treatment outcomes but does not imply that anger directly causes changes in PTSD symptoms. Nonetheless, the findings suggest that assessing and addressing anger may be valuable within the context of PTSD treatment. In a case series of eight Army members with problematic anger (a study at high risk of bias), PTSD symptoms reduced significantly after 12 sessions of a cognitive behavioural anger intervention (Cash et al., 2018). Two participants (25% of the sample) who scored above the clinical threshold for probable PTSD at baseline scored below the clinical threshold post-intervention.

There were no identified studies that investigated medications for treatment of PTSD in ADF members.

3.6. Studies of ex-serving members

One study of ex-serving members included 1025 peacekeepers deployed between 1989 and 2002 (Forbes et al., 2016). The prevalence of 12-month CIDI-defined PTSD was 16.8%. PTSD was significantly associated with retired/sickness benefit employment status ($\chi^2 = 40.03$, $p < .001$), income level ($\chi^2 = 19.72$, $p < .01$), older age ($\chi^2 = 0.86$, $p < .05$) and being unpartnered ($\chi^2 = 7.37$, $p < .05$). In terms of trauma exposure and deployment, PTSD was significantly associated with older age at deployment ($\chi^2 = 7.50$, $p < .01$), multiple deployments ($\chi^2 = 5.23$, $p < .05$), greater number of deployment-related potentially traumatic events ($t = 9.35$, $p < .001$), experiencing fear/horror at the time of trauma ($\chi^2 = 93.69$, $p < .001$), and greater lifetime potentially traumatic event exposure ($\chi^2 = 58.13$, $p < .001$). The other study of ex-serving ADF members included 63 Vietnam veterans and 66 peacekeepers attending specialised PTSD treatment units (Forbes et al., 2005). Clinician-Administered PTSD Scale scores were significantly higher among peacekeepers (mean = 89.73, SD = 17.83) compared to Vietnam veterans (mean = 81.70, SD = 18.46) ($p < .03$) and both groups responded equally well to standard treatment.

4. Discussion

This systematic review synthesised evidence on PTSD among Australia Defence Force members between 2002–2023 to inform longitudinal research over the life course. The findings reveal a consistent evidence base that, when integrated across prevalence, screening, comorbidity, and treatment domains, highlights limitations that life-course approaches are needed to address.

4.1. Prevalence and methodological considerations

The observed 2-8% diagnostic PTSD prevalence based on structured clinical interview (Abouzeid et al., 2012; Creamer et al., 2006; Graham et al., 2020; Ikin et al., 2004; Ikin et al., 2017; Kelsall et al., 2004; McKenzie et al., 2010; Syed Sheriff et al., 2019; Wade et al., 2017) aligns with international military populations, including UK cohort studies (Stevelink et al., 2018), establishing consistent cross-national consistency. However, the estimates for probable PTSD are limited by methodological concerns. Most studies relied on symptom questionnaires without assessing clinical impairment or identifying index traumatic events, while higher prevalence estimates (Cowlishaw et al., 2020; Rayner & Viney, 2010) employed lenient PCL-C thresholds that likely overestimated rates of disorder, consistent with the tendency for screening tools to prioritise sensitivity over specificity. More critically, no included studies provided incidence or mortality data, reflecting inadequate epidemiological approaches and limited follow-up periods that prevent understanding of PTSD trajectories across military careers and transition.

The prevalence studies focused predominantly on specific deployments rather than representative ADF samples, further limiting generalisability. The cross-sectional nature of most research prevented examination of temporal relationships, exemplified by the finding of bidirectional associations between PTSD and physical symptoms over four years (Graham et al., 2022), a relationship that extends US Army research (McAndrew et al., 2019) but cannot establish causality or identify critical windows for intervention. These methodological constraints necessitate future research employing two-phase epidemiological designs that combine population-level screening with diagnostic interviews in stratified subsamples to establish accurate prevalence of PTSD at baseline, followed by extended longitudinal follow-up to capture incidence of new PTSD cases, timing of symptom onset (including delayed presentations), and long-term trajectories.

4.2. Performance of screening instruments

Four studies examined screening instruments (Graham et al., 2020; Searle et al., 2019; Steele et al., 2014; Steele & Fogarty, 2017) yet none demonstrated performance superior to the original measures or structured interviews, and only one achieved low risk of bias (Searle et al., 2019). The PCL-Short demonstrated high classification agreement with the full PCL-C for identifying high-risk individuals in a study at moderate risk of bias (Steele et al., 2014), indicating potential utility in military environments, although replication in studies with lower risk of bias is needed before implementation. Physical symptom scales captured PTSD cases missed by the PCL-C (Graham et al., 2020), suggesting that somatic presentations may represent an under-recognised pathway to identifying PTSD in military populations. However, this finding warrants replication given the moderate risk of bias.

The high-quality validation study (Searle et al., 2019) found that the PHQ-9 depression measure (cut-off ≥ 6) and K10 distress scale (cut-off ≥ 17) achieved AUROCs of 0.88 and 0.84 respectively for detecting PTSD. While these findings demonstrate that general distress measures can identify probable PTSD through symptom overlap, they underscore a conceptual limitation: such instruments detect comorbid psychological distress rather than PTSD-specific symptomatology. This distinction matters for life-course research since the tools cannot differentiate whether distress precedes, accompanies or follows

the onset of PTSD, information essential for understanding causal pathways and understanding points for intervention across the life course. Life-course research therefore requires PTSD-specific assessment tools assessed repeatedly over time to establish when PTSD symptoms emerge, how they evolve, and their temporal relationships with other mental health conditions.

4.3. Comorbidity patterns: physical health and hyperarousal-related behaviours

When synthesised across studies, the evidence related to comorbidity reveals associations spanning physical health conditions and hyperarousal-related behaviours, with implications for understanding how PTSD may initiate cascading health risks over time. PTSD was associated with musculoskeletal disorders (Kelsall et al., 2014) and hypertension (Abouzeid et al., 2012) in low risk of bias studies. Problem gambling, associated with PTSD in one study using a lenient PCL-C threshold (Cowlishaw et al., 2020) aligns with US veteran research showing gambling problems in up to 24% of healthcare-engaged veterans (Hierholzer R & Mallios, 2010), with elevated rates among those with PTSD (Lusk et al., 2017).

These findings converge with evidence that military personnel exhibit increased post-deployment risk-taking behaviours compared to civilians (Killgore et al., 2008; Thomsen et al., 2011), suggesting that hyperarousal symptoms may simultaneously drive physiological changes (hypertension) and high-risk behaviours (gambling, risk-taking) that increase subsequent trauma exposure, creating a self-perpetuating cycle. From a life-course perspective, this suggests PTSD may set in motion accumulating health risks that extend from military service into civilian life. The bidirectional relationship between PTSD and physical symptoms observed over four years (Graham et al., 2022) supports this conceptualisation, indicating that PTSD and physical health problems likely influence each other over time.

Risk factors, such as deployment frequency (Bleier et al., 2011) and adverse childhood events (Syed Sheriff et al., 2019; Zheng et al., 2016), further support this cascade. Although pre-service adversity precedes service-related stressors such as repeated deployment, current evidence cannot clarify whether, how, or at what points across the life course these temporally separated risk factors converge to influence the development and persistence of PTSD. The absence of association between parenthood and risk for PTSD among female service members (Davy et al., 2015) requires investigation given the increasing participation of women in the military and the potential for parenthood to interact differently with military stressors across career stages.

4.4. Treatment evidence and symptom-specific considerations

Treatment evidence, while limited, reveals clinically important patterns. The strongest evidence regarding treatment efficacy emerged from an RCT of massed prolonged exposure (MPE) at low risk of bias (Dell et al., 2023b). This two-week intensive format addresses a practical constraint of standard prolonged exposure, namely that it is delivered over 8–15 weekly sessions and as such, may limit acceptability among military personnel. A study at low risk of bias found that anger was associated with treatment response (Cowlishaw et al., 2022), although this finding cannot establish whether anger causally influenced treatment outcomes. These preliminary results suggest that anger symptoms warrant consideration in PTSD treatment protocols, pending replication in controlled trials.

4.5. Implications for life-Course research

When integrated across domains, these findings reveal that PTSD in ADF populations is associated with diverse comorbidities spanning cardiovascular, musculoskeletal, and behavioural domains, with evidence suggesting hyperarousal-related behaviours (risk-taking, gambling) may represent one pathway through which cascading health risks develop over time. However, the evidence base is constrained by cross-sectional designs and deployment-specific samples that cannot address how PTSD emerges, persists, or resolves across military careers and civilian transition. The absence of incidence data, limited understanding of symptom trajectories, and lack of investigation into how military stressors interact with different life stages (deployment, promotion, parenthood, retirement) represent critical gaps.

Life-course research must establish accurate baseline prevalence of PTSD through two-phase designs, followed by extended follow-up capturing delayed-onset presentations and long-term outcomes. The patterns of comorbidity suggest PTSD initiates cascading health risks that compound over time, requiring longitudinal examination of how physical and mental health outcomes interact across military service and civilian reintegration. Critically, whether targeting established risk factors (adverse childhood events, deployment frequency) can minimise PTSD symptom severity, chronicity, and effects on career retention represents a priority that current evidence cannot address.

4.6. Limitations

Several limitations warrant consideration. Most studies using structured diagnostic interview focused on specific deployments, limiting generalisability.

Cross-sectional designs prevented exploration of causality, while examining PTSD diagnostic criteria (anger, sleep disturbance, reckless behaviour) as separate comorbidities limits conclusions about independent associations. Attrition and small sample sizes in some studies constrained interpretation. The restriction of the review to current-serving members and studies from 2002 onwards, potentially excludes valuable historical data from earlier deployments. Despite these limitations, this review employed rigorous methodology following best-practice guidelines, providing a comprehensive contemporary picture of PTSD research among Australian Defence Force members.

5. Conclusions

Research on PTSD among ADF members is extensive for prevalence studies but limited for treatment interventions and longitudinal outcomes. The synthesised evidence reveals associations with physical health conditions (cardiovascular, musculoskeletal) and behavioural comorbidities (including risk-taking behaviours) that may interact and compound over time. Critical gaps include the absence of incidence data and limited understanding of symptom trajectories across military careers and transition to civilian life. Future research should adopt two-phase epidemiological approaches with weighted prevalence estimates (Dunn et al., 1999; Scott et al., 2023) and extended longitudinal follow-up to establish incidence data and trajectories of PTSD onset and persistence. Research priorities should include treatment intervention studies to establish effectiveness across military populations, and investigation of whether early intervention targeting identified risk factors prevents PTSD onset and persistence. Such research is essential for supporting military personnel across their life course and successful transition to civilian life.

Author contributions

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ORCID

Dunya Tomic http://orcid.org/0000-0003-2471-2523
Jennifer Wild http://orcid.org/0000-0001-5463-1711
Zoë Jenkins http://orcid.org/0000-0002-8551-0792
Helen Kelsall http://orcid.org/0000-0003-0664-3376
Natasha Kinsman http://orcid.org/0000-0002-0847-605X
Alex Collie http://orcid.org/0000-0003-2617-9339
Shanthakumar Wilson Rajaratnam http://orcid.org/0000-0001-7527-8558
Karen Walker-Bone http://orcid.org/0000-0002-5992-1459

Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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