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Treatment of military-related posttraumatic stress disorder: Challenges, innovations, and the way forward

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Treatment of military-related posttraumatic stress disorder: Challenges, innovations, and the way forward

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11 impact on improving mental health outcomes for past and present military personnel
12 and their families.
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Abstract

Posttraumatic stress disorder (PTSD) is one of the common mental disorders in military and veteran populations. Considerable research and clinical opinion has been focused on understanding the relationship between PTSD and military service and the implications for prevention, treatment, and management. This paper examines factors associated with the development of PTSD in this population, considers issues relating to engagement in treatment, and discusses the empirical support for best practice evidence-based treatment. The paper goes on to explore the challenges in those areas, with particular reference to treatment engagement and barriers to care, as well as treatment non-response. The final section addresses innovative solutions to these challenges through improvements in agreed terminology and definitions, strategies to increase engagement, early identification approaches, understanding predictors of treatment outcome, and innovations in treatment. Treatment innovations include enhancing existing treatments, emerging non trauma-focused interventions, novel pharmacotherapy, personalised medicine approaches, advancing functional outcomes, family intervention and support, and attention to physical health.

Posttraumatic stress disorder in veteran and military populations

Posttraumatic stress disorder (PTSD) is one of the common mental disorders in military and veteran populations (Magruder & Yeager, 2009; Williamson, Stevelink, Greenberg, & Greenberg, 2018; Wisco et al., 2014). (The term “veteran” has several meanings in different contexts. Sometimes, for example, it refers to anyone who has left the military, regardless of their combat experiences and deployment history, while at other times it refers to anyone who has completed an operational deployment, regardless of whether he/she is still serving. We recognise that this causes confusion in the research literature and have tried, where relevant, to differentiate the two). While the disorder can present in mild forms, PTSD can often become a chronic disorder resulting in substantial functional impairment and reduced quality of life (Australian Centre for Posttraumatic Mental Health, 2013; Bruffaerts et al., 2012; Schnurr, Lunney, Bovin, & Marx, 2009). The Diagnostic and Statistical Manual of Mental Disorder 5th Edition (DSM-5) describes PTSD as having four symptom clusters: (1) re-experiencing the traumatic event, including recurring intrusive memories, flashbacks, or dreams of the trauma; (2) intentional avoidance of traumatic memory triggers; (3) changes in mood and/or thoughts, such as feelings of anxiety, sadness, shame or anger, negative thoughts about the self or others, or emotional numbing; and (4) hyperarousal in the form of irritability, hypervigilance, and trouble with concentration and sleep (American Psychiatric Association, 2013). The ICD-11 PTSD criteria are somewhat simpler and focus on the three symptom clusters of re-experiencing, active avoidance, and hyperarousal (Maercker et al., 2013). The DSM-5 also introduced a dissociative subtype characterised by high levels of either depersonalisation or derealisation.

PTSD is not unique to military and veteran populations. Veteran populations, however, are characterised by several factors that may influence the development and

1
2
3 nature of the disorder. In addition to the risk of exposure to the trauma of war, for
4
5 example, adverse childhood experiences prior to joining the military (a risk factor for
6
7 the development of later mental health problems) are reported at increased rates among
8
9 those who have served in the military (Blosnich, Dichter, Cerulli, Batten, & Bossarte,
10
11 2014). Transition to and from military life creates many adjustment challenges,
12
13 potentially disrupting identity and increasing risk for development of mental health
14
15 problems. Military populations report higher rates of musculoskeletal conditions and
16
17 chronic pain than civilian controls, and chronic physical disorders have been shown to
18
19 precede depression and anxiety in many cases (Andersen, Wade, Possemato, &
20
21 Ouimette, 2010; Thompson et al., 2016). This combination of mental and physical
22
23 health conditions has a synergistic effect on functional impairment (especially in
24
25 military roles) which, in turn, may significantly contribute to worsening of mental
26
27 health problems in veterans (Thompson et al., 2015).
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33 Taken together, those factors represent a unique risk profile for the development
34
35 of mental health problems among military and veteran populations. Once problems
36
37 develop, cultural factors may affect the person's willingness to acknowledge mental
38
39 health issues, as well as how those problems are expressed (Sharp et al., 2015),
40
41 highlighting the need for specialised understanding among practitioners about military
42
43 service and the need to build trust with veterans in clinical settings. Those factors, of
44
45 course, may also adversely affect engagement in, and response to, treatment. Without
46
47 effective engagement, individuals with PTSD (whether military or civilian) are at risk of
48
49 a chronic course and long duration of illness with significant negative consequences for
50
51 themselves and their families. Regrettably, a detailed discussion of the impact on
52
53 families is beyond the scope of this paper. Suffice to say at this point, however, that it is
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2
3 of the utmost importance to actively support families – both in their own right and as
4
5 part of PTSD recovery for the service member (Fear et al., 2018).
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9 **Trauma exposure and prevalence of PTSD in military and veteran** 10 **populations**

11
12 Military-related PTSD can be the result of a diverse range of operational
13
14 experiences including combat, peacekeeping and humanitarian deployments, as well as
15
16 non-deployment trauma. Traumatic exposures may include direct threat to the self or
17
18 others, or witnessing significant human suffering and being prevented through rules of
19
20 engagement from intervening to protect non-combatants. Many of these scenarios are
21
22 characterised by moral ambiguity and complexity. There is increasing recognition of
23
24 moral injury – the psychological, social and spiritual impacts of exposure to traumatic
25
26 events that transgress deeply held moral beliefs (Litz et al., 2009) or involve betrayal of
27
28 “what’s right” (Shay, 2014). These exposures can occur repeatedly against a
29
30 background of long periods spent in demanding operational contexts, high levels of
31
32 threat, and hostile physical environments.
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39 Military personnel operating in a combat role have an increased likelihood of
40
41 developing PTSD (Prigerson, Maciejewski, & Rosenheck, 2001). However, not all
42
43 military trauma is deployment related. Non-deployment stressors are part of everyday
44
45 military life, including realistic training exercises conducted under extreme conditions,
46
47 often with dangerous machinery and live ammunition, in order to prepare them for their
48
49 roles in operational environments. Military sexual trauma (MST), which affects both
50
51 men and women (although proportionately more women), is associated with increased
52
53 risk of PTSD as well as other comorbidities (Kimerling et al., 2010; Wilson, 2018).
54
55 Inevitably, as a military career progresses, there is increased likelihood of experiencing
56
57 multiple potentially traumatic events, putting individuals at greater risk of the effects of
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1
2
3 cumulative trauma exposures. A more sophisticated understanding of trauma exposures
4
5 in military experiences beyond the warzone has been influential in informing treatment
6
7 approaches to military-related PTSD.
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10 Estimates of PTSD prevalence in veteran populations vary widely depending,
11
12 for example, on the era, the percentage of those who deployed, and the specific nature
13
14 of the deployment. For the veteran population as a whole (i.e., across cohorts and
15
16 including both deployed and non-deployed), the best estimates are usually around 8%
17
18 lifetime and 5% current PTSD (Wisco et al., 2014). These prevalence rates are
19
20 comparable to, or slightly higher than, those for civilian populations (Chapman et al.,
21
22 2012; Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012; Woodhead et al.,
23
24 2011). Specific deployments, however, can be associated with substantially higher rates,
25
26 with estimates of lifetime PTSD prevalence varying up to 35% (O'Toole, Catts, Outram,
27
28 Pierse, & Cockburn, 2009; Xue et al., 2015). Experiences on deployment, such as
29
30 increased combat exposure, fear of being killed or seriously injured, discharging a
31
32 weapon, and witnessing someone being wounded or killed, substantially increase the
33
34 risk for PTSD (Xue et al., 2015). PTSD prevalence in military and veteran populations
35
36 also varies across nations, a function of factors such as trauma-related exposure,
37
38 deployment length, and rank (Kok, Herrell, Thomas, & Hoge, 2012; Sundin et al.,
39
40 2014), as well as methodological variations in sampling strategy and psychometrics
41
42 (Creamer & Forbes, 2004; Rischardson, Frueh, & Acierno, 2010; Sundin, Fear, Iversen,
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44 Rona, & Wessely, 2010). (We have avoided providing comparisons across nations due
45
46 to interpretational challenges).
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54 Somewhat counterintuitively, PTSD prevalence is usually higher in ex-service
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56 populations than in currently serving cohorts (Stevellink et al., 2018; Van Hooff et al.,
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58 2018): since veterans are no longer exposed to military stressors, and should benefit
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3 from the effects of a natural recovery process, one might expect PTSD rates to be lower
4
5 in veterans. The explanation may lie in the additional stress faced by veterans as they
6
7 swap the structure and security of the military for civilian life (e.g., finding jobs and
8
9 accommodation, budgeting, and forming civilian relationships), which may provide
10
11 time and space for past experiences (including traumatic events) to dominate
12
13 consciousness. It may also be that personnel who develop substantial PTSD
14
15 symptomology in service are more likely to leave resulting in higher rates of PTSD in
16
17 the ex-service population. Research has also explored PTSD prevalence in specific
18
19 military and veteran sub-populations, including peacekeepers (Souza et al., 2011) and
20
21 military personnel (particularly women) who have experienced MST (Kimerling et al.,
22
23 2010), with results showing significant levels of PTSD even in the absence of combat
24
25 exposure.
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30
31 Notwithstanding the heterogeneity in PTSD prevalence research, there is
32
33 sufficient consistency to conclude that, in the majority of Western countries: a) PTSD
34
35 remains one of the common mental disorders in both military and veteran populations;
36
37 b) PTSD rates increase in proportion to potentially traumatic event exposure (including
38
39 combat); and c) prevalence is higher among discharged veterans than among active duty
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41 military.
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46 **Questions of Causality: Risk indicators and risk factors for military-related** 47 **PTSD** 48

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50 Risk factors are antecedents that contribute causally to the condition of interest,
51
52 in this case PTSD, while risk indicators are characteristics of subgroups in whom the
53
54 condition of interest is more common but where evidence of causality remains uncertain
55
56 (American Psychiatric Association, 2013). PTSD appears to arise in individuals owing
57
58 the interaction of multiple causal risk factors. While numerous risk indicators have been
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1
2
3 identified, PTSD causality is not yet fully explained. Exposure to a traumatic event is
4
5 required as part of the diagnostic criteria for PTSD. Yet, while PTSD is a common
6
7 cause of morbidity in military and veteran populations, the majority of those exposed to
8
9 potentially traumatic events do not develop PTSD. Thus, exposure to a traumatic event
10
11 is a necessary but not sufficient risk factor in understanding individual risk for
12
13 developing PTSD. The onset of PTSD is influenced by a complex interaction of
14
15 biological, cognitive, and psychosocial factors across various time points. Research
16
17 suggests that, as with civilians, a whole life approach to understanding risk for PTSD is
18
19 required, since risk indicators have been identified in pre-trauma, peri-trauma, and post-
20
21 trauma time periods (Brewin, Andrews, & Valentine, 2000). The person's stage of life
22
23 and developmental tasks at the time of trauma exposures and recovery feed into this
24
25 complex mix. In addition, the risk factors for the development of PTSD are not
26
27 necessarily the same as the risk factors for chronicity (Schnurr, Lunney, & Sengupta,
28
29 2004).

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35 Commonly cited pre-trauma risk indicators in military and veteran populations
36
37 include age, gender, race, education, and military status (M. Jones et al., 2013; Xue et
38
39 al., 2015). Research has consistently shown that childhood trauma is a significant risk
40
41 factor for later development of PTSD and, as noted above, military and veteran
42
43 populations are more likely to report adverse childhood experiences. Sleep problems are
44
45 also associated with, or potentially an early marker for, development of PTSD both at
46
47 pre- and post-deployment (Gehrman et al., 2013; Wang et al., 2018).

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51 Aspects of military service independent of deployment may influence the risk of
52
53 developing PTSD, with factors such as service branch, rank, quality of leadership,
54
55 social support, and unit cohesion proving relevant (Anderson et al.; N. Jones et al.,
56
57 2012; Wright, Kelsall, Sim, Clarke, & Creamer, 2013). Similarly, historical overviews
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1
2
3 addressing the issue of combat motivation and breakdown suggest that broader
4
5 consideration should be given to the influence of the group and the key social
6
7 connections between serving personnel as an important moderator of vulnerability
8
9 within the military and following discharge (Janowitz & Shils, 1948; Wessely, 2006).
10
11 Wessely argues that risk of psychological injury increases when the primary
12
13 relationships of small fighting units are poor or fractured, or the unit is rendered
14
15 ineffective, and individuals become isolated and lose their sense of connection to a
16
17 powerful group. This possibility is supported by social network analyses in civilian
18
19 contexts that fractured social networks following trauma increases risk for PTSD
20
21 (Bryant et al., 2016). Indeed, given that unit cohesion and leadership are integral to
22
23 occupational health in the military (Adler & Castro, 2013), they provide a potential
24
25 avenue for reducing the risk of PTSD and enhancing adjustment following exposure to
26
27 potentially traumatic events.
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33 Trauma related risk factors in military and veteran populations include the extent
34
35 of exposures, length of deployments, time between deployments, and (in most cases)
36
37 number of deployments (Bliese, Thomas, McGurk, McBride, & Castro, 2011; Rona et
38
39 al., 2014), mirroring civilian research indicating the cumulative risk effects of repeated
40
41 trauma exposure. Post-trauma risk factors include concurrent and subsequent life
42
43 stressors and post-deployment support, both within and outside the military
44
45 environment. This is particularly critical during the adaptation period during transition
46
47 to civilian life.
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51 PTSD is often associated with other health problems. Comorbidity of psychiatric
52
53 disorders is common, particularly depression, anxiety disorders, and substance use
54
55 disorders, with co-morbidity more the rule than the exception (Head et al., 2016; Smith,
56
57 Goldstein, & Grant, 2016). Chronic physical health conditions, medically unexplained
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1
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3 somatic symptoms and chronic pain also are recognized PTSD risk indicators (NICE,
4 2018). However, the nature and direction of causal relationships between PTSD and
5
6 physical health status remain largely unexplored (Gautam, Jain, Gautam, Vahia, &
7
8 Grover, 2017; McFarlane, Lawrence-Wood, Van Hooff, Malhi, & Yehuda, 2017).
9
10 Suicidal ideation and attempts, although not exclusively related to PTSD, have also
11
12 been the focus of considerable attention in recent years (Naifeh, Mash, et al., 2018;
13
14 Naifeh, Ursano, et al., 2018). Significant functional impairment is common in the form
15
16 of problematic relationships, reduced social networks, and poorer employment
17
18 outcomes (Rona et al., 2009; Schnurr et al., 2009).
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25 **The current status of PTSD treatments**

26
27 Earlier international PTSD treatment guidelines consistently found trauma-
28
29 focused cognitive behavioural therapies, such as Cognitive Processing Therapy (CPT),
30
31 Prolonged Exposure (PE) and Eye-Movement Desensitization and Reprocessing
32
33 (EMDR) to be the gold standard for treatment (Australian Centre for Posttraumatic
34
35 Mental Health, 2013). More recent guidelines expand the number of treatments with
36
37 high levels of evidence. For example, the guideline jointly developed by the Department
38
39 of Veterans Affairs and the Department of Defense (2017) in the US gave the strongest
40
41 recommendation to trauma-focused psychotherapies such as PE, CPT, and EMDR, but
42
43 also included a range of additional therapies in this recommendation (e.g., written
44
45 narrative exposure, Brief Eclectic Therapy). The recent update of the UK National
46
47 Institute for Clinical Excellence (NICE) PTSD Guideline differs slightly in endorsing
48
49 PE and CPT with the strongest recommendations but giving a slightly lower rating to
50
51 EMDR specifically in relation to military veterans who have been traumatised as a
52
53 result of combat, in view of the more limited evidence base for EMDR in this
54
55 population (NICE, 2018). Taken together, the consistent findings across several
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1
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3 guidelines from different countries recommend that trauma focussed psychological
4
5 interventions should be the first line treatment for PTSD.
6

7
8 PTSD guidelines and meta-analyses (e.g., N. Jones, Burdett, Green, &
9
10 Greenberg, 2017; Lee et al., 2016) have generally reported smaller clinical effects in
11
12 pharmacotherapy than trauma-focused interventions. Increasing attention, however, is
13
14 now being paid to the methodologies of studies included in those reviews. For example,
15
16 the meta-analysis of these comparisons by Lee et al. (2016), while supporting the use of
17
18 trauma focused interventions as first line, recommended the need for more direct head
19
20 to head research with specific agents, as well as the need to prioritise studies utilising
21
22 active controls instead of waitlist or treatment-as-usual conditions (Lee et al., 2016).
23
24 Consistent with this, new evidence indicating little difference between sertraline plus
25
26 enhanced medication management, PE plus placebo, and PE plus sertraline (Rauch et
27
28 al., 2018) suggests that, as the direct comparison evidence base firms, more nuanced
29
30 recommendations will emerge. Despite this, all current guidelines continue to
31
32 emphasise the role of medication and recommend its use, where indicated, in
33
34 stabilisation or where first-line treatments are not available, not acceptable, or have not
35
36 worked.
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42
43 The intensive treatment outcome research efforts in recent years, using high-
44
45 quality randomised controlled trials, is commendable. Regrettably, however, research
46
47 suggests that military and veteran populations experience more modest treatment
48
49 outcomes than civilians, with around two-thirds retaining their PTSD diagnosis after
50
51 treatment with CPT or PE (Steenkamp, Litz, Hoge, & Marmar, 2015). In view of these
52
53 modest outcomes, modifications to standardised treatment may be required in clinical
54
55 practice to suit the specific presentation. Promising early results, for example, have been
56
57 found in the treatment of moral injury with veterans (Litz, Lebowitz, Gray, & Nash,
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1
2
3 2017). Similarly, although more research is required, it is reasonable to assume that the
4 presence of significant dissociation would have implications for treatment (Frewen &
5 Lanius, 2015). Interestingly, one study found that female veterans who met criteria for
6 the dissociative subtype of PTSD had reduced, but still meaningful, response to PE
7
8 (Wolf, Lunney, & Schnurr, 2016).
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17 **Challenges in providing evidence-based treatments**

18
19 Significant challenges exist in delivering evidence-based treatments to military
20 and veteran populations. Pathways to care comprise multiple steps, including
21 acknowledging the problem, making a decision to enter treatment, accessing care, and
22 remaining in treatment. A multitude of potential barriers to care exist at each step
23 (Forbes et al., 2018). Some of the key challenges in delivering evidence-based
24 treatments to military and veteran populations with PTSD include: a) engagement and
25 retention in treatment; b) absence of defined benchmarks for assessing treatment
26 progress and non-response; and c) clinician-related barriers including reluctance by
27 some to work with veteran populations, capability and willingness to use evidence-
28 based treatments, and degree of treatment fidelity. The section below expands on these
29 key barriers to effective care, of which stigma is a prominent one, before providing a
30 framework for future research in order to best respond to these challenges.
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48 *Treatment engagement*

49
50 Elements of military culture and organisation, as well as individual factors, can
51 make help-seeking and treatment engagement a challenge. Engaging in help-seeking
52 behaviours, and the associated perceived vulnerability, can be experienced as
53 antithetical to the warrior ethos universal to all militaries that prize self-reliance and
54 strength in the face of adversity. Combined with a tendency to externalise, this may
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3 make it difficult for military personnel and veterans to acknowledge problems even to
4 themselves and, if they do acknowledge them, to refuse mental health care on the
5 grounds that they would rather handle the problem on their own (Naifeh et al., 2016).
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10 Further research is needed to better untangle the complexity of this preference for self-
11 management in order to increase help-seeking behaviours and modify the way in which
12 services are delivered (Adler, Britt, Riviere, Kim, & Thomas, 2015).
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16
17 A further concern for serving members (as well as some emergency responders)
18 is that engaging in PTSD treatment may have a negative effect on career trajectory
19 (Coleman, Stevelink, Hatch, Denny, & Greenberg, 2017; Iversen et al., 2011). Some of
20 these concerns are well-founded, as certain mental health problems and medication use
21 can result in being assessed as unfit to deploy. Other concerns, such as being treated
22 differently by leadership or fellow unit members, may or may not be justified yet the
23 broad issue of stigma is clearly relevant (Sharp et al., 2015). Cultures, beliefs, and
24 behaviours around help-seeking that develop in military service may become ingrained,
25 remaining after transition out of the military (Sharp et al., 2015). There is some
26 evidence that stigma is not a 'fixed' entity and, indeed, may be highest whilst service
27 personnel are on deployment (Osório, Jones, Fertout, & Greenberg, 2013). This may be
28 because deployed personnel develop an adaptive strong 'operational mindset' which
29 allows them to focus on the various challenging tasks they are required to undertake
30 whilst deployed. Such a mindset is unlikely to include positive attitudes towards help-
31 seeking. The concept of stigma relates both to 'self-stigma' (the individuals' own
32 beliefs and agreement with stereotypes they perceive others apply to themselves), and
33 'anticipated public stigma' (the manner in which they believe they will be viewed by
34 others) (Forbes et al., 2018; Hoge et al., 2004; McFarlane, Hodson, Van Hooff, &
35 Davies, 2011). Both types may impede help-seeking behaviour.
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3 The nature of PTSD itself may also impede engaging in treatment (Blais,
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5 Hoerster, Malte, Hunt, & Jakupcak, 2014). A cardinal feature of the disorder is
6
7 avoidance and it is not unusual for people with PTSD to go to extreme lengths in order
8
9 to avoid reminders of their traumatic experience. Many treatments for PTSD, of course,
10
11 require people to do the exact opposite and to confront the memory of their traumatic
12
13 experiences repeatedly, and in rich sensory detail. Thus, avoidance may contribute to
14
15 failure to engage in treatment, early drop out, and a delayed return to treatment. Finally,
16
17 involvement in adversarial liability and compensation processes can contribute to delays
18
19 and interruptions in treatment, potentially undermining recovery. Any process that
20
21 prolongs symptoms and disability arising from PTSD will reduce opportunities for the
22
23 individual to modify, re-focus, or substantially change their vocational goals.
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26 Movements internationally toward non-liability approaches to health care (i.e.,
27
28 automatic approval for treatment without going through a lengthy claims process) have
29
30 helped to separate treatment seeking from compensation, hopefully reducing this
31
32 potential barrier to care.
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38 Primary care (in both military and civilian contexts) deserves special mention,
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40 since this will be the first point of contact for many people with PTSD or other mental
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42 health conditions. PTSD recognition, and patient engagement, can present major
43
44 challenges for primary care providers. PTSD may present in a wide variety of ways. It
45
46 could, for example, be just one of many differential diagnoses of nonspecific symptoms
47
48 or a masked factor complicating the care of physical health conditions. It could manifest
49
50 as late onset, remote from psychologically traumatic events, or as complex PTSD in
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52 persons with ongoing psychologically traumatic stressors. As the health practitioner
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54 most likely to be delivering initial and ongoing care, as well as providing referrals for
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3 specialist mental health care, primary care providers need to find ways to recognise
4 possible PTSD among a potentially complex array of clinical presentations.
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8 9 *Treatment non-response*

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11 “Head to head” comparisons of veterans and civilian patients have not been
12 conducted and conclusions, therefore, must be drawn with caution. Nevertheless,
13 observation of clinical effect sizes in the treatment outcome literature from several
14 countries (e.g., Australia, US, Canada) suggests a poorer treatment response among
15 military personnel and veterans compared to other trauma populations (N. Jones et al.,
16 2017). High comorbidity may be a contributing factor, with military PTSD associated
17 with high levels of problematic anger, substance abuse, sleep disturbance and emotional
18 numbing (Knowles, Sripatha, Defever, & Rauch, 2018). Personality style and military
19 training (good soldiers may not necessarily make good patients), trauma history, over-
20 representation of males, and differences across service delivery systems may all play a
21 part in these somewhat disappointing outcomes. Despite recognition of the complexity
22 and poor treatment response in military and veteran PTSD, there is little evidence and
23 guidance to support sound clinical decision making when an individual: a) has an
24 atypical presentation; b) has a complex presentation including several comorbidities
25 and/or psycho-social problems that challenge considerations in how to sequence
26 treatment; and/or c) does not respond to first or second-line treatments.
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48 One outstanding question in the field is how to correctly identify treatment-
49 resistant PTSD. This contrasts with other disorders such as depression which have
50 clearly developed heuristic definitions of treatment resistance (McFarlane, 2019) and
51 have adopted clinical algorithms that guide clinicians through the decision-making
52 process of ‘next steps’ when treatment is ineffective and a change of treatment plan is
53 indicated (Gautam et al., 2017). Sippel and colleagues (2018) have recently offered
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3 guidance on how to define treatment resistant PTSD, but evidence is needed to inform
4
5 the appropriate action in the context of non-response to treatment. As noted below,
6
7 recent moves towards personalised medicine may have relevance in this context.
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10 11 *Clinician-related barriers*

12
13 The quality of the therapeutic relationship is a key factor in achieving positive
14
15 outcomes. To work effectively with military and veteran populations, practitioners need
16
17 an understanding of military culture and have the capacity to tolerate details of
18
19 traumatic experiences whilst maintaining unconditional positive regard (Australian
20
21 Centre for Posttraumatic Mental Health, 2013). In addition to consideration of the
22
23 therapeutic relationship, the skills needed to deliver trauma-focused treatments are time-
24
25 intensive and expensive to obtain. Research suggests that, even after a clinician has
26
27 been appropriately trained in trauma-focused treatment, the uptake and implementation
28
29 with military and veteran populations with PTSD is poor (Rosen et al., 2017; Rosen et
30
31 al., 2016). There are several reasons why clinicians might be hesitant to use evidence
32
33 based interventions, including doubts about the effectiveness of trauma-focused
34
35 treatments and concerns about distressing the patient with recounting and recalling the
36
37 traumatic memory.
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44 Maintaining the fidelity of PTSD treatment protocols in real world clinical
45
46 settings is always a challenge, as practitioners adapt the protocols to suit specific
47
48 clinical presentations, including the unique features of military and veteran populations
49
50 (Cook, Dinnen, Thompson, Simiola, & Schnurr, 2014). Perhaps not unreasonably, when
51
52 veterans do not respond to first-line treatments, and in the absence of evidence-based
53
54 clinical decision algorithms for treatment resistant PTSD, clinicians may seek
55
56 alternative approaches to treatment. While some of these options may be clinically
57
58 appropriate, others may be of little therapeutic benefit and there is a risk of long
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3 treatment episodes that achieve little. As a result, implementation of treatments that
4
5 work, as well as maintaining patients in these treatments, is becoming an increasing
6
7 focus and cause for concern, in addition to concerns regarding the quality and impact of
8
9 the treatments themselves (Sippel et al., 2018; Stirman et al., 2017).
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13 **Innovative solutions to PTSD treatment challenges**

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16 The current challenges in PTSD treatment require development of scientifically
17
18 robust innovations that are consistent with the priorities of military personnel and
19
20 veterans, and accessible to them across nations. We will now explore possible research
21
22 directions necessary to progress this agenda over the next decade.
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26 *Agreed terminology and definitions*

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29 A clear consensus on what constitutes PTSD treatment success, treatment failure
30
31 and/or non-response, treatment resistance, and cure and/or remission, along with an
32
33 agreed terminology, is essential. A fundamental problem at present is how to
34
35 operationalise when a person has had sufficient treatment. Varying definitions exist and
36
37 are not used systematically across studies (Schnurr & Lunney, 2016; Sippel et al.,
38
39 2018). Operationalisation of these constructs will facilitate development of clinical
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41 algorithms to guide decision making and treatment planning in cases of treatment non-
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43 response, treatment resistance, or relapse.
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50 *Strategies to increase engagement*

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53 Strategies to enhance engagement include increasing individual awareness of the
54
55 need for treatment, reducing stigma, alternative methods of healthcare delivery,
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57 enhancing treatment acceptability and accessibility, and involving families, military
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59 leaders and communities in sustaining an environment supportive of care. A better
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3 understanding of the many steps in the pathway to care is needed in order to effectively
4 target strategies to increase engagement at all levels. These improvements could be
5 facilitated through leadership initiatives, unit-based bystander support, and family
6 involvement, as well as through strategies designed to increase awareness of the
7 benefits of PTSD treatment.
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14 Systemic changes are required to improve the coordination and integration of
15 healthcare services within and between military and veteran systems, as well as to
16 improve accessibility, quality, and resourcing of those services. Such systemic
17 improvements are particularly important during key transition periods. The
18 organisational culture needs to actively promote engagement in treatment when
19 required, from the highest levels of leadership through various command levels, to
20 leveraging unit and “buddy” support. Peers (i.e., “buddies” and “mates”) can be
21 particularly important in encouraging engagement in care. Emerging research
22 examining the effectiveness of peer led engagement and help promoting activities
23 following exposures are demonstrating promise and warrant further investigation (N.
24 Jones et al., 2017).
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40 Identifying who will benefit from intervention is a key component of
41 engagement. While population screening has been considered, large automated
42 screening trials have demonstrated little impact on treatment seeking (Rona et al.,
43 2017). Face to face engagement with healthcare professionals, often including education
44 and some psychometric screening, is currently delivered in several Defence Forces, with
45 the goal of facilitating early detection, case identification, and engagement in treatment
46 if required. Such approaches are commonly applied to cohorts at specific timepoints
47 (e.g., following deployment, at the point of transition) and, when indicated, in primary
48 care settings. Studies building on the work of Rona et al. (2017) to examine the
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3 effectiveness of different elements provided in current face to face engagement and
4
5 screening practices are critical to ensure that scarce resources are devoted to where the
6
7 gains will be most substantial (McFarlane 2017). An integrated approach to identifying
8
9 mental health problems, which may include screening across the deployment cycle is
10
11 needed to facilitate continuity of care from garrison to deployment and back again
12
13
14 (Warner, Appenzeller, Parker, Warner, & Hoge, 2011).

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17 On a related theme, it may be possible to go beyond screening based purely on
18
19 self-report to explore other risk markers. While military personnel can develop PTSD
20
21 after a single incident during service, there is increasing recognition that repeated
22
23 deployments confer an incremental risk of developing PTSD (McFarlane et al., 2011).
24
25 Conceptualising PTSD within a staging model, whereby trauma exposed individuals
26
27 have not developed symptoms but are at greater risk due to high likelihood of further
28
29 exposure and are presenting with certain biomarkers, may provide opportunity for early
30
31 engagement and avoid the complications, comorbidity, and psychosocial losses
32
33 associated with chronicity and a prolonged recovery process (McFarlane et al., 2017). It
34
35 is unclear, however, how effective these interventions might be in returning personnel
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37 to full function and studies are required to properly understand the occupational
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39 prognosis of trauma-related adjustment disorders which develop during service, with or
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41 without early intervention.
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47 Collaborative care models in primary care (e.g., a multidisciplinary team
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49 approach), which have a strong evidence base in mental health (Archer et al., 2012),
50
51 may assist with increasing engagement in PTSD treatment, helping to efficiently
52
53 identify PTSD patients and match care according to clinical complexity and patient
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55 characteristics (Engel et al., 2016). Emerging evidence around case management has
56
57 significant promise for high risk and complex cases (Kehle-Forbes & Kimerling, 2017).
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3 However, trials of collaborative care for PTSD have yielded mixed results, and point to
4 the importance of ensuring that collaborative care involves effective treatments
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8 (Schnurr, 2016; Schnurr et al., 2013).
9

10 Modifications to PTSD treatments or healthcare service structures also have the
11 potential to increase military and veteran engagement with PTSD treatment. Massed
12 treatment, for example, such as intensive PE (Foa et al., 2018) and CPT or CT (Ehlers et
13 al., 2014), may be appealing to military personnel who may have limited availability for
14 lengthy treatment periods. Another potential treatment modification, designed to
15 improve maintenance of treatment gains, is booster sessions after treatment completion.
16
17 Little evidence is available regarding the long-term benefits of treatment for PTSD
18 because most trials only assess outcomes in the short and medium term, but the few
19 long term follow-ups that exist suggest initial treatment gains may not be maintained
20 over time (Resick, Williams, Suvak, Monson, & Gradus, 2012; Shalev et al., 2016).
21
22 Booster sessions may provide beneficial refresher training of skills taught in therapy,
23 and lead to greater symptom reduction in the long-term. In addition, continued
24 expansion of telehealth and related modalities may assist in making evidence-based
25 treatment, educational activities, and research participation more accessible.
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46 *Improved understanding of treatment outcome predictors*

47 Research focused on uncovering predictors of treatment outcome, including
48 active facilitators and inhibitors of change, is vital. Loss, shame, and problematic anger
49 are particularly relevant to military and veteran populations and have been demonstrated
50 to be potentially important inhibitors of treatment outcomes (Forbes et al., 2005; Lloyd
51 et al., 2014; Yehuda, Vermetten, McFarlane, & Lehrner, 2014). There is mixed
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60 evidence around the extent to which depression, guilt, anxiety, and dissociation at pre-

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3 treatment are associated with poorer treatment response (e.g., Richardson et al., 2014).
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5 Recent research has suggested that it may be a combination of co-occurring risk
6
7 indicators that best predicts outcomes (e.g., severe PTSD, guilt and depression as a co-
8
9 occurring triad) rather than single predictors considered independently (Phelps et al.,
10
11 2018). Further work is needed in developing the evidence base around differential
12
13 treatment response in individual PTSD profiles with a view to evidence based
14
15 guidelines for treatment sequencing and the development of interventions for clusters of
16
17 features such as the triad outlined above. The emerging concept of moral injury and its
18
19 implications for PTSD interventions is also relevant here (Bryan, Bryan, Roberge,
20
21 Leifker, & Rozek, 2017). Different approaches might be required when the impact of
22
23 traumatic experiences manifests as recognisable symptoms of PTSD (e.g., arousal) but
24
25 the mechanism of action driving symptoms is markedly different (e.g., not fear of harm
26
27 but beliefs about transgressions of core beliefs or perceived betrayals by self or others –
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29 moral injury; Williamson, Stevelink, & Greenberg, 2018).
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37 *Innovations in treatment*

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39 Now that the evidence base for first-line treatments of PTSD is established,
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41 increasing attention is being paid to related questions. The following are important areas
42
43 for further research: a) how to improve, complement, and augment current evidence-
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45 based treatments to maximise treatment response; b) expanding knowledge about non-
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47 trauma focused treatments; c) novel pharmacotherapy; d) personalised medicine
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49 approaches; and e) treatments that specifically aim to enhance functioning.
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52 i) Enhancing existing treatments

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54 Research must continue to focus on strategies designed to prepare an individual
55
56 for treatment, better engage an individual in treatment, or augment the effects of current
57
58 treatments. Advances in neuroscience, cognitive psychology and pharmacology have
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2
3 produced several novel approaches to augmenting current PTSD treatments that can be
4 used concurrently with trauma-focused treatments or in a preparatory fashion. Examples
5 include pharmacological approaches such as MDMA, ketamine, and LSD, which, when
6 used in conjunction with unstructured psychotherapy, may facilitate engagement with
7 the traumatic memory (Mithoefer, Grob, & Brewerton, 2016). Further work is also
8 underway in combining MDMA with evidence based trauma focused treatments. The
9 use of propranolol, a noradrenergic beta-receptor blocker, as a putative reconsolidation
10 blocker in conjunction with psychotherapy also shows some promise in reducing PTSD
11 symptoms (Brunet et al., 2018).
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24 Recent developments in cognitive and neuroscientific interventions that aim to
25 enhance working memory or improve attention control (McDermott et al., 2016),
26 transcranial magnetic stimulation (TMS; Kozel et al., 2019), and new technologies such
27 as virtual reality (Reger et al., 2016) have also shown promise as augmentation
28 interventions.
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35 Given the evidence indicating that anger inhibits treatment response in PTSD,
36 using targeted anger interventions in a phased approach prior to trauma focused
37 treatment may offer benefit (Cash et al., 2018). Experiential and physical treatments
38 such as physical exercise or creative art therapies, and current second-line treatments
39 such as acupuncture or mindfulness, may have a role to play in augmenting existing first
40 line treatments (as well as potentially treatments in their own right). While these
41 approaches may be more acceptable to some service members, their effects on
42 improving PTSD are not well studied (Benedek & Wynn, 2016).
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53 ii) Non-trauma-focused treatments

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55 Current promising non-trauma-focused treatments for PTSD include
56 Interpersonal therapy (Markowitz et al., 2015), Mindfulness-Based Stress Reduction
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3 (Polusny et al., 2015), and Present-Centred Therapy (Schnurr et al., 2007), which was
4
5 initially conceptualised as a control treatment. Emerging evidence in neurofeedback and
6
7 biofeedback is also showing promise (Fisher, Lanius, & Frewen, 2016). As noted above,
8
9 although it is not yet known whether these non-trauma focus interventions will improve
10
11 outcomes for military personnel or veterans who do not respond to first-line treatments,
12
13 they may be more acceptable to those who express a strong preference not to engage in
14
15 trauma focused work. Similarly, in recognition that PTSD is often comorbid with other
16
17 psychiatric disorders, transdiagnostic approaches are becoming increasingly considered
18
19 as a useful approach for trauma related pathology (Gutner, Galovski, Bovin, & Schnurr,
20
21
22
23
24 2016).

25
26 iii) Novel pharmacotherapy

27
28 A common theme in recent literature is the disappointing lack of innovation in
29
30 the development of effective pharmacotherapy for PTSD (Krystal et al., 2017).
31
32 Antidepressants targeting traditional monoaminergic systems, in particular selective
33
34 serotonin reuptake inhibitors, remain the first line evidence-based treatments when
35
36 considering medications. Given the limited effect size of agents like the SSRIs (Ipser &
37
38 Stein, 2012) and the absence of a PTSD-specific agent, a range of agents predominantly
39
40 designed for other mental health conditions have also been trialled or frequently utilized
41
42 including other antidepressant, anxiolytic and antipsychotic medications. At this point,
43
44 none have reached established high level evidence. Work is currently underway,
45
46 however, focussing on non-monoaminergic transmitter systems that may be of specific
47
48 relevance to the neurobiology of PTSD. A recent expert consensus identified a list of
49
50 mechanisms that should be targeted for ongoing research, with the top three being
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52 NMDA receptor antagonists, cannabinoid receptor modulators, and glucocorticoid
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60 receptor agonists (Krystal et al., 2017).

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3 iv) Personalised medicine
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5 Personalised medicine in PTSD, where treatments are tailored to match the
6 specific needs of an individual military member or veteran, holds considerable promise.
7
8 This work now goes well beyond the traditional genomic focus of personalised
9
10 medicine. Research is needed on how to improve treatment fit and effectiveness through
11
12 better understanding of the typologies of PTSD phenotypes and across the
13
14 biopsychosocial indicators. Advances in use of fMRI, EEG, biomarkers and genetics
15
16 hold some promise also for improved understanding of neurobiological profile
17
18 variations and the for potential matching and tailoring interventions. In addition, large
19
20 randomised controlled trial datasets using first-line treatments such as PE and CPT
21
22 (Schnurr et al., 2015) could form a base for machine learning approaches to identify
23
24 which interventions work for whom. This “big data” research can then drive appropriate
25
26 adaptations to the treatment protocols or the clinical setting and provide informed
27
28 guidance for treatment selection through data-driven, continuous quality improvement
29
30 (Cook et al., 2014). Machine learning approaches to large data may aid in moving
31
32 PTSD to personalized medicine, matching the individual with the most likely successful
33
34 treatment.
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42 v) Approaches specifically designed to enhance functioning
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44 Since PTSD is routinely associated with impaired social and occupational
45
46 functioning, it is critical to develop and rigorously evaluate interventions designed to
47
48 have a broader social-occupational focus on wellbeing and function (examples include
49
50 not only occupational rehabilitation, but also support animals, equine therapy, and
51
52 hiking). Such interventions have the potential to provide avenues to engagement in
53
54 activity, positive social connections and regaining a sense of self beyond the mental
55
56 health problems. Indeed, such interventions may succeed where traditional approaches
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3 have been unsuccessful, including in preparatory phases prior to first line treatments. In
4
5 the absence of robust evidence, however, it is important that these approaches are not
6
7 considered as a substitute for evidence based interventions. Psychological wellbeing is
8
9 strongly influenced by participation in life roles, but ensuring role participation
10
11 requires: (a) recognising, diagnosing and effectively treating the condition so as to
12
13 minimize impairments; (b) enabling adaptive coping for those living with the condition;
14
15 and (c) reducing barriers to role participation in their social and physical environments.
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19 vi) The role of family intervention and support
20

21 While the impact on families is beyond the scope of this paper, it is nevertheless
22
23 important to recognise the difficulties faced by family members of military personnel
24
25 and veterans with PTSD. How do we care for the wellbeing of families as an end goal in
26
27 of itself, and how do we improve their wellbeing in a way that supports the veteran's
28
29 recovery? Research consistently finds that support and encouragement from loved ones
30
31 increases treatment initiation and retention in military and veteran populations (Murphy,
32
33 Palmer, Hill, Ashwick, & Busuttill, 2017). The burden of care shouldered by the families
34
35 of those with PTSD is substantial and the impact on their own mental health needs must
36
37 be assessed in order to minimise long term negative consequences for the PTSD sufferer
38
39 and the family (Cramm, Mahar, MacLean, & Birtwhistle, 2019; Fear et al., 2018).
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44 vii) Attention to physical health
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46 Specialist mental health providers and researchers are sometimes at risk of
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48 focussing exclusively on psychiatric conditions and ignoring the role of chronic
49
50 physical health conditions, medically unexplained symptoms, and chronic pain. Those
51
52 three types of problems are disproportionately prevalent in persons with PTSD (as,
53
54 indeed, they are in persons with depression or anxiety disorders). Whole person
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3 management must include attention to comorbid/co-occurring physical health problems
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5 in addition to the psychiatric condition (Sharp, 2019).
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7 8 **Strengths and Weaknesses** 9

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11 The author group of this paper was convened by the 5 Eyes Mental Health
12 Research and Innovation Collaborative (5 Eyes MHRIC). The 5 Eyes MHRIC is a
13 collaboration of mental health researchers in Canada, Australia, the United States, the
14 United Kingdom and New Zealand working to improve mental health outcomes for past
15 and present military personnel and their families. The paper reflects interpretations of
16 the evidence base by a group of researchers working on military and veteran mental
17 health in those countries and might not represent the views of other researchers.
18 However, the broad representation of disciplines, nationalities and military and veteran
19 life course stages mitigates the risks of bias.
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32 33 **Summary and Conclusions** 34

35 Research over the past decade has demonstrated that evidence-based treatments,
36 when used correctly, can be moderately effective for treating PTSD in military and
37 veteran populations. Improvements in symptom reduction and quality of life for some
38 individuals are modest, however, highlighting the need for improved PTSD treatment
39 and chronic symptom management approaches.
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46 This paper has provided an overview of key questions in each of several
47 important areas for future research including: a) developing a consensus on terminology
48 and definitions around treatment success, failure and/or non-response, resistance, and
49 cure/remission; b) developing individual and systemic approaches to enhancing
50 treatment engagement, including addressing stigma, improving early recognition, and
51 modifying treatment; c) improving our understanding of predictors of treatment
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3 outcome; d) improving the efficacy of treatment through enhancing existing
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5 interventions, exploring new approaches, increasing personalised approaches to
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7 treatment, and increasing the focus on functional impairment and physical health.
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10 We also do not underestimate the scale of this important task. We also recognise
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12 that research directions will continue to be driven, in large part, by the individual
13
14 interests of researchers, by the availability of targeted research funding, and by various
15
16 social and government priorities. Nevertheless, we believe that the future directions
17
18 outlined in this paper will inform key developments in each of the nominated areas. The
19
20 authorship group is are committed to ongoing international collaboration with a view to
21
22 optimising a consistent and coherent approach to research and policy in military and
23
24 veteran mental health.
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28 The agenda for future research needs to be ambitious, focussing on international
29
30 cooperation and extending the focus beyond a “one-size-fits-all” approach in order to
31
32 tailor treatment to individual need. Only then will we ensure better mental health
33
34 outcomes for serving personnel, veterans, and their families.
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