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REVIEW

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The emergence of accelerated resolution therapy for treatment of post-traumatic stress disorder: A review and new subgroup analyses

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Abstract

Introduction: Post-traumatic stress disorder (PTSD) is a chronic, disabling psychiatric disorder prevalent among civilian and military personnel in the United States (US) and United Kingdom (UK). Current trauma-focused psychotherapies may place high emotional demands and lengthy treatment commitment that may hinder successful treatment completion for some patients. Accelerated resolution therapy (ART) is an emerging trauma-focused psychotherapy that is briefer than most current treatments.

Materials and Methods: This review describes the ART clinical protocol and theoretical underpinnings, its relationship to current treatments and formal established treatment guidelines and empirical research data. Also presented are new subgroup data for the use of ART among clients with PTSD and concomitant traumatic brain injury (TBI), and among US Special Operations Forces (SOF) personnel with extensive combat-related trauma exposure. Treatment response was defined as ≥10-point reduction on the 17-item PCL-M (PTSD Checklist).

Results: In subgroup analyses, mean treatment with ART consisted of approximately four sessions. Among 202 US service members/veterans, intention-to-treat response rates (assuming no response for non-completers) by TBI status were as follows: no TBI (58.1%, n = 105), mild TBI (60.4%, n = 48), moderate/severe TBI (46.9%, n = 49). Among 141 US service members/veterans, intention-to-treat response rates by SOF status were as follows: non-SOF (54.3%, n = 116), SOF (60.0%, n = 25).

Conclusion: The ART protocol aligns closely with established first-line trauma-focused psychotherapies and clinical guidelines. It appears to provide frequent clinical relief of symptoms of PTSD in an average of four sessions among military personnel with challenging clinical presentations, including concomitant TBI and extensive operational combat-related trauma.

KEYWORDS

eye movements, military, post-traumatic stress disorder, psychological trauma, traumatic brain injury

1 | INTRODUCTION

Post-traumatic stress disorder (PTSD) is a chronic, disabling psychiatric disorder characterised by exposure to actual or threatened death, serious injury or sexual violence that results in persistent re-experiencing of details related to the trauma(s), avoiding stimuli that invoke thoughts, feelings and reminders of the trauma, negative alterations in cognitions and mood associated with the traumatic event(s) and heightened trauma-related arousal and reactivity (APA, 2013). In the United States (US), PTSD affects 10%–20% of military personnel returning from deployments to Iraq and Afghanistan (Gates et al., 2012; Hoge, Terhakopian, Castro, Messer, & Engel, 2007; Milliken, Auchterlonie, & Hoge, 2007) and is the most common mental health diagnosis (11%) seen in the US Veterans Administration (VA) system (Barnett et al., 2014). In the US general population, the past 6-month prevalence of PTSD has been estimated at 3.8% (Kilpatrick et al., 2013). By way of comparison, a meta-analysis of nine studies of military service personnel who served in the United Kingdom (UK) Armed Forces reported current prevalence rates of PTSD ranging from 2.0% to 4.3%, depending on time since last military deployment (Rona et al., 2016). Similarly, in the UK general population, an estimated 4.4% of adults (age 16 years and older) will screen positive for PTSD (Fear, Bridges, Hatch, Hawkins, & Wessely, 2016).

The large number of both military and civilian personnel with PTSD in both the US and UK illustrates a paramount need for effective treatments. In particular, untreated and/or inadequately treated PTSD is associated with a range of health-related debilitating comorbidities, including depression and substance abuse disorders (Wisco et al., 2014), impairments in social and occupational functioning and overall quality of life (Buckley, Mozley, Bedard, Dewulf, & Greif, 2004; Pietrzak, Goldstein, Southwick, & Grant, 2011; Schnurr, Lunney, Bovin, & Marx, 2009), poorer perceived physical health and greater healthcare utilisation for physical problems (Levine, Levine, & Levine, 2014) and lifetime suicide attempts (Pietrzak et al., 2011). In the UK, an estimated 38.5% of individuals with a substance use disorder meet diagnostic criteria for current PTSD (Reynolds et al., 2005), and among UK Armed Forces, a diagnosis of PTSD has been associated with a striking 8.5-fold higher odds of intentional self-harm or suicide attempt (Pinder, Iversen, Kapur, Wessely, & Fear, 2012).

Evidence-based treatment guidelines for PTSD are similar for US and UK populations. In the US, the VA/DoD Clinical Practice Guideline specifically recommends individual, manualised trauma-focused psychotherapies that have a primary component of exposure and/or cognitive restructuring (US-Department-of-Veterans-Affairs, 2017). In the UK, the corresponding National Institute for Health and Care Excellence (NICE) Guideline similarly recommends trauma-focused psychological treatment provided on an individual outpatient basis (NICE, 2005, 2013).

Whereas US and UK guidelines do not explicitly endorse any specific individual trauma-focused psychotherapy, extensive efforts in the United States have centred on widespread training and delivery of prolonged exposure (PE) therapy and cognitive processing therapy (CPT) as first-line treatment modalities (Karlin & Cross, 2014; Ruzek, Karlin, & Zeiss, 2012). Still, the implementation of these two treatments is notoriously low in some VA outpatient and specialised PTSD treatment settings (Finley et al., 2015; Mott et al., 2014). The reasons for sporadic overall low utilisation of PE and CPT are multi-factorial and include but are not limited to practitioner concerns that many clients may not be suitable candidates for these trauma-focused therapies due to psychiatric comorbidities, cognitive limitations, and overall low levels of motivation (Cook, Dinnen, Simiola, Thompson, & Schnurr, 2014).

Similarly, a related provider concern relevant to both US and UK practitioners may be their perception that many clients lack the readiness required to receive established trauma-focused psychotherapies. Many providers may perceive that their patients need initial preparation to acquire improved coping skills and symptom management in order to tolerate and benefit from trauma-focused psychotherapies (Hamblen et al., 2015; Zubkoff, Carpenter-Song, Shiner, Ronconi, & Watts, 2015). The above-described limitations provide a rationale to examine alternative therapies that may reduce overall emotional demands and readiness of patients to engage in trauma-focused psychotherapy. This may include stipulation of an anticipated brief course of treatment, one that does not require verbalisation of details of traumatic experiences, and a treatment setting that does not require an established client–provider relationship.

The treatment protocol of Accelerated Resolution Therapy (ART) may address some of the limitations of the most widely recommended trauma-focused psychotherapies, including PE and CPT in the United States, and eye movement desensitisation reprocessing (EMDR) in the UK. Whereas ART most closely resembles EMDR, which is classified by the NICE as a first-line psychological intervention when PTSD symptoms have been present for more than 3 months after a trauma (National-Institute-for-Health-and-Clinical-Excellence, 2005, 2013), it differs in a number of important ways (described below) and is briefer than the conventional 8–12 treatment sessions that are used with PE, CPT and EMDR protocols. Therefore, we describe the ART protocol, including brief theoretical description on its potential therapeutic mechanisms, summarise the empirical research base of ART and present new data on the use of ART for treatment of adults with symptoms of PTSD in the presence versus absence of traumatic brain injury (TBI), and by comparing US Special Operations Forces (SOF) military personnel to non-SOF personnel. These subgroups were selected based on potential complexity in delivery of therapy due to the high rate of prior injuries sustained, and magnitude of combat operations and intensity of trauma exposure.

2 | METHODS

This section is subdivided into five subsections: *Section 1*: Description of ART protocol; *Section 2:* Theoretical basis of ART; *Section 3:* Comparison of ART protocol to first-line trauma-focused therapies endorsed in the NICE guideline; *Section 4:* Review of ART empirical

research data; *Section 5:* New data results on the use of ART among adults with TBI and among US SOF military members.

2.1 | Section 1. Brief description of ART protocol

The ART protocol (Hernandez, Waits, Calvio, & Byrne, 2016; Kip, Shuman, Hernandez, Diamond, & Rosenzweig, 2014; Waits, Marumoto, & Weaver, 2017) includes four primary steps consisting of (a) *Relaxation and Orientation*; (b) *Imaginal Exposure*; (c) *Imagery Rescripting*; and (d) *Assessment and Closeout*. For all four steps that are implemented, patients are directed by the clinician to perform repeated sets of horizontal smooth pursuit eye movements (Purves, Augustine, & Fitzpatrick, 2001), by following the clinician's hand, which is moving horizontally from side to side in close proximity to the patient's face. These sets of eye movements are similar to those used in EMDR, but are generally performed at the fastest speed in which patients can track with their eyes the clinician's moving hand, and by performing a fixed number of 40 eye movements (side to side counted as one movement) per set.

In the *Relaxation and Orientation* step, the client identifies and reports to the clinician the specific traumatic experience to be addressed in the treatment session. Typically, this disclosure results in heightened physiological arousal whereby the client reports the nature and bodily location(s) of the associated uncomfortable sensations that are being experienced. The client is then directed to focus specifically on the bodily sensation(s) while simultaneously performing a set of eye movements (as described above).

In the *Imaginal Exposure* step, the client is directed to start visualising the traumatic event (referred to as a "scene" in ART) in their mind from beginning to end, while simultaneously performing sets of eye movements. As with the initial Relaxation and Orientation step, the client is directed to notice and report to the clinician any somatic, emotional and physiological sensations that emanate from recall of each particular segment of the scene. Each sensation that is reported is processed (diminished) with sets of eye movements to the point whereby the client is comfortable returning to the scene at the point they left off. This process is repeated until the client has "imagined" their scene from beginning to end two times through. This step is considered complete when the client is able to re-imagine the traumatic event with an acceptable (for example, low) level of physiological reactivity.

In the *Imagery Rescripting* step, the client is directed to imagine a new, preferred way to visualise their original traumatic experience, while performing sets of eye movements. This is known as the "Director's" intervention in ART and may be considered analogous to the client imagining a new ending for their original traumatic experience. It seeks to modify the memory of the original traumatic experience, including the addition (construction) of positive material and imagery, through the process of memory reconsolidation (Nader & Hardt, 2009; Nader, Schafe, & LeDoux, 2000).

In the *Assessment and Closeout* step, reinforcing techniques are used to test whether or not there are remaining "stuck" points/images that generate visceral responses and to evaluate the ease with which the client can shift their focus to the new rescripted image(s). To be considered successful, the client should be able to report that they can access the original memory without significant distress and can easily shift to the rescripted version. This is followed by a closing ritual, such as crossing a bridge or going down a path, to help reinforce that the trauma is now in the past.

2.2 | Section 2. Theoretical basis of ART

The use of eye movements, imaginal exposure and imagery rescripting in the ART protocol have a theoretical basis of potential therapeutic value. In brief, performing horizontal eye movements has been reported to elicit a relaxation response (Stickgold, 2002), lower electrodermal arousal (Barrowcliff, Gray, Freeman, & MacCulloch, 2004; Barrowcliff, Gray, MacCulloch, Freeman, & MacCulloch, 2003) and enhance parasympathetic system activity (Elofsson, von Scheele, Theorell, & Sondergaard, 2008). In addition, performing horizontal eye movements, particularly at fast speed, improves overall memory recall (Bruyné, Mahoney, Augustyn, & Taylor, 2009; Christman, Garvey, Proper, & Phaneuf, 2003; Maxfield, Melnyk, & Hayman, 2008; Nieuwenhuis et al., 2013; Parker, Buckley, & Dagnall, 2009; Parker, Relph, & Dagnall, 2008), which may help to consolidate fragmented elements of trauma memories, some of which may have been previously repressed. Moreover, when the client is directed to perform two tasks simultaneously (for instance, re-experiencing the trauma and performing eye movements), this is believed to tax limited working memory capacity. Importantly, this may force memory traces representing events, emotions and sensations to compete for permanence (Gunter & Bodner, 2008), as well as reduce the vividness and emotional intensity of the original traumatic material (van den Hout, Muris, Salemink, & Kindt, 2001; Maxfield et al., 2008; van Schie, van Veen, Engelhard, Klugkist, & van den Hout, 2016).

Regarding imagery rescripting and use of the ART "Director" intervention, the purpose of this activity is to modify the original traumatic memory and its imagery in particular. In brief, highly emotional memories (for example, those associated with trauma) become labile during a relatively short window of time each time they are retrieved (recalled) at a level that produces physiological arousal, and they innately undergo memory reconsolidation following retrieval (Monfils, Cowansage, Klann, & LeDoux, 2009; Schiller et al., 2010; Tronson & Taylor, 2007). Clinically, the use of imagery rescripting can result in new information being woven into the original memory (Hardt, Einarsson, & Nader, 2010), and the potential for the old (original) information (and associated symptomatology) to be weakened or lost (Treanor, Brown, Rissman, & Craske, 2017).

2.3 | Section 3. Comparison of ART protocol to trauma-focused therapies endorsed in the NICE guideline

The ART protocol is consistent with the NICE Guideline that recommends PTSD sufferers be offered a course of trauma-focused psychological treatment provided on an individual outpatient basis

(National-Institute-for-Health-and-Clinical-Excellence, 2005, 2013). The NICE Guideline recommends a minimum of 8–12 sessions when the PTSD results from a single event, and potentially longer for more complex trauma. In the published studies of ART (reviewed briefly below), a mean of approximately four treatment sessions has been reported. The NICE Guideline recommends the use of EMDR as well as other cognitive behavioural trauma-focused therapies. With respect to EMDR, key differences with delivery of the ART protocol can be summarised as follows (Kip et al., 2014; Shapiro & Solomon, 2010; Waits et al., 2017):

1. With ART, the client is asked to visualise the entire traumatic event from beginning to end; with EMDR, the single worst image from the trauma and associated negative cognition and emotions are typically selected for processing.
2. With ART, continuous body scanning is used to bring attention to somatic/emotional sensations that are paired with the traumatic material; with EMDR, total body scanning is less of an emphasis than the cognitive focus to install a positive cognition by the end of the session.
3. With ART, the desensitisation process keeps attention focused directly on the bodily sensations that have emerged; with EMDR, the desensitisation process is free associative to identify and process associations with the trauma target.
4. With ART, imagery rescripting is a core procedure to modify the original traumatic material; with EMDR, "installation" of preferred positive cognition is a key goal of the therapeutic process, along with reduction in overall distress.
5. With ART, the use of eye movements is fixed at sets of 40, and at a fast pace, if possible; with EMDR, clinicians may vary the speed, number and sometimes the direction of eye movements, or use other forms of bilateral stimulation.

2.4 | Section 4. Brief review of ART empirical research data

To date, four studies have been conducted on ART for the treatment of psychological trauma, including three that used a case series design and one randomised controlled clinical trial. In brief, the first study conducted principally among adult civilians used an observational prospective cohort study design (n = 80) with clinical assessments made at pre-ART, at post-treatment completion and at 2- and 4-month follow-up (Kip et al., 2012). The second study was a randomised controlled trial among 57 U.S. service members and veterans, with clinical assessments made at pre-ART, at post-treatment completion and at 3-month follow-up (Kip et al., 2013). The 28 subjects initially randomly assigned to an attention control condition were offered ART after the 3-month control period. The third study, a large case series among US service members and veterans, used an observational prospective cohort study design (n = 160) with clinical assessments made at pre-ART, at post-treatment completion and at 6-month follow-up (Kip et al., 2016). This study focused on enrolling veterans with combat-related trauma or military sexual trauma. The fourth study, conducted among female veterans with a history of military sexual trauma, used a small case series design (n = 6) with clinical assessments made at pre-ART, at post-treatment completion and at 3-month follow-up (Rossiter, D'Aoust, Shafer, Martin, & Kip, 2017).

All four studies used similar outcome measures, including the 17-item PCL-C or PCL-M instrument (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Weathers, Litz, Herman, Huska, & Keane, 1993) (PTSD Checklist-Civilian or Military version) to assess change in symptoms of PTSD from pre- to post-ART completion. Across the four studies in which subjects received at least one session of ART (n = 291), mean age was 42.3 ± 12.3 years, and 28.9% were female. Of the 291 subjects, 237 (81.4%) completed treatment with a mean of 3.9 ± 1.1 ART sessions received.

Among the 237 treatment completers, the mean baseline (pre-ART) score on the PCL was 57.3 ± 13.4. At completion of treatment, the mean score on the PCL was 36.6 ± 15.8, which corresponded to a mean reduction of 20.6 ± 15.0 points. This yielded a large within-subject effect size of 1.38 (95% confidence interval: 1.20–1.56, $p < 0.0001$). A reduction of ≥10 points on the PCL instrument has been used to define clinically and statistically reliable change (improvement) in symptoms of PTSD (Monson et al., 2008). Using this metric, 177 of the 237 treatment completers (74.7%) had a favourable treatment response. Assuming no treatment response for all subjects who did not complete treatment (regardless of the reason for withdrawal), 177 of the 291 enrolled subjects (60.8%) had a clinically meaningful reduction (≥10 points) in symptoms of PTSD.

2.5 | Section 5. New results on the use of ART among adults with traumatic brain injury and among US Special Operations Forces military members

2.5.1 | Rationale for subgroups

According to the 2008 Rand Report, 7% of US of troops returning from Iraq and Afghanistan suffered TBI with comorbid PTSD or depression (Tanielian & Jaycox, 2008), and those with TBI are three times more likely to have PTSD (Carlson et al., 2010). One of the main consequences of TBI is impaired cognition. Thus, the extent to which individuals with comorbid TBI and PTSD are able to effectively utilise and benefit from evidence-based PTSD treatments that rely on cognition (at least in part), including CPT and EMDR, is unclear (Tanev, Pentel, Kredlow, & Charney, 2014). As described above, ART does not rely largely on cognitive processing, and thus, might offer an effective treatment option for persons with comorbid PTSD and TBI. As stated by Tanev et al. (2014), it is imperative to study psychotherapies in clients with comorbid PTSD and TBI, and include a control group of subjects with PTSD but without TBI. Although ART is not recognised as a "first-line" treatment, we sought to examine its effectiveness in the setting of comorbid PTSD and TBI.

The US military Special Operations Forces (SOF) are highly trained military personnel who operate advanced U.S military equipment and perform unique missions. These include but are not limited

to short-duration strikes in hostile, denied or diplomatically sensitive environments, special reconnaissance and surveillance activities, counter-terrorism and unconventional warfare actions and hostage, rescue, and recovery missions. By virtue of their specialised training and unique mission assignments, SOF personnel frequently have multiple deployments, often spaced close in time, and with extensive combat-related traumatic exposures.

Importantly, Special Forces (SF) Soldiers and SOF combat-arms soldiers have been reported to have significantly higher PCL-M (PTSD) scores compared to their non-combat-arms SOF counterparts, and higher PCL-M scores are associated with more deployments (for instance, to Afghanistan) (Hing, Cabrera, Barstow, & Forsten, 2012). Given the high number of deployments and substantial combat operations exposure routinely experienced by SOF personnel, one question that arises is the effectiveness of trauma-focused therapy, whether by ART or any of the first-line established therapies such as EMDR. One might postulate that SOF Soldiers are likely to have more complex and challenging treatment histories and circumstances (due to magnitude of combat exposure) to address with trauma-focused psychotherapy. On the other hand, these uniquely selected operators represent the "crème of the crop" of the US Armed Forces and thus might be expected to have greater resilience and protection from the psychological effects of combat-related trauma. Either way, they represent a unique group for study, including with the use of ART protocol due to the lack of requirement to verbalise traumatic experiences (for example, classified information does not need to be disclosed), brevity of the approach in terms of number of treatment sessions and ability to treat multiple traumatic experiences that share the same "theme" within a single treatment session.

2.6 | Definitions for subgroup cohorts

For the TBI subgroup analysis, classification of TBI status was based on self-report responses on the Defense and Veterans Brain Injury Center (DVBIC) Screening Tool (Schwab et al., 2006). This three item screening tool with multiple components is designed to identify service members who may need further evaluation for mild traumatic brain injury (mTBI). It has been validated among U.S. active duty service members who served in Iraq/Afghanistan (Schwab et al., 2006). To classify study participants into three groups, *Moderate/Severe TBI* required three conditions: (a) injured during deployment (for example, fall or blast), (b) injury that involved being dazed or confused or not remembering the injury and (c) injured that involved losing consciousness. The category of *Mild TBI* was defined as having an injury during deployment (as defined above), yet not meeting the conditions for moderate/severe TBI. The category of *No TBI* was defined as not sustaining an injury during deployment characteristic of head injury or concussion.

For the SOF subgroup analysis, study participants self-reported their primary branch of service as well as number and types of deployments. This information, in addition to session notes from the ART treating clinicians, allowed identification of study participants who served in the U.S. Special Operations Command (SOCOM). This includes Special Forces and Special Operators (hereafter referred to as Special Operations Forces (SOF)) distributed as follows: Army Special Forces (Rangers and Green Berets, $n = 18$), Marine Special Operations Command ($n = 4$), Navy SEALs ($n = 1$) and Air Force Special Tactics ($n = 2$). All other service members/veterans in the analysis were classified as Non-SOF.

2.7 | Symptom measures evaluated

For the TBI and SOF subgroup analyses, study participants completed the following measures, which have previously demonstrated acceptable reliability and validity prior to beginning treatment with ART and at completion of treatment with ART: 17-item PCL (PTSD) checklist (Blanchard et al., 1996; Weathers et al., 1993), 18-item Brief Symptom Inventory to measure psychological distress (Meachen, Hanks, Millis, & Rapport, 2008), 20-item Center for Epidemiologic Studies Depression Scale (CES-D) to measure depressive symptoms (Radloff, 1977), 21-item State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA) (Dros, Antony, Simms, & McCabe, 2007), Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) and the 20-item Pain Outcomes Questionnaire-Short Form (POQ) to measure key domains of pain (Clark, Gironda, & Young, 2003).

2.8 | Statistical methods

The TBI subgroup analysis includes participants from the two military studies described in Section 2.4, which excludes the first study conducted principally among civilians, as well as the fourth small pilot study of female veterans with a history of military sexual trauma. The SOF subgroup analysis is restricted to male participants from the third study described in Section 2.4, due to its focus on veterans with combat-related psychological trauma. For both subgroup analyses, baseline and clinical presenting characteristics of study participants by either TBI status or SOF status were compared by the use of Student's t tests or analysis of variance (ANOVA) for continuous variables, and chi-square tests for categorical variables. Examination of treatment outcomes that reflected change (pre- to post-ART) in symptoms of PTSD, anxiety, depression, sleep quality and pain was examined by the use of standardised effect sizes and 95% confidence intervals calculated using the within-person single-group pretest–posttest design described by Morris & DeShon (2002). This method provides an uncontrolled comparison of treatment response. To compare whether there was evidence of differential treatment-related response by either presenting TBI status or SOF status, analysis of covariance (ANCOVA) was used to compare post-ART mean scores adjusted for potential confounding variables. For the TBI subgroup analysis which compared results between three groups (no TBI, mild TBI and moderate/severe TBI), the ANCOVA models included adjustment for baseline value of the symptom measure being evaluated, global psychopathology score derived from the

TABLE 1 Demographic and clinical characteristics of study participants by TBI status

Characteristic	All (*n* = 202)	TBI status			*p*-Value
		None (*n* = 105)	Mild (*n* = 48)	Moderate/severe (*n* = 49)	
Demographic characteristics					
Age in years (mean ± *SD*)	43.0 ± 12.8	45.1 ± 12.4	41.6 ± 13.6	40.0 ± 12.4	0.02*
Male gender (%)	90.1	82.9	95.8	100.0	0.001
Race (%)					0.05
White	83.6	82.9	77.1	91.7	
Black	12.9	12.4	22.9	4.2	
Other	3.5	4.8	0.0	4.2	
Years of education (mean ± *SD*)	14.5 ± 2.7	14.6 ± 2.8	14.5 ± 2.4	14.4 ± 2.7	0.70*
Current military status (%)					0.06
Active duty	8.0	2.9	12.5	14.3	
Reservist	9.0	10.6	10.4	4.1	
Discharged/veteran	83.1	86.5	77.1	81.6	
Three or more overseas tours (%)	35.2	31.9	31.9	46.9	0.14
Clinical characteristics					
PCL-M score (mean ± *SD*)	58.5 ± 13.7	56.7 ± 14.0	58.4 ± 14.9	62.3 ± 11.2	0.02*
PDSQ score (mean ± *SD*)	57.5 ± 9.3	56.4 ± 9.2	58.5 ± 10.9	59.4 ± 7.0	0.05*
Brief Symptom Inv. (mean ± *SD*)	27.7 ± 14.8	26.7 ± 14.5	26.4 ± 15.3	31.2 ± 14.9	0.08*
CES-D (mean ± *SD*)	27.6 ± 12.4	28.1 ± 12.5	26.2 ± 12.7	28.0 ± 12.1	0.96*
STICSA (anxiety) (mean ± *SD*)	43.9 ± 12.3	43.1 ± 12.4	44.2 ± 13.3	45.0 ± 11.3	0.37*
Pittsburgh Sleep Quality Index (mean ± *SD*)	13.0 ± 4.1	12.4 ± 4.1	12.8 ± 4.2	14.5 ± 3.6	0.003*
Pain Outcomes Quest.(mean ± *SD*)	32.6 ± 30.1	29.4 ± 26.3	32.5 ± 34.3	40.9 ± 34.9	0.12*
On disability for PTSD/MH (%)	38.0	34.3	29.2	55.3	0.02
Previous trauma history (%)					0.0002
Sexual trauma	6.9	12.4	0.0	2.0	
Physical assault/homicide of civilian	3.5	4.8	4.2	0.0	
Improvised explosive device (IED)	20.3	14.3	25.0	28.6	
Witness death/execution	20.8	29.5	16.7	6.1	
3 + traumas/major injuries	44.1	33.3	54.2	57.1	
Other	4.5	5.7	0.0	6.1	
Trauma for 11+ years (%)	53.2	58.1	54.2	41.7	0.17
Prior psychotherapy for PTSD (%)	68.2	67.3	70.2	68.1	0.88*
Treatment completion rate (%)	79.7	83.8	79.2	71.4	0.08*
Total accelerated resolution therapy sessions (mean ± *SD*)	3.7 ± 1.3	3.9 ± 1.2	3.5 ± 1.3	3.4 ± 1.4	0.03*

CES-D: Center for Epidemiologic Depression Scale; MH: mental health; PCL-M: PTSD Checklist; PDSQ: Psychiatric Diagnostic Screening Questionnaire; PTSD: post-traumatic stress disorder; STICSA: State-Trait Inventory for Cognitive and Somatic Anxiety.
*Linear test of trend.

125-item Psychiatric Diagnostic Screening Questionnaire (PDSQ) (Zimmerman & Chelminski, 2006; Zimmerman & Mattia, 2001), having witnessed death or execution and number of ART sessions received. A one degree of freedom linear test of trend was conducted. For the SOF subgroup analysis which compared results between two groups (non-SOF, SOF), the ANCOVA models included adjustment for baseline value of the symptom measure being evaluated, PDSQ score, age, number of overseas tours, Combat Exposure Scale score and number of ART sessions received. The proportion of all participants who experienced a clinically meaning response in symptoms of PTSD (≥10-point reduction on the PCL) was compared by TBI status or SOF status by the use of chi-square analysis. A two-sided *p*-value of <0.05 was used in all analyses to define statistical significance.

TABLE 2 Symptom treatment response with accelerated resolution therapy (ART) by TBI status

	TBI status									
	None (*n* = 88)			Mild (*n* = 38)			Moderate/severe (*n* = 35)			
Symptom measure	Diff.	95% C.I.	ES (W/I)	Diff.	95% C.I.	ES (W/I)	Diff.	95% C.I.	ES (W/I)	*p*-Value (B/T)*
PCL-M (PTSD Checklist)	−18.8	−22.3, −15.3	1.14	−21.2	−26.1, −16.2	1.40	−17.5	−22.3, −12.7	1.25	0.15
Brief Symptom Inventory (BSI)	−14.9	−17.7, −12.0	1.12	−16.1	−20.7, −11.6	1.19	−13.7	−18.4, −9.0	1.00	0.15
Center for Epidemiologic Depression Scale (CES-D)	−12.9	−15.3, −10.5	1.14	−14.3	−18.3, −10.3	1.20	−9.1	−13.1, −5.1	0.78	0.12
State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA)	−12.5	−15.1, −9.8	1.02	−14.1	−17.9, −10.4	1.24	−7.7	−11.8, −3.6	0.65	0.007
Pittsburgh Sleep Quality Index (PSQI)	−2.5	−3.3, −1.6	0.66	−3.0	−4.4, −1.7	0.80	−3.5	−5.4, −1.5	0.64	0.79
Pain Outcomes Questionnaire (POQ)	−10.9	−14.4, −7.3	0.83	−6.2	−12.0, −0.4	0.53	−11.7	−14.7, −8.7	1.84	0.97

ES (W/I): within-group effect size comparing mean scores before and after treatment with ART.

*B/T: between-group comparison of treatment response adjusted for baseline value of the symptom measure, male gender, global psychopathology (PDSQ) score, witnessed death or execution and number of ART sessions received. *p*-Values are ordinal test of linear trend.

3 | RESULTS

3.1 | TBI subgroup analysis

As seen in Table 1, among the 202 study participants, 105 (52.0%) were classified as No TBI, 48 (23.8%) were classified as having had mild TBI, and the remaining 49 (24.3%) were classified as having had moderate/severe TBI. The mean age of study participants was 43.0 ± 12.8 years and was approximately 5 years higher for participants with no history of TBI compared to those with moderate/severe TBI ($p = 0.02$).

The study population was predominantly of White race (83.6%) and male gender (90.1%). The mean PCL (PTSD) score was 58.5 ± 13.7, and 38% of study participants were receiving disability for PTSD or other mental health conditions. Of note, almost half of all participants (44%) reported having experienced three or more traumas/major injuries, 53% had trauma-related symptoms for 11 or more years, and 68% had received prior psychotherapy for PTSD. Examination by TBI status revealed that those with moderate/severe TBI tended to be younger, have higher PCL (PTSD) and global psychopathology (PDSQ) scores, poorer sleep function and were more likely to be on disability for PTSD or another mental health condition. Thus, participants with moderate/severe TBI generally presented with a more complex and severe clinical profile compared to participants with mild TBI or no history of TBI.

The treatment completion rate with ART varied by TBI status (Table 1) and was highest in those with no history of TBI (83.8%), intermediate in those with mild TBI (79.2%) and lowest in those with moderate/severe TBI (71.4%) (p for trend = 0.08). As seen in Table 2, all three groups of participants who completed treatment with ART experienced similar large reductions in mean scores on the PCL-M. This consisted of mean reductions of 18.8 points in the no TBI group (within-group effect size = 1.14), 21.2 points in the mild TBI group (within-group effect size = 1.40) and 17.5 points in the moderate/severe TBI group (within-group effect size = 1.25).

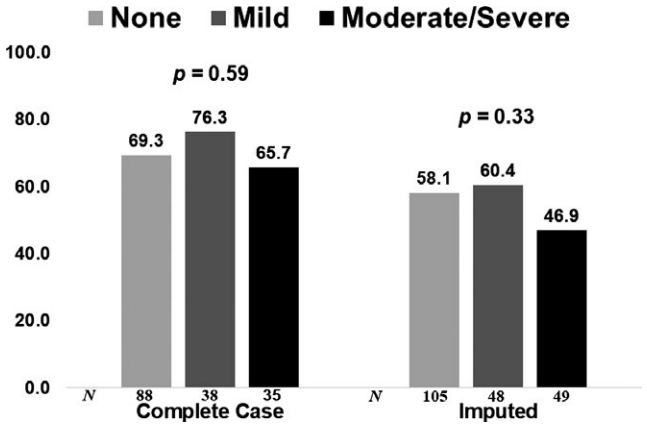

FIGURE 1 Histogram of treatment response rates defined as ≥10-point reduction in PTSD symptoms on the 17-item PCL-M (PTSD Checklist) by history of traumatic brain injury (TBI). The left side refers to subjects who completed treatment with accelerated resolution therapy (ART). The right side refers to all subjects (intention to treat) and assumes no treatment response for non-completers

After statistical adjustment for potential confounding variables, the three groups did not differ statistically in the between-group mean reduction in PTSD symptoms ($p = 0.15$). Using the definition of clinically meaningful change (reduction) in symptoms of PTSD (≥10-point reduction) (Figure 1), respective percentages were 69.3% in the no TBI group, 76.3% in the mild TBI group and 65.7% in the moderate/severe TBI group ($p = 0.59$). Imputing all treatment non-completers as having no treatment response resulted in corresponding treatment response rates of 58.1%, 60.4% and 46.9%, $p = 0.33$.

In examining change in comorbidities associated with PTSD, the three groups experienced similar medium-to-large reductions (effect sizes) on the Brief Symptom Inventory, depression, sleep function and pain. However, the moderate/severe TBI group experienced less reduction in anxiety (effect size = 0.65) compared to the no TBI (effect size = 1.02) and mild TBI group (effect size = 1.24) ($p = 0.007$).

TABLE 3 Demographic and clinical characteristics by special operations forces (SOF) classification

Characteristic	All (*n* = 141)	Special operations classification		*p*-Value
		Non-SOF (*n* = 116)	SOF (*n* = 25)	
Demographic characteristics				
Age in years (mean ± *SD*)	43.4 ± 13.1	43.3 ± 13.8	39.3 ± 7.6	0.01
Race (%)				0.08
White	85.7	82.6	100.0	
Black	11.4	13.9	0.0	
Other	2.9	3.5	0.0	
Years of education (mean ± *SD*)	14.3 ± 2.7	14.1 ± 2.7	15.2 ± 2.4	0.06
Current military status (%)				0.003
Active duty	5.7	2.6	20.0	
Reservist	5.7	6.1	4.0	
Discharged/veteran	88.6	91.3	76.0	
Three or more overseas tours (%)	36.2	25.7	84.0	<0.0001
Clinical characteristics				
PCL-M score (mean ± *SD*)	59.4 ± 13.0	59.6 ± 12.3	58.6 ± 16.2	0.73
PDSQ score (mean ± *SD*)	56.0 ± 18.3	56.9 ± 17.6	51.8 ± 12.3	0.20
Brief Symptom Inventory (mean ± *SD*)	28.0 ± 14.2	27.9 ± 13.7	28.6 ± 16.2	0.82
CES-D (mean ± *SD*)	27.3 ± 11.6	27.1 ± 10.9	28.4 ± 14.5	0.68
STICSA (anxiety) (mean ± *SD*)	44.1 ± 11.6	44.4 ± 11.3	42.8 ± 13.5	0.53
Pittsburgh Sleep Quality Index (mean ± *SD*)	13.2 ± 4.1	13.0 ± 4.0	14.2 ± 4.2	0.19
Pain Outcomes Quest.(mean ± *SD*)	66.6 ± 33.2	67.6 ± 32.1	62.0 ± 38.7	0.45
On disability for PTSD/MH (%)	38.1	36.0	48.0	0.26
Previous trauma history (%)[a]				
Sexual assault	7.8	8.6	4.0	0.43
Physical assault	17.0	18.1	12.0	0.46
IED blast/explosion	62.4	58.6	80.0	0.05
Witness death/execution	77.3	75.9	84.0	0.38
Witness major injuries (non-lethal)	58.9	58.6	60.0	0.90
Trauma for 11 + years (%)	52.9	52.2	56.0	0.73
Combat Exposure Scale Score (mean ± *SD*)	20.3 ± 10.9	19.3 ± 11.0	25.2 ± 9.0	0.02
Screen positive for mild TBI (%)	53.6	51.3	64.0	0.25
Prior psychotherapy for PTSD (%)	81.6	79.3	92.0	0.14
Treatment completion rate (%)	77.3	72.4	100.0	0.003
Total ART sessions (mean ± *SD*)	3.6 ± 1.4	3.5 ± 1.4	4.1 ± 0.9	0.02

ART: accelerated resolution therapy; CES-D: Center for Epidemiologic Depression Scale; IED: improvised explosive device; MH: mental health; PCL-M: PTSD Checklist; PDSQ: Psychiatric Diagnostic Screening Questionnaire; PTSD: post-traumatic stress disorder; STICSA: State-Trait Inventory for Cognitive and Somatic Anxiety; TBI: traumatic brain injury.

[a]Categories are not mutually exclusive.

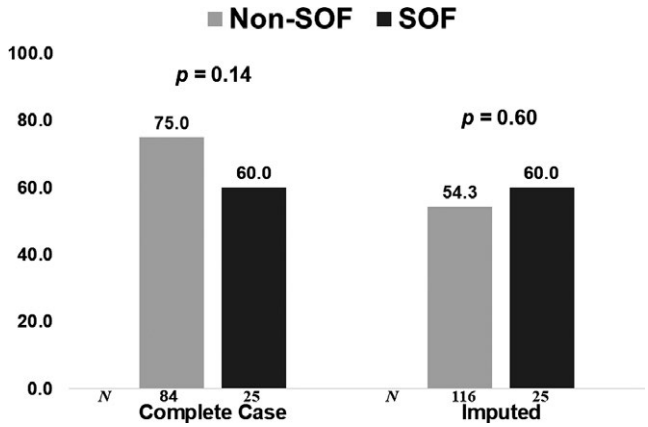

FIGURE 2 Histogram of treatment response rates defined as ≥10-point reduction in PTSD symptoms on the 17-item PCL-M (PTSD Checklist) by U.S. Special Operations Forces (SOF) military classification. The left side refers to subjects who completed treatment with accelerated resolution therapy (ART). The right side refers to all subjects (intention to treat) and assumes no treatment response for non-completers

3.2 | SOF subgroup analysis

As seen in Table 3, among the 141 study participants, 116 (82.3%) were classified as Non-SOF and the remaining 25 (17.7%) were classified as SOF military personnel. The mean age of study participants was 43.4 ± 13.1 years and was approximately 4 years higher in the Non-SOF group compared to the SOF group ($p = 0.01$). The study population was predominantly of White race (86%) with a higher prevalence of active duty service members in the SOF group (20.0% vs. 2.6%, $p = 0.003$) and significantly more overseas tours in the SOF group ($p < 0.0001$).

The mean PCL (PTSD) score was 59.4 ± 13.0, and 38% of study participants were receiving disability for PTSD or another mental health conditions. More than half (53%) had trauma-related symptoms for 11 or more years, and 81% had received prior psychotherapy for PTSD. Although the mean score on the Combat Exposure Scale was higher in the SOF group compared to the Non-SOF group (25.2 ± 9.0 vs. 19.3 ± 11.0, $p = 0.02$), the prevalence of screening positive for mild TBI was high overall (54%) and did not differ by SOF status. Clinically, the two groups presented with similar levels of PTSD symptoms, global psychopathology, depression, anxiety, sleep quality and pain.

The treatment completion rate with ART was 100% in the SOF group compared to 72.4% in the Non-SOF group (Table 3, $p = 0.003$). The SOF group received a higher mean number of ART sessions than the non-SOF group (4.1 ± 0.9 vs. 3.5 ± 1.4, $p = 0.02$), yet the treatment-related mean reduction in PCL-M (PTSD) scores, while large, was non-significantly greater (after statistical adjustment) in the Non-SOF group compared to the SOF group (−22.0 points vs. −14.5 points, $p = 0.08$).

Using the definition of clinically meaningful change (reduction) in symptoms of PTSD (≥10-point reduction) (Figure 2), respective percentages were 75.0% in the non-SOF group vs. 60.0% in the SOF group ($p = 0.14$). Imputing the treatment non-completers as having no treatment response resulted in corresponding treatment response rates of 54.3% vs. 60.0%, respectively ($p = 0.60$).

In examining change in comorbidities associated with PTSD, both groups experienced clinically meaningful changes (improvement), yet the Non-SOF group appeared to have better treatment response than the SOF group for symptoms of depression (effect size = 1.22 vs. 0.73, adjusted $p = 0.20$) and sleep quality (effect size = 0.82 vs. 0.48, adjusted $p = 0.10$) (Table 4).

4 | DISCUSSION

Accelerated resolution therapy is an emerging trauma-focused psychotherapy with a solid theoretical base, and a treatment protocol that is clinically consistent with current PTSD treatment guidelines,

TABLE 4 Symptom treatment response with accelerated resolution therapy (ART) by special operations forces (SOF) classification

	Special operation forces classification						
	Non-SOF ($n = 84$)			SOF ($n = 25$)			
Symptom measure	Diff.	95% CI	ES (W/I)	Diff.	95% CI	ES (W/I)	p-Value (B/T)*
PCL-M (PTSD Checklist)	−22.0	−25.5, −18.6	1.39	−14.5	−21.5, −7.4	0.85	0.08
Brief Symptom Inventory (BSI)	−16.5	−19.3, −13.6	1.27	−12.6	−18.4, −6.8	0.90	0.22
Center for Epidemiologic Depression Scale (CES-D)	−12.7	−15.0, −10.4	1.22	−10.4	−16.2, −4.5	0.73	0.20
State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA)	−12.7	−15.4, −10.0	1.05	−10.0	−15.1, −5.0	0.82	0.75
Pittsburgh Sleep Quality Index (PSQI)	−3.1	−3.9, −2.2	0.82	−2.3	−4.3, −0.3	0.48	0.10
Pain Outcomes Questionnaire (POQ)	−21.3	−26.6, −16.1	0.89	−15.7	−25.0, −6.3	0.69	0.18

ES (W/I): within-group effect size comparing mean scores before and after treatment with ART.
*B/T: between-group comparison of treatment response adjusted for baseline value of the symptom measure, global psychopathology (PDSQ) score, age, number of overseas tours, Combat Exposure Scale score and number of ART sessions received.

including the VA/DoD Clinical Practice Guideline and the NICE Guideline (2005, 2013; US-Department-of-Veterans-Affairs, 2017). With respect to the NICE Guideline in which EMDR is recommended as a first-line trauma-focused psychotherapy, ART includes all of the specific techniques in EMDR protocols, yet provides a more streamlined, body-focused approach with an emphasis on imagery rescripting (memory reconsolidation). The research studies on ART indicate evidence of efficacy in the treatment of PTSD in a mean of approximately four treatment sessions, which is briefer than 8–12 sessions typically recommended with PE, CPT and EMDR protocols.

The present review and analysis provides updated research data on ART for two important, understudied military-related subgroups of interest, including military personnel with a history of TBI, and those who have served in the US Special Operations Forces and tend to have had multiple deployments and extensive combat exposure histories. In the TBI subgroup analysis, service members and veterans with PTSD and concomitant moderate/severe TBI presented with overall higher PTSD and global psychopathology scores, as well as a high prevalence of multiple traumas and injuries. This complex treatment profile was associated with a somewhat lower treatment completion rate of 71.4% compared to completion rates of 83.8% and 79.2% among those with no history of TBI and mild TBI, respectively. This trend of greater challenge in treatment completion has been similarly reported with the use of CPT, whereby 20.7% of clients with PTSD alone versus 36.4% of clients with mild TBI/PTSD discontinued treatment at or before the fourth session (Davis, Walter, Chard, Parkinson, & Houston, 2013). Notwithstanding this challenge, almost half of the clients in the moderate/severe TBI group experienced a clinically meaningful reduction in symptoms of PTSD (≥10 points) in intention-to-treat analysis, and approximately two-thirds of treatment completers had a favourable treatment response in a mean of 3.4 treatment sessions. These data suggest that the brief ART protocol may be appropriate for veterans with concomitant PTSD/TBI.

In the SOF subgroup analysis, the 25 US service members/veterans who were classified as SOF personnel presented with a history of multiple overseas tours and high level of combat exposure. Still, these operators presented with similar PTSD symptoms scores compared to non-SOF personnel, which is somewhat at odds with a report of SOF soldiers with multiple tours in Afghanistan as having higher PTSD symptomatology compared to non-combat-arms SOF counterparts (Hing et al., 2012). On the other hand, Espinoza reported that SOFs deployed to combat experience mild to moderate PTSD symptoms at a somewhat lower rate than that of non-SOF soldiers exposed to combat, yet higher than that of the general population in the United States (Espinoza, 2010).

In terms of treatment response, all 25 SOF service members/veterans completed the ART protocol, with a mean reduction of 14.5 points on the PCL-M. While this represents an overall favourable response, it was non-significantly lower than the mean reduction of 22.0 points reported on the PCL-M by non-SOF service members/veterans. Still, in intention-to-treat analysis (which included treatment completers and non-completers), the rate of clinically significant treatment response (≥10-point reduction on the PCL-M) was 60.0% in the SOF group compared to 54.3% in the non-SOF group. These comparable results suggest that a brief course of treatment with ART may result in significant, favourable reductions in symptoms of PTSD in half or more of US SOF personnel who characteristically have served in multiple deployments with high levels of combat exposure.

For PTSD symptoms that have been present for more than 3 months after a trauma (characteristic of essentially all of the SOF and non-SOF study participants), the NICE Guideline specifically states that trauma-focused psychological treatment should be 8–12 sessions when treating PTSD from a single event and that healthcare professionals should consider extending the duration of treatment beyond 12 sessions for more complex circumstances. Given that 84% of the 25 SOF personnel treated had three or more overseas tours, 84% had witnessed death or execution, and 80% had been exposed to an IED blast/explosion (previous Table 3), ostensibly all had experienced multiple traumas rather than a single isolated event. In this regard, the significant PTSD treatment response reported in 60% of the SOF personnel in a mean of 4.1 treatment sessions would appear promising. Of note, the ART protocol has a specific intervention technique whereby multiple traumatic experiences that fall into a consistent theme (for example, sniper attacks) can be treated within a single session. This feature and accompanying brevity of approach may be useful in the setting of multiple and chronic traumatic experiences, as opposed to treating each trauma in separate sessions.

4.1 | Limitations and conclusions

To date, the ART protocol has not been formally studied in a head-to-head RCT against the current standard of care trauma-focused psychotherapies. However, a large RCT of 280 civilians and veterans with PTSD comparing ART to CPT to a waitlist control condition is currently underway at the University of Cincinnati (Chard, 2018). Importantly, this trial will provide a definitive evaluation of ART versus current standard of care for treatment of PTSD, including the use of assessors blinded to treatment condition throughout the study and with 1-year post-treatment follow-up. In the meantime, the brevity of the ART protocol, concordance with established treatment guidelines, evolving evidence for successful treatment of PTSD overall and among complex treatment circumstances (for example, concomitant TBI), and high provider satisfaction rates with the protocol (Waits et al., 2017), indicate that ART may be an appropriate treatment option for PTSD.

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CONFLICT OF INTEREST

Drs. Kip and Finnegan and Ms. Berumen and Zeidan do not have any financial interests in ART. Dr. Hernandez provides ART in his clinical practice and also trains clinicians in the use of the ART protocol.

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