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The Effects of Animal-Assisted Therapy on the Health and Well-Being of Military Veterans: A Systematic Scoping Review and Recommendations for Future Research

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Abstract Veterans of the armed forces may have experienced a range of physical and psychological traumas during their service, which can lead to long-standing problems with health and well-being, sometimes compounded with challenges accessing and engaging with support. Animal-assisted therapies (AAT) may offer an engaging, holistic approach that could be helpful for the veteran population. The aim of this scoping review is to examine the existing research on the effects of AAT on the health and well-being of veterans.

Method: The databases EMBASE (OVID), Web of Science, Cinahl, Cochrane, and Medline were searched in October 2020. Articles were screened against inclusion/exclusion criteria (based around language, accessibility, inclusion of veterans, use of AAT) and critically appraised using MMAT v.2018. Data were extracted and analyzed qualitatively.

Results: Thirteen articles met the inclusion criteria. The studies showed heterogeneity in design and delivery, including nature of interaction with the animal; therapy duration; goals assigned to each session; and type and number of staff present. The most common animals used were horses, then dogs. The most evaluated health outcomes were post-traumatic stress disorder (PTSD) symptoms, depression symptoms, and change in quality of life. Short-term results included lower scores on the Depression Anxiety Stress Scale-21 and PTSD checklist. Where assessed, participants enjoyed the therapy programs.

Conclusion: This review reveals that currently, clear conclusions on the efficacy of AAT are lacking due to the heterogeneity of programs, session characteristics, small sample sizes, and methodological limitations. AAT does appear to show promise, particularly for the short-term treatment of veterans' psychosocial problems, but this needs more systematic, robust research and the development of protocols to establish cost-effectiveness, feasibility, and manualizable protocols.

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Introduction

Individuals leaving the armed forces are known as veterans. While some aspects of military service are associated with enhanced health and well-being (e.g., physical fitness requirements for entry; focus on teamwork and camaraderie), resulting in a perhaps surprising lower mortality rate for soldiers and veterans than for their civilian counterparts (Kang & Bullman, 1996; Rothberg et al., 1990), veterans are at risk of certain morbidities at higher rates than the general population.

Military personnel, in particular those who have been deployed to combat zones, are likely to be exposed to psychological (Kendall-Tackett, 2019) and physical traumas (Belmont et al., 2012). Transitioning from military to civilian life is recognized as a particularly challenging period, with significant social and psychological problems (Blackburn, 2016). Veterans, particularly those who were deployed to war zones, have been demonstrated to experience high rates of physical, psychological, and social concerns, including (Oster et al., 2017):

> Physical: traumatic brain injury (TBI) (Agimi et al., 2019), musculoskeletal injury including amputation (Aldington et al., 2014), spinal cord injury (Schoenfeld et al., 2012), chronic pain (Chapman & Wu, 2015), infectious diseases (Beste & Ioannou, 2015), hearing impairment (Theodoroff et al., 2015), fatigue (Kang et al., 2003)
>
> Psychological and social: depression (Blore et al., 2015), post-traumatic stress disorder (PTSD) (Magruder & Yeager, 2009), substance abuse (Kelsall et al., 2015), violent behavior (MacManus et al., 2015), cognitive impairment and dementia (Sibener et al., 2014), homelessness (J. Tsai & Rosenheck, 2015)

It is, of course, important to recognise that dividing these conditions into physical/psychological/social is at best arbitrary as they are often interlinked in complex and self-perpetuating ways.

A study of 4 million veterans found 12.8% had high disability ratings, 39.9% medium, and 47.2% low disability ratings (Maynard et al., 2018). Significant numbers of veterans have combinations of health conditions, for example traumatic brain injuries (TBI) and post-traumatic stress disorder (PTSD) (Burke et al., 2009). The number of veterans with service-connected (SC) disabilities has increased by 117% since 1990 (U.S. Department of Veterans Affairs, 2020), displaying an ever-growing need for therapy and support.

Veterans can struggle to access and engage with clinical and social support services (Ahern et al., 2015; Iversen et al., 2005). In particular, mental illness remains stigmatized (C. W. Hoge et al., 2008), and admitting to needing help with mental health may be viewed as a weakness (Strom et al., 2012). Only 23–40% of post-9/11 veterans screened positive to have a mental health disorder had sought care (C. W. Hoge et al., 2004). Even once care has been sought, engagement can be challenging, with a range of barriers being identified, including high levels of arousal and anger, frequently seen in PTSD, interfering with the establishment of a therapeutic relationship (Creamer & Forbes, 2004; Forbes et al., 2008). Patients who do present rarely enroll in evidence-based exposure interventions and the dropout rate is high (Eftekhari et al., 2020; Gros et al., 2013; Kehle-Forbes et al., 2016; Rosen et al., 2019; Steenkamp & Litz, 2014).

It could, therefore, be helpful to identify therapeutic approaches that are accessible, stigma-reducing, engaging, and able to provide social support (Zinzow et al., 2012) to maximize uptake and adherence in this population.

Animal-Assisted Therapy

Animal-assisted therapy (AAT) is defined as "*a goal-orientated, planned, and structured therapeutic intervention directed and/or delivered by health, education and human service professionals . . . with expertise within the scope of the professionals' practice. AAT focuses on enhancing physical,*

cognitive, behavioural and/or socio-emotional functioning of the particular human recipient" (IAHAIO, 2014).

AAT is one form of animal-assisted intervention (AAI) ("*a goal oriented and structured intervention that intentionally includes or incorporates animals in health, education and human services (e.g., social work) for the purpose of therapeutic gains in humans*" (IAHAIO, 2014). The key distinguishing features of AAT are the involvement of a trained therapy professional—within the scope of this review, the therapists are clinicians, commonly physiotherapists, occupational therapists, and psychologists. This article focuses on AAT rather than AAI or other animal-assisted activities (AAA). This is not to deny the potential benefits of AAA and AAI in many populations, including military veterans (O'Haire et al., 2015; Rumayor & Thrasher, 2017; Van Buiten et al., 2021), but there is such breadth in the scope of this work that we have chosen to focus on the more clearly defined, formal, goal-oriented intervention AAT, which could be argued to have closer parallels to traditional, non-animal-assisted therapy.

The integration of animals into therapy has a history spanning several centuries (Beck et al., 2018; Fine, 2010; Morrison, 2007). Systematic reviews suggest possible benefits in physical, behavioral and psychological outcomes in physical and psychiatric conditions (including stress management, trauma, and acquired brain injury) but emphasize that the literature predominantly comprises small studies of limited quality (Kamioka et al., 2014; Maujean et al., 2015; Nimer & Lundahl, 2007; Stapleton, 2016).

Benefits of AAT may include:

Reducing

- Pain perception, stress response, and distracting from unpleasant stimuli (Braun et al., 2009; Calcaterra et al., 2015; Denzer-Weiler & Hreha, 2018; Edwards, 2019; Harper et al., 2015; Havey et al., 2014; Krause-Parello et al., 2018; Rodrigo-Claverol et al., 2019; Shiloh et al., 2003; C. C. Tsai et al., 2010)
- Anxiety, depression, and distress (Crossman et al., 2015; CrowleyRobinson et al., 1996; Hoffmann et al., 2009; Hunt & Chizkov, 2014)
- Fatigue, confusion, tension, aggression, and agitation (CrowleyRobinson et al., 1996; Majic et al., 2013; Richeson, 2003)
- Self-consciousness and awareness of body limitations (Simon, 2014)

Improving

- Motivation to participate and engage in therapy sessions (Denzer-Weiler & Hreha, 2018; Gee et al., 2007; Macauley, 2006; Markovich, 2011; Simon, 2014)
- Interaction and communication within and outside of therapy sessions (Ambrosi et al., 2019; Kramer et al., 2009; Richeson, 2003; Simon, 2014; Townsend, 2007)
- Self-confidence, self-esteem, independence, and purpose (Baldwin et al., 2018; Bland, 2019; Simon, 2014; Winegardner et al., 2015)
- Well-being and quality of life (Ambrosi et al., 2019; Olsen et al., 2016; Simon, 2014)

There are multiple routes through which AAT has been hypothesized to be effective, including "biophilia" (whereby being in the presence of animals creates a calming effect in humans due to our inherent need to connect with animals in the environment) (Kahn, 1997); "emotional contagion" (whereby emotions expressed by one individual may be reflected by another) (Hatfield et al., 1994); social buffering" or "social support," where the presence of a relaxed social animal provides social support and relief or protection from stressful situations (Kikusui et al., 2006), sometimes in a way that other humans cannot; and "attachment" and "affection exchange" theories, recently summarized with particular reference to oncology (Holder et al., 2020).

AAT and Veterans

AAT could be a particularly useful intervention for veterans. Evidence suggests that the presence of an animal in a therapy session may catalyze and enhance the development of a therapeutic relationship

(Hill et al., 2020). While there has not been specific research looking at stigma reduction associated with AAT, one study showed that attitudes toward individuals with disabilities were more positive when the individual was accompanied by an assistance dog (Coleman et al., 2015), and therapists and volunteers report reduction in stigmatization in different environments through AAT (Muller, 2015; Sobelsson & Mixon, 2017). Retention rates in psychological AAT programs are high, indicating tolerability and acceptability, which may be higher than that of some more traditional therapeutic approaches (Jones et al., 2019; Kern-Godal et al., 2015).

There have been several reports of AAT for veterans, mainly for treating psychological problems, particularly PTSD, but, as in the wider field of AAT, there is a lack of consistency in therapy implementation and reporting. There is a lack of international standards and guidelines in the AAT field. Each individual institution/care provider makes its own decisions about the planning and delivery of AAT. There is no overarching regulatory body to standardize therapy and ensure patients receive the best care by balancing the personalization and protocolization of treatment.

The extent, variety, and quality of current research into AAT is unclear. A scoping review is necessary to map the current data and identify gaps for future research.

Research Question/Aim: "To examine the extent, range, and nature of research activity on the effects of animal-assisted therapy on the general health and well-being of veterans."

Methods

Search Strategy

The search strategy used was as follows:

1. *Animal assisted therap**
2. *Human animal interaction**
3. *Human animal bond**
4. *Support animal**
5. *Equine therap**
6. *Canine therap**
7. *Animal therap**
8. *Hippotherap**
9. *1 or 2 or 3 or 4 or 5 or 6 or 7 or 8*
10. *Veteran**
11. *Military Personnel*
12. *Soldier**
13. *Army*
14. *Navy*
15. *Combat-related PTSD*
16. *Service-connected Condition**
17. *"Military Medicine"*
18. *10 or 11 or 12 or 13 or 14 or 15 or 16 or 17*
19. *9 and 18*

A computerized search in the following databases was conducted on October 16, 2020, to find relevant articles: EMBASE (OVID), Web of Science, CINAHL, Cochrane, and MEDLINE.

All titles/abstracts/articles were reviewed by two authors independently (BF and FM); any areas of uncertainty were resolved by discussion between all authors (BF, FM, LE).

Inclusion Criteria

1. AAT used as intervention (including individual or group, long-term or short-term programs). As per IAHAIO definition of AAT (IAHAIO, 2014), the intervention had to be goal-oriented and delivered by a formally trained professional.
2. Veterans as participants
3. Literature of any design

We included studies that allowed participants to receive concurrent pharmacological or nonpharmacological treatment (e.g., medications, physiotherapy, psychotherapy). There was no restriction by country, length of service, or specific posting or war.

Exclusion Criteria

1. Articles not in English
2. Article does not mention all of: veterans, AAT, and service-related conditions

3. Articles focused on service animals or pet ownership
4. Review articles
5. Article does not focus on the veteran's outcomes
6. Full text unavailable
7. Article included duplicate data from study

Data Extraction and Synthesis

Data were extracted according to the following predesignated categories:

Date of publication
Geographical location of study
Design of study
Number of participants
Characteristics of participants
Intervention details—type of animal, nature of intervention, who delivered the intervention
Control condition details (if relevant)
Outcome measures used
Results

One author collected data from each study; any areas of uncertainty were discussed and agreement reached. No automation tools were used.

Due to the heterogeneous nature of the studies, quantitative synthesis and meta-analysis were not possible. Narrative qualitative synthesis was selected as being most appropriate.

Critical Appraisal

Articles were critically appraised using the Mixed Methods Appraisal Tool (MMAT), Version 2018 (Hong et al., 2018). The MMAT is an efficient tool, ideal for analyzing studies with varying methodologies (mixed method studies/nonrandomized studies/qualitative studies/quantitative descriptive studies/randomized controlled trials), with high interreviewer reliability (Pace et al., 2012). For each category there are 5 core criteria most relevant to that methodology and rated on a scale of "yes," "no," and "can't tell." The percentage of "yes" answers was used to assign indicators of quality to each study, with 0–33% indicating low, 33–66% medium, and 67–100% high quality. Agreement was sought between all authors for MMAT scoring.

Results

Searches yielded a total of 669 papers, which after duplicates were excluded, totaled 556. A flowchart diagram of the study selection process adapted from the PRISMA 2009 Flow Diagram is presented in Figure 1.

Thirteen articles (all representing individual, unique studies) made the final inclusion list. Their details are shown in Tables 1–3.

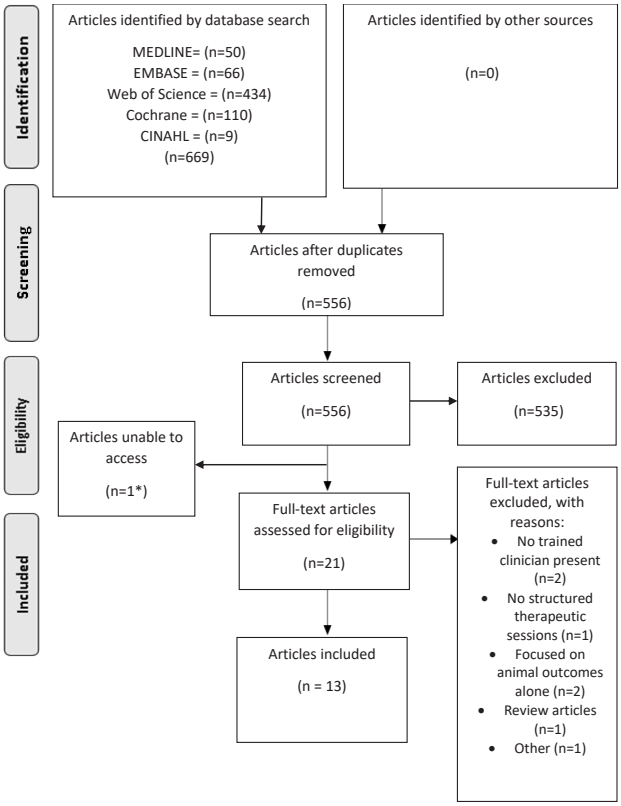

Figure 1. PRISMA 2009 Flow Diagram for scoping reviews; *Lanning 2017 in reference list. "Other" excluded article [92] was a commentary on a study of equine-assisted therapy (EAT) in veteran nursing students. It was felt that this could not be considered as a definitive assessment of the therapeutic value to the participants.

Table 1. Included Studies' Characteristics Including Title, Design, Objective, Inclusion and Exclusion Criteria, and Participant Numbers and Characteristics

Author, Year, Ref	Country	Study Title	Study Design	Objective
Aldridge et al., 2016 [93]	USA	The Effects of Hippotherapy on Motor Performance in Veterans with Disabilities: A Case Report	Quantitative descriptive (case report)	"To compare traditional physiotherapy to hippotherapy combined with traditional physical therapy on the physical performance of a 34-year-old male military veteran with low back pain and neck pain"
Arnon et al., 2020 [94]	USA	Equine-Assisted Therapy for Veterans with PTSD: Manual Development and Preliminary Findings	Quantitative nonrandomized (description of manual development and pilot study)	Describing the "development of a treatment manual [for equine-assisted therapy for PTSD]" and collecting preliminary data
Brisson and Decker, 2017 [95]	USA	Staff Attitudes Regarding the Impact of a Therapy Dog Program on Military Behavioural Health Patients	Quantitative descriptive study	To "determine the attitudes of behavioral health staff members regarding the impact of an AAT dog program on military behavioral health patients and whether the program should be continued"
Burton et al., 2019 [96]	USA	Efficacy of Equine-Assisted Psychotherapy in Veterans with Posttraumatic Stress Disorder	Quantitative non-randomized controlled	"To explore the effects of [equine-assisted psychotherapy] on PTSD symptoms"
Ferruolo, 2016 [86]	USA	Psychosocial Equine Program for Veterans	Quantitative descriptive	Describing "a pilot program designed to address the mental health needs of veterans [and] discuss future directions for evolving development of equine treatment programming"
Johnson et al., 2018 [97]	USA	Effects of Therapeutic Horseback Riding on Post-Traumatic Stress Disorder in Military Veterans	Quantitative randomized	To "test the efficacy of a 6-week therapeutic horseback riding program for decreasing PTSD symptoms and increasing coping self-efficacy, emotion regulation, social and emotional loneliness"
Krause-Parello et al., 2016 [98]	USA	Effects of VA Facility Dog on Hospitalized Veterans Seen by a Palliative Care Psychologist: An Innovative Approach to Impacting Stress Indicators	Quantitative non--randomied controlled (crossover repeated measures)	To "examine the effects of an animal-assisted intervention in the form of a therapy dog on stress indicators in 25 veterans on the palliative care service"

Participant Number	Participant Characteristics	Inclusion Criteria	Exclusion Criteria	Concomitant medication/therapy
1	34-year-old veteran with low back and neck pain and PTSD 100% male Race not stated	>18 years of age Physician determined need for physiotherapy	Severe horse allergy, unstable fractures, atlanto-axial instability, inability to balance in seated position	Ongoing physiotherapy; no comment re: other treatment
8	Veterans with PTSD Co-morbidities including depression (50%), bipolar disorder (25%), OCD (13%), ADHD (13%), previous substance misuse (38%) 75% male 63% white; 25% Black; 13% with Mixed ethnicity	DSM-5 diagnostic criteria for PTSD and score >/= 50 on CAPS-IV; age 18–65; reported military experience; English fluency	History of psychotic disorder or unstable bipolar disorder; severe depression as scored by HAM-D, elevated suicide risk, recent moderate/severe substance or alcohol use disorder; physical limitations regarding participation	Participants concurrently undergoing treatment for psychiatric disorders
29	Health care staff witnessing the therapy Genders not stated Race not stated	Employment as behavioral health staff member; had observed patients in presence and absence of therapy dog	Not stated	Not stated
20	Veterans with PTSD 80% male 70% white; 25% Hispanic, 5% Asian	Diagnosis of PTSD, score of at least 29 on PCL-M	Inability to provide informed consent, aged <18 years, pregnancy, prisoner, in receipt of antipsychotic or glucocorticoid medication	Not permitted to be using antipsychotic or glucocorticoid medication
8	Veterans with depressive and anxiety disorders and reintegration issues (all homeless and unemployed) being treated at Veterans Affairs facility All male “mainly white”	Not stated	Not stated	Undergoing treatment for psychiatric disorders
29	Veterans with PTSD identified through VA electronic medical records and living within 50-mile radius of equine facility 84% male Race not stated	Aged 18 years or older, no longer in active military service, weight of 220 pounds or less, able to walk at least 25 ft without the assistance of a person, willing to interact with and ride a horse	Not stated	Not stated
25	Veterans admitted to palliative care 84% male 68% white, 16% Black, 12% Hispanic, 1% Native Hawaiian/Pacific Islander	Veteran of U.S. Armed Forces; admitted to palliative care services for at least 24 hours	Dog allergy or fear; immunosuppression; MRSA infection; intensive care status	Not stated

Table 1. (*Continued*)

Author, Year, Ref	Country	Study Title	Study Design	Objective
Lanning, 2013 [99]	USA	Examining Effects of Equine-Assisted Activities to Help Combat Veterans Improve Quality of Life	Quantitative nonrandomized	To "begin to address the need for research in EAA by assessing the changes in quality of life indicators and depression symptoms of veterans participating in a PATH International Equine Services for Heroes Therapeutic Riding program"
Malinowski et al., 2018 [100]	USA	The Effects of Equine-Assisted Activities Therapy on Plasma Cortisol and Oxytocin Concentrations and Heart Rate Variability in Horses and Measures of Symptoms of Posttraumatic Stress Disorder in Veterans	Quantitative nonrandomized	To "test the hypothesis . . . that symptoms of post traumatic stress disorder would be reduced after 5 sessions of EAAT in veterans who had previously been diagnosed with PTSD"
Meyer, 2019 [101]	USA	Attachment Theory and Equine-Facilitated Psychotherapy for Vietnam Veterans	Qualitative	To "explore five Vietnam veterans' perceptions of their bond with an equine partner during equine-facilitated psychotherapy and how it influences their behavior and PTSD symptoms"
Romaniuk et al., 2018 [102]	AUS	Evaluation of an Equine-Assisted Therapy Program for Veterans Who Identify as "Wounded, Injured or Ill" and Their Partners	Quantitative nonrandomized	To evaluate "outcomes of an equine-assisted therapy program for Defence Force veterans and their partners across the psychological domains of depression, anxiety, stress, post traumatic stress, happiness and quality of life, as well as compare the outcomes of an Individual and Couples program"
Sylvia et al., 2020 [103]	USA	Acceptability of an Adjunct Equine-Assisted Activities and Therapies Program for Veterans with Posttraumatic Stress Disorder and/or Traumatic Brain Injury	Qualitative	To examine the "acceptability of integrating an EAAT program as part of a two-week, intensive clinical program for veterans with PTSD and/or TBI"
Wortman et al., 2018 [104]	USA	Pinnipeds and PTSD: An Analysis of a Human-Animal Interaction Case Study Program for a Veteran	Quantitative, descriptive case study	To "examine the impact of a pinniped facilitated human animal interaction pilot program on the self-reported PTSD-like symptoms of a veteran"

Abbreviations: ADHD = attention deficit hyperactivity disorder; AUS = Australia; EAA = equine-assisted activity; EAT = equine-assisted therapy; EAAT = equine-assisted activities and therapies; HAM-D = Hamilton Rating Depression scale; MRSA = methicillin-resistant staphylococcus aureus; OCD = obsessive compulsive disorder; PATH = Professional Association of Therapeutic Horsemanship; PCL-M = PTSD checklist—military; PTSD = post-traumatic stress disorder; TBI = traumatic brain injury; USA/US = United States of America; VA = Veterans Association.

Participant Number	Participant Characteristics	Inclusion Criteria	Exclusion Criteria	Concomitant medication/therapy
13	Veterans 85% PTSD, 69% musculoskeletal/pain issues; 23% TBI, 8% military sexual trauma, 8% stroke Gender not stated Race not stated	Not stated	Not stated	Not stated
7	Veterans with PTSD 86% male 100% white	Not stated	Not stated	Not stated
5	Veterans with PTSD (major depression and alcoholism among comorbidities) 80% male (20% not stated) Race not stated	Not stated	Not stated	Undergoing psychiatric treatment
25 veterans; 22 couples	Veterans who identify as "wounded, injured or ill" and their partners 91% male/76% male Race not stated	Ex-serving Defence Force personnel or their partners; members of the Veterans Service Organisation, Mates4Mates, approved to complete the program by a Mates4Mates psychologist	Nil stated	Not stated
65 veterans, 49 family members	Veterans and their family members 82% PTSD, 14% TBI, 2% alcohol abuse, 3% depression 83% male 61% white, 14% Black, 10% Hispanic/ Latino, 18% not stated, 6% other	Participation in a 2-week intensive outpatient program for veterans with primary PTSD or TBI	Not stated	EAT referred to as "adjunct," no other details provided
1	Veteran with PTSD Gender not stated Race not stated	Not stated	Not stated	Not stated

Table 2. Study Details—Setting, Therapy Animals, Details of Interventions and Control

Author, Year, Ref	Setting	Type and Number of Therapy Animals	Selection of Therapy Animal/ Pairing with Participant/ Continuity	Included Horseback Riding?
Aldridge et al., 2016 [93]	Not clearly stated	Horse	Not stated	Yes
Arnon et al., 2020 [94]	Equestrian facility	2 horses	Same horses for all sessions; participants worked with both horses	No
Brisson and Decker, 2017 [95]	Inpatient and outpatient psychiatry	1 "highly trained therapy dog"	n/a	n/a
Burton et al., 2019 [96]	Community equine-assisted psychotherapy facility	Trained horses	Not stated	No
Ferruolo, 2016 [86]	Equine retreat at "established therapeutic horse farm"	Horses	Not stated	Yes
Johnson et al., 2018 [97]	Equestrian facility	Horses "selected by the PATH-certified riding instructor for their fitness and experience of being ridden by adults"	"Facility staff matched each veteran with a horse based on physical criteria and the veteran's expressed preferences"	Yes
Krause-Parello et al., 2016 [98]	Inpatient palliative care unit	1 "trained and certified" facility dog	n/a	n/a
Lanning, 2013 [99]	Not clearly stated	Horses "trained by PATH International certified instructors and desensitized to situations and devices typically found in populations with physical and mental disabilities"	Pairing decided by facility staff on basis of factors including participant request, weight, suitability of participant/horse for riding/interaction between horse and participant	Yes

Description of Therapy	Duration of Therapy	Staff delivering Therapy	Control
Example of session: "Retrieving the horse from the pasture or stall; tacking the horse; brushing and grooming the horse; mounting the horse . . . ; riding the horse . . . ; performing stretching and strengthening exercises; changing directions and speeds while on the horse; dismounting the horse; untacking the horse and returning the horse to the pasture or stall"	15 weeks, 60 minutes per week	Hippotherapy-certified physiotherapist, trained horse handler, 2 trained side walkers	15 weeks physio-therapy at 120 minutes per week
Group-based format, sessions comprising a "series of progressively complex and challenging exercises designed to help patients connect and communicate with horses"	8 weeks, 90 minutes per week	"Equestrian treatment team" (licensed mental health professional, equine specialist, horse wrangler)	Nil
Dog "participated regularly in individual and group counseling sessions as well as during recreational activities and activities of daily living"	"Patient interaction with the therapy dog 2–3 days per week," program lasted 1 year	Not stated	Nil
3–4 participants per group, directed interaction with trained horses with horse-based activities aimed to allow the participants to perceive that "the horses were metaphors in specific ground-based experiences"	6 weeks, 1 hour per week	Equine-therapy certified occupational therapist and horse handler	Delayed inter-vention control of standard therapy
Sessions of psychoeducation, guided experiential equine activities, group processing, and personal reflection where "the use of metaphor, analogy and anthropomorphization leads to therapeutically relevant instances"	1 or 2 days, 7 hours a day	Not clear	Nil
"Grooming and interacting with the horse before riding, applying the riding tack to the horse, then riding with a horse leader and two side walkers to ensure safety"	6 weeks, about 60 minutes a week	Hippotherapy-certified riding instructor, occupational therapist, riding center volunteer, side walkers as required	6-week waiting list control
Dog joined clinical psychologist on an "unstructured visit with veterans"	20-minute visit	Clinical psychologist	20-minute psychologist visit without dog
A combination of riding and handling activities "designed to improve communication between the participant and horse, improve muscle function and coordination and decrease stress"	24 weeks, approx. 60–120 minutes per week	Veteran volunteers and certified staff	Nil

Table 2. (*Continued*)

Author, Year, Ref	Setting	Type and Number of Therapy Animals	Selection of Therapy Animal/ Pairing with Participant/ Continuity	Included Horseback Riding?
Malinowski et al., 2018 [100]	Equestrian facility	9 "healthy geldings [horses] of various breeds, aged 10–23 years, conditioned and experienced as therapeutic riding horses"	Not stated	No
Meyer, 2019 [101]	Horse rescue ranch	5 "horses rescued from neglectful and abusive situations . . . , chosen for amenable disposition and history of exposure to many types of groups"	Same horse used in each session by each participant, with quotes provided indicating that veterans selected their horses, with rationale including appearance, behavior, and history provided	No
Romaniuk et al., 2018 [102]	Residential working horse property	Horses	Not stated	No
Sylvia et al., 2020 [103]	Residential farm	Horses	Not stated	Yes
Wortman et al., 2018 [104]	Aquarium	4 pinnipeds: 1 rescued gray seal, 1 rescued Pacific harbor seal, 1 rescued Atlantic harbor seal, 1 harbor seal raised under human care	Different seals encountered by participant at different sessions	n/a

Abbreviations: PATH = Professional Association of Therapeutic Horsemanship; PTSD = post-traumatic stress disorder.

Description of Therapy	Duration of Therapy	Staff delivering Therapy	Control
A series of 5 sessions including orientation, grooming, leading, handling and petting horses, education around horse psychology and behavior, often using the horses as metaphors	5 days, 60 minutes per day	Not stated	Nil
"Us[ing] interactions with equine partners to address the psychological sequelae of PTSD in a natural environment," including handling, leading, and interacting with horses and reflecting on the veterans' relationships with their equine partner	Not stated	Program staff including licensed psychotherapist and certified equine specialist	Nil
Sessions including meeting, interactions, grooming, handling, and leading horses with opportunities for reflection and mindfulness	5-day residential program	Not stated	Nil
Sessions including "therapeutic riding, therapeutic driving, equine-assisted learning/groundwork, horse-human energy, herd observation or equine care, as well as non-horse-based activities such as quilting"	3, 120-minute sessions over a weekend	Team of providers including professional counselors, military advocate, support staff, therapeutic riding instructor, driving instructor, equine specialist in mental health learning	Nil
Each session included a minimum of 10-minute direct interaction with a seal (including feeding, touching, observing behavior) (different seal each time) and the remainder of the time spent on relevant educational topics	4, 1-hour sessions	Not stated	Nil

Table 3. Study Outcome Measures and Outcomes

Author, Year, Ref	Attrition/ Attendance	Outcome Measures—PTSD	Outcome Measures—Other Psychosocial	Outcome Measures—Physical/ Physiological	Outcome Measures—Intervention Evaluation
Aldridge et al., 2016 [93]	No details given			Sheehan Disability Scale, Oswestry Low Back Pain Questionnaire, Neck Disability Index, "a range of motion, strength balance, gait analysis and posture"	
Arnon et al., 2020 [94]	Median 7.5/ 8 sessions attended by participants	PCL-5, CAPS	HAM-D, BDI, QLESQ-SF		Client Satisfaction Questionnaire and exit interview
Brisson and Decker, 2017 [95]	26/29 participants responded to survey				An "anonymous six question survey . . . regarding the impact of the program on the patients"
Burton et al., 2019 [96]	96% completion rate	PCL-M	Connor-Davidson Resilience Scale	0800 salivary cortisol	
Ferruolo, 2016 [86]	Not stated		Open-ended evaluation questions re: effects on psychosocial issues		Evaluation data from participants regarding their opinions and feelings around the retreat
Johnson et al., 2018 [97]	66% completion rate	PCL-M	Coping self-efficacy scale, difficulties in emotion regulation scale, social and emotional loneliness scale		
Krause-Parello et al., 2016 [98]	Not stated		Coping strategy indicator, perceived stress scale, UCLA Loneliness Scale, CDC-HRQOL; Pet Attitude Scale	Salivary cortisol, alpha-amylase, IgA; blood pressure and heart rate	Likert-scale questions re: visits

Timing of Assessments	Results	Adverse Effects	Quality Assessment
Measured at the end of each session	Improvements in all domains when hippotherapy added to traditional physiotherapy, but details and significance unclear	Not stated	
Pretreatment, midpoint, post-treatment, and 3 months post-treatment	CAPS-V and HAM-DD: significant decreases between baseline/post-treatment; midpoint/post-treatment; baseline/follow-up Self-report: significant improvement baseline to post-treatment PCL-5, BDI, QLESQ but insufficient response at follow-up High participant satisfaction with EAT; all would recommend program to others	No adverse effects	
Answered at the end of the year-long program	86% of staff identified overall positive impact on patients with improvements including improved mood, relaxation, attitudes toward therapy, increased social interactions; 100% staff reported desire to continue program	7% staff observed patients avoiding/ignoring dog; 3% noticed patients being tense/uncomfortable around dog	
Weeks 0 and 6 (beginning and end of intervention)	Intervention and control both had significant reductions in PCL-M at 6 weeks compared to baseline; no difference between groups Resilience scores significantly increased at 6 weeks of EAT No change in salivary cortisol between weeks 0 and 6	Not stated	
Not stated	100% voted they "'oved it" and found it valuable, helped lessen their depression and anxiety. No difference in reported outcomes between 1-day and 2-day retreat. Participants reported high rates of learning about self	Not stated	
Baseline, week 3, and week 6	Statistically significant decrease in PTSD scores at 3 weeks; statistically and clinically significant decrease at 6 weeks; no significant change in self-efficacy, emotion regulation, loneliness	No adverse effects	
Saliva samples, BP and HR taken before, immediately after and 30 minutes after sessions; others only at baseline	Both intervention and control group had significant decreases in cortisol and HR at 30 minutes compared to baseline; no changes in BP; no significant changes in IgA or amylase. Majority of patients had good/excellent experience; all looked forward to dog visit; majority would want daily visit	Not stated	

Table 3. (*Continued*)

Author, Year, Ref	Attrition/ Attendance	Outcome Measures—PTSD	Outcome Measures—Other Psychosocial	Outcome Measures—Physical/ Physiological	Outcome Measures—Intervention Evaluation
Lanning, 2013 [99]	54% completion rate		BDI, 36-item short form health survey version 2; postintervention open-ended questions to determine emerging themes re: effects of EAA		
Malinowski et al., 2018 [100]	Not stated	PCL-5	Brief symptom inventory for psychological distress	Heart rate, respiratory rate, blood pressure	
Meyer, 2019 [101]	Not stated		"Semistructured interview . . . to capture the essence of the attachment between human and horse and the liver experience of their interactions"		
Romaniuk et al., 2018 [102]	Attendance not reported; some follow-up measures unavailable	PCL-5	Depression and anxiety stress scale-21, Oxford Happiness Questionnaire, QLESQ-SF		

Timing of Assessments	Results	Adverse Effects	Quality Assessment
Baseline, after 6, 12, and 24 sessions (open-ended questions at end of study only)	Depression scores "dropped" and SF-36 scores "increased" but no statistical/clinical significance provided. Participants reported feeling "stronger, more confident, and more open and accepting of others" with "increased sociability"	Not stated	
Brief Symptom Inventory and PCL-5 immediately before first session and immediately after last session BP, HR, RR before, during, and after each session	Significant reduction in PCL-5 scores compared to baseline; significant reduction in BSI compared to baseline; no overall change in HR, RR or BP (drop in HR sessions during session grooming horses, but returned to baseline after session)	Not stated	
6 preliminary questions and 6 questions at the end of the intervention	Descriptions of positive changes in thoughts and behaviors; positive relationships with horses; emotional benefits of program	Not stated	
Pre-intervention, on conclusion of the program (postintervention), and 3 months after the conclusion of the program (follow-up)	Individual program: significantly lower PTSD and DASS scores postintervention compared to baseline; significantly higher OHQ and QLESQSF scores Followup: DASS and PTSD scores significantly higher and OHQ/QLESQSF than postintervention (no difference from pre-intervention) Couples: PTSD and depression scores significantly lower at postintervention and follow-up compared to baseline; significantly lower anxiety at follow-up compared to baseline; significantly higher OHQ and QLESQSF at postintervention compared to baseline, but no significant difference between baseline and follow-up. QLESQSF significantly lower at follow-up compared to postintervention. Participants in couples program significantly fewer PTSD, depression, and stress symptoms at follow-up than participants in individual program	Not stated	

Table 3. (*Continued*)

Author, Year, Ref	Attrition/ Attendance	Outcome Measures—PTSD	Outcome Measures—Other Psychosocial	Outcome Measures—Physical/ Physiological	Outcome Measures—Intervention Evaluation
Sylvia et al., 2020 [103]	No details given				A "satisfaction survey including 11 open-ended questions" regarding participants' experience at EAAT weekend
Wortman et al., 2018 [104]	All sessions attended	PCL-5	Nil	Nil	

Abbreviations: BDI = Beck Depression Inventory; BP = blood pressure; CAPS = Clinically Administered PTSD Scale; CDC-HRQOL = Centers for Disease Control Health-Related Quality of Life; DASS = Depression and Anxiety Stress Scale; EAA = equine-assisted activities; EAAT = equine-assisted activities and therapies; EAT = equine-assisted therapy; HAM-D = Hamilton Rating Depression Scale; HR = heart rate; IgA = immunoglobulin A; OHQ = Oxford Happiness Questionnaire; PCL-5 = PTSD checklist for the DSM-5 symptoms of PTSD; PCL-M = PTSD checklist—military; PTSD = post-traumatic stress disorder; QLESQ-SF = Quality of Life Enjoyment and Satisfaction Questionnaire Short Form; RR = respiratory rate; SF36 = short form 36; VAS = visual analogue scale.

Study Design and Conduct

As shown in the tables, the included studies had a wide range of objectives and study designs. The majority of studies were small in size, and studies predominantly featured white male veterans. PTSD was the most frequently studied disorder, but several psychosocial and physical comorbidities were also included.

A range of animals was integrated into therapy sessions, but therapy animals were most frequently horses. An equal number of EAT programs included and excluded horseback riding, and more focus tended to be put on equine interaction and use of the horse as a metaphor for experiences.

A minority of studies included control conditions (Aldridge et al., 2016; Burton et al., 2019; Johnson et al., 2018; Krause-Parello et al., 2018).

Only one study reported statistical powering to detect a difference in early morning salivary cortisol levels between EAP participants and controls and met the required sample size (Burton et al., 2019).

There was heterogeneity in intervention duration and amount, as well as staff types and numbers delivering the intervention.

Outcomes mostly focused on psychiatric and psychosocial outcomes, with some physical and physiological assessments, and some assessment of satisfaction/enjoyment of the therapy.

Rates of study completion/attrition were not thoroughly reported. Where given, reasons for attrition included relocation, other commitments, or negative perceptions of the programs (Johnson et al., 2018; Lanning & Krenek, 2013).

Measures were mainly reported at pre- and post-intervention, with only two reporting effects at later follow-up (Arnon et al., 2020; Romaniuk et al., 2018).

Study Outcomes

PTSD. Most studies reported decreases in PTSD following AAT (Arnon et al., 2020; Burton et al., 2019; Johnson et al., 2018; Malinowski et al., 2018; Wortman et al., 2018), but in one of the controlled

Timing of Assessments	Results	Adverse Effects	Quality Assessment
At the end of the weekend	Mean score of 9.76 on 1–10 VAS on how would you rate your overall experience (9.91 family). Satisfaction with the following program aspects: (1) "disconnecting" or removing most electronic devices from their environment; (2) being around animals; (3) program staff that were knowledgeable about their experiences.	Not stated	
Collected before first intervention, at mid-point, and post-test (further details not given)	Reduction in PTSD scores of 15 points between weeks 1 and 4 of therapy	Not stated	

studies, improvements in PTSD were also seen in the control condition with no significant differences between the groups (Burton et al., 2019). Of the two studies that examined longer follow-up periods (both 3 months after the end of the therapy program), one had the option of including participants' partners in the program ("Couples program") (Romaniuk et al., 2018) and one did not (Arnon et al., 2020). Both studies showed that participants had improvements in their PTSD between pre- and post-treatment. At follow-up, these improvements were maintained in individuals in one study (Arnon et al., 2020), but in another were only maintained in those who had participated in the "Couples program" and not the "Individual program" (Romaniuk et al., 2018).

Other Psychosocial. Improvements were reported across the studies in other areas, including depression (again, in the study that compared individual and couples therapy, depression improvements were maintained in the couples participants but not the individual participants at 3-month follow-up (Romaniuk et al., 2018), resilience (Burton et al., 2019), quality of life (Arnon et al., 2020), anxiety (Ferruolo, 2016), and well-being (Lanning & Krenek, 2013).

Physical. The case report of a single veteran comparing traditional physical therapy versus hippotherapy plus physiotherapy reported improvements in all domains measured (Aldridge et al., 2016). No significant changes were noticed in "stress-related" measures such as salivary cortisol (Burton et al., 2019) or cardiovascular measures (Malinowski et al., 2018).

Satisfaction. Where it was measured, high levels of satisfaction were universally reported (Arnon et al., 2020; Brisson & Dekker, 2017; Ferruolo, 2016; Sylvia et al., 2020).

Quality Appraisal of Studies

The studies had a range of strengths and weaknesses in their study design; notably, the small sample size tended to make it difficult to assess how representative the sample was of the target population. It was frequently not possible to ascertain completeness of outcome data and fidelity of intervention delivery from available data. This resulted in commonly low "scores" on quality assessment where such parameters were assessed, as shown in Table 4.

Table 4. Quality Appraisal of Studies Using MMAT Criteria

Author, Year, Ref	Study Design Category	No. "Yes" Responses (/5)	No. "No" Responses (/5)	No. "Can't Tell" Responses (/5)	Percentage "Yes" Responses
Aldridge et al., 2016 [93]	Case study; quantitative descriptive	2	2	1	40
Arnon et al., 2020 [94]	Quantitative nonrandomized	1	1	3	20
Brisson and Decker, 2017 [95]	Quantitative descriptive	1	1	3	20
Burton et al., 2019 [96]	Quantitative nonrandomized	1	1	3	20
Ferruolo, 2016 [86]	Quantitative descriptive	0	2	3	0
Johnson et al., 2018 [97]	Randomized	2	1	2	40
Krause-Parello et al., 2016 [98]	Quantitative non-randomized	1	0	4	20
Lanning, 2013 [99]	Quantitative non-randomized	1	2	2	20
Malinowski et al., 2018 [100]	Quantitative nonrandomized	1	1	3	20
Meyer, 2019 [101]	Qualitative	3	0	2	60
Romaniuk et al., 2018 [102]	Quantitative non-randomized	1	3	1	20
Sylvia et al., 2020 [103]	Qualitative	3	1	1	60
Wortman et al., 2018 [104]	Case study, quantitative descriptive	1	0	4	20

Discussion

This scoping review identified 13 studies, which reflect the limited amount of research in the field of AAT for veterans. The studies had generally small participant numbers, varying study designs and methodologies, intervention type, delivery and duration, short follow-up periods, and a lack of statistical powering. Consequently, determining the implications of results is challenging and perhaps it is more pragmatic to address these as a series of pilot or feasibility studies.

There were fairly consistent reports of improvements in psychosocial areas such as PTSD (Arnon et al., 2020; Burton et al., 2019; Johnson et al., 2018; Malinowski et al., 2018; Romaniuk et al., 2018; Wortman et al., 2018), depression (Arnon et al., 2020; Lanning & Krenek, 2013; Romaniuk et al., 2018), and quality of life (Arnon et al., 2020; Burton et al., 2019; Romaniuk et al., 2018) between the start and

end of the intervention. Interview and questionnaire analysis generally revealed high satisfaction with the intervention (Arnon et al., 2020; Brisson & Dekker, 2017; Ferruolo, 2016; Krause-Parello et al., 2018; Sylvia et al., 2020), and reports of individual benefits in mood, behaviors, relationships, self-acceptance and understanding, sociability (Brisson & Dekker, 2017; Ferruolo, 2016; Lanning & Krenek, 2013; Meyer & Sartori, 2019), and one instance of a disappearance of a stutter, felt to be related to the participant's PTSD (Aldridge et al., 2016). These findings are in keeping with several other studies, including systematic reviews, that have shown potentially beneficial roles for AAT in helping with physical, emotional, and behavioral problems and in being perceived as an enjoyable intervention (Kamioka et al., 2014; Maujean et al., 2015; Nimer & Lundahl, 2007).

Longer-term outcomes were only reported in two studies and had some differing results, with improvements being maintained in one study that was delivered in a group format (Arnon et al., 2020), and maintained in a second study so long as the participant participated in couples therapy, but not in individual therapy (Romaniuk et al., 2018). A common problem with AAT studies is a lack of longer-term follow-up, with focus on short-term outcomes (E. L. Hawkins et al., 2019; Park et al., 2020). It is understandable that withdrawal of an enjoyable intervention could be associated with deteriorating symptoms—participants can develop strong attachments to therapy animals (Zilcha-Mano et al., 2011), and failure to manage the end of the program may actually be detrimental (Cohen, 2015). It is possible that longer-lasting effects from the couples therapy could be due to the veterans' partners learning new skills to support and understand their partner, which could improve the longer-term outcomes.

Physical assessments of parameters such as heart rate, respiratory rate, and blood pressure did not demonstrate any measurable differences (either compared to baseline or to a control group) (Krause-Parello et al., 2018; Malinowski et al., 2018), nor did other "stress markers" such as salivary cortisol, amylase, or IgA (Burton et al., 2019; Krause-Parello et al., 2018). Some prior work has shown that AAT can cause alterations in "stress markers," although this has more commonly been in more acute settings, such as the postoperative period (Calcaterra et al., 2015), or in health care workers in a work situation (Machova et al., 2019), whereas patients with the chronic condition fibromyalgia did not see any difference in salivary cortisol following AAT (although other markers, including heart rate and heart rate variability and salivary oxytocin did change) (Clark et al., 2020), perhaps emphasizing the importance of selection of outcome measures for different participants with different conditions and in different settings, and these are all important areas for consideration in future work.

Strengths and Limitations

This scoping review had several strengths: (1) a comprehensive search strategy across multiple databases; (2) high agreement levels between the authors for article selection according to inclusion and exclusion criteria and quality appraisal; (3) use of suggested structure for a scoping review (Arksey & O'Malley, 2005; Levac et al., 2010).

There are also several potential limitations. Only published studies in English were included; the terminology around AAT can be confusing; and although some selection criteria were common across studies (e.g., being aged over 18 years), participant eligibility varied between studies. Moreover, more thorough analysis is limited by the lack of detailed information regarding specific techniques and heterogeneity in outcome measures and study designs. Previous work has shown differences in animal attachment by gender (R. D. Hawkins et al., 2017; Schwarzmueller-Erber et al., 2020), and the majority of participants included were white males. Ethnicity has been shown to be associated with different rates of pet ownership, but not attachment (Ramon et al., 2010; Westgarth et al., 2013), but it is possible that history of pet ownership may influence an individual's opinion of AAT.

Many of the included studies had small sample sizes, and few had control groups (Aldridge et al., 2016; Burton et al., 2019; Johnson et al., 2018;

Krause-Parello et al., 2018). Open trials are appropriate at this stage of investigation into the AAT field but make assessment of efficacy challenging. It is impossible to blind participants to the intervention, and many measures designed for mental health conditions are self-reported. It is important to also acknowledge the lack of exclusion of participants who were actively receiving preexisting therapies and the lack of information regarding concurrent therapies in several of the studies.

The majority of the studies scored relatively poorly on quality assessment. This is not a criticism or reflection on the researchers and studies per se but more a reflection on the relative infancy of AAT as a studied intervention in this population.

Therefore, while one can conclude that there are some interesting and promising preliminary findings, particularly on the effectiveness of AAT for improving psychosocial symptoms during the intervention, many questions remain to be answered.

Future Research

There are several questions that still need to be answered, including identifying the following aspects.

Target Population. AAT may only appeal to a restricted population. Outcome research has highlighted the significance of patient preference in treatment outcomes (Kocsis et al., 2009; Markowitz et al., 2016; Swift et al., 2011). Most of the studies included veterans who self-admitted to treatment. Personality traits that make one seek help may also be conducive to positive therapeutic outcomes, such as "openness to new experiences" (Kakhnovets, 2011). Consequently, if AAT were more widespread, veterans who are not as open or willing to participate (e.g., afraid of or allergic to animals) may have less beneficial outcomes. The wide variety of SC conditions—occurring individually or concomitantly—complicates the target population, making the generalizability of small cohort studies extremely difficult. Only one study included a questionnaire on pet ownership and subjective views on the intervention before AAT was implemented and found all participants had had a dog at some point in their lifetime and indicated a positive pet attitude (Krause-Parello et al., 2018). Other studies did not report such pre-intervention data. Future research should investigate how preconceived expectations of AAT, previous pet ownership, gender, ethnicity, or different diagnoses may affect outcomes. While it may not be ethical to exclude concurrent therapies, it is important to record and report other therapeutic input.

Optimal Duration, Frequency and Intensity of Intervention and Suitable Follow-Up Periods. The longest study duration was 24 weeks of intervention (Lanning & Krenek, 2013)2013—one therapy dog program ran for a year in a hospital, but there is no information on how long each patient was involved in the program (Brisson & Dekker, 2017). The studies do not explain why each length of program was chosen. AAT may have only had transient effects reported because there has not been an optimal program length identified. The ethics of giving veterans a short course of therapy that they perceive as beneficial and then taking it away needs to be considered. The removal of the animal may be distressing and demotivating for participants (Aldridge et al., 2016). Determining an optimal set of conditions would require comparison of a range of durations, frequencies, and intensities of intervention. Some of this may be dictated by pragmatism, such as in-hospital visits by therapy dogs on a palliative care unit (Krause-Parello et al., 2018), availability of funding, and practicalities of research design. It is also important to recognize the needs of therapy animals and their handlers—experienced dog handlers advise that therapy dogs should not be expected to deliver more than two hours of AAT per day, or four sessions per week (Good, 2019; Nationwide, 2019). As outlined above, it will be important to consider different strategies to prepare patients for withdrawal of therapies.

There does not seem to be a consensus regarding optimal duration of psychosocial interventions for PTSD or depression, with NICE guidelines recommending up to 8–12 sessions or around 12 weeks' intervention (NICE, 2009, 2018)—albeit recommending

that more may be "clinically indicated, for example if they have experienced multiple traumas" (NICE, 2018). The majority of studies included in this review were of much shorter duration, and future work could perhaps look at longer duration of intervention.

Optimal Animal Characteristics for Therapy. Few of the included studies commented on the traits of the animals used or how/why those specific animals were picked. Descriptions of matching, if present, were brief and not replicable; for example: "*A participant might need a talkative volunteer and a more interactive horse. In another case, a participant might seem to need a very calm horse and a calm volunteer*" (Lanning & Krenek, 2013)2013. Preexisting opinions of animals or specific breeds could influence the outcomes of the therapy. There may also be a difference in efficacy of therapy dependent on the species of animal used. Pet attachment may differ by species (Su et al., 2018) and perhaps even by breeds, or by characteristics within breeds, or even by the history of individual animals. Some of these factors may be difficult to assess—for instance, a participant in one EAT study was reported to relate strongly to his equine partner's history of neglect (Meyer & Sartori, 2019). Similar findings have been reported in youth offenders identifying with rescue dogs who have experienced poor treatment, and this facilitating the establishment of a relationship (Smith & Smith, 2019). However, it is important not to make assumptions or project emotions onto patients or program participants, and it seems unlikely that "matching" could be made into a simple algorithm. This in itself could be an important area for future research—not only studying the characteristics of different species, breeds, and, indeed, individual animals that make them attractive to participants in AAT, but also whether that "attraction" translates into a more therapeutic relationship than arbitrary assignation of animal partners.

Process Evaluations. AAT is a complex intervention with many interacting components. A process evaluation was conducted in only one study reviewed here (Ferruolo, 2016), but it will be important to explore various facets in future work. One example is the increase in social activity associated with group therapy sessions—with staff, volunteers, and other participants. In one of the EAT studies reviewed here, participants recounted the staff and volunteers as the most important relationship in the program, only then followed by the horse (Lanning & Krenek, 2013)2013. A common theme was the reduction in isolation due to the social aspect of the programs, independent of the animals' presence. No studies to date sought to examine the influence of staff or volunteers, and there was a particular lack in the description of the volunteers: training received (if any); whether they were veterans also; if they had any experience with health care; if they had any experience with animals; how or where they were recruited. Other factors that may contribute to a program's effectiveness could include change of scenery, potentially increased exposure to the outdoor environment, visiting ranches or equine facilities that may be based in more rural areas, changes in routine, and increased activity, which have been reported to be beneficial for physical, mental, and emotional well-being (Manferdelli et al., 2019; Maund et al., 2019).

Essentially, AAT is a prime example of a complex intervention, and any program design and development should take this into account (Skivington et al., 2021).

Cost-effectiveness. The cost-effectiveness of AAT is not mentioned in any of the studies (although quality of life is frequently assessed, which can be useful for health economics analysis) and will need to be investigated before AAT would be considered for wider implementation.

Summary for Practitioners

This review aimed to explore the current state of research into animal-assisted therapy for military veterans. A total of 13 articles were included, which had a strong focus on equine-assisted therapy, but also included canine and pinniped therapy. The included

studies were heterogeneous in nature, frequently had small numbers of participants, and had variation in study design, therapy characteristics, methodology, and reporting.

Short-term effects were quite consistently shown in psychosocial outcomes, but long-term follow-up is limited. Research in this area focuses heavily on post-traumatic stress disorder (PTSD) and therefore does not give a full insight into the general health and well-being of veterans.

There was a low level of methodological rigor in most of the studies, indicating the preliminary nature of this area of investigation. The promise of AAT as a successful treatment option for veterans is still evident, but further research to establish cost-effectiveness, feasibility, and manualizable protocols is necessary.

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