Preliminary Efficacy of Service Dogs as a Complementary Treatment for Posttraumatic Stress Disorder in Military Members and Veterans

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Objective: Psychiatric service dogs are an emerging complementary treatment for military members and veterans with posttraumatic stress disorder (PTSD). Yet despite anecdotal accounts of their value, there is a lack of empirical research on their efficacy. The current proof-of-concept study assessed the effects of this practice. *Method:* A nonrandomized efficacy trial was conducted with 141 post-9/11 military members and veterans with PTSD to compare usual care alone ($n = 66$) with usual care plus a trained service dog ($n = 75$). The primary outcome was longitudinal change on *The PTSD Checklist* (*PCL*; Weathers, Litz, Herman, Huska, & Keane, 1993), including data points from a cross-sectional assessment and a longitudinal record review. Secondary outcomes included cross-sectional differences in depression, quality of life, and social and work functioning. *Results:* Mixed-model analyses revealed clinically significant reductions in PTSD symptoms from baseline following the receipt of a service dog, but not while receiving usual care alone. Though clinically meaningful, average reductions were not below the diagnostic cutoff on the *PCL*. Regression analyses revealed significant differences with medium to large effect sizes among those with service dogs compared with those on the waitlist, including lower depression, higher quality of life, and higher social functioning. There were no differences in employment status, but there was lower absenteeism because of health among those who were employed. *Conclusion:* The addition of trained service dogs to usual care may confer clinically meaningful improvements in PTSD symptomology for military members and veterans with PTSD, though it does not appear to be associated with a loss of diagnosis.

What is the public health significance of this article?
Despite anecdotal accounts of the benefits of service dogs for military members and veterans with PTSD, limited empirical evidence exists to document their efficacy. This proof-of-concept study suggests that the addition of trained psychiatric service dogs to usual care may improve PTSD symptomology, but not below the level of clinical diagnosis, and contribute to better quality of life and improved social functioning. In their current form, service dogs may confer benefits as a complementary or integrative treatment option among military members and veterans with PTSD.

Keywords: posttraumatic stress disorder, animal-assisted intervention, military veterans, service dogs, human–animal interaction

Posttraumatic stress disorder (PTSD) is a trauma- and stressor-related disorder that adversely affects the mental health and quality of life of a substantial number of United States military members

and veterans (American Psychiatric Association, 2013; Kang, Natelson, Mahan, Lee, & Murphy, 2003; Kulka et al., 1990). The traumatic event of experiencing combat violence associated with military deployment is particularly associated with a risk of developing PTSD, enough so that the recognition of the disorder by modern psychiatry in 1980 was largely brought about as a result of the mental health experiences of military members returning from the Korean and Vietnam Wars (Trimble, 1985). An estimated 6–14% of all Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) military veterans returning from deployments to Iraq or Afghanistan are affected by PTSD (Hoge et al., 2004; Tanielian & Jaycox, 2008). Further, PTSD in this population is linked to negative comorbidities, such as depression (Grieger et al., 2006), alcohol and substance abuse (Jacobson et al., 2008), and suicidal behavior (Kemp & Bossarte, 2013).

The demand remains high for effective PTSD treatment options for military personnel. Current evidence-based treatments for PTSD are effective for many individuals; however, dropout and

nonresponse rates can be up to 50% (Hoge et al., 2014; Mott et al., 2014; Schottenbauer, Glass, Arnkoff, Tendick, & Gray, 2008). These high dropout and nonresponse rates may be explained by barriers to receiving mental health care specific to the military population. Such barriers can range from conflicts with work, school, or family commitments to social stigmata and stereotypes surrounding treatment (Ouimette et al., 2011; Pietrzak, Johnson, Goldstein, Malley, & Southwick, 2009). Further, common symptoms of PTSD and depression such as denial, avoidance, and helplessness can exacerbate the problem (Sayer et al., 2009). It is therefore imperative that we discover and evaluate alternative and complementary therapies (Bomyea & Lang, 2012; Cukor, Spitalnick, Difede, Rizzo, & Rothbaum, 2009). In particular, there is a need to evaluate complementary treatment options for PTSD that encourage engagement and retention while directly or indirectly addressing the comorbidities of the diagnosis (Hoge et al., 2014; Ouimette et al., 2011; Pietrzak et al., 2009).

One of these emerging treatment options is the placement of a specially trained PTSD service dog. Psychiatric service dogs are distinguished from emotional support, therapy, or companion dogs by specifically being trained to perform a variety of commands relevant to the psychiatric needs of the individual, and thus are legally allowed public access under the Americans with Disabilities Act (ADA; Kruger & Serpell, 2010; Tedeschi, Fine, & Helgeson, 2010). These service dogs are thought to mitigate PTSD symptomology by instilling a sense of confidence, safety, and independence in the veteran on a day-to-day basis. Specific tasks can range from responding to and distracting a veteran from panic or emotional distress, "watching" their back in public, and waking them up from nightmares. PTSD service dogs may also alleviate anxious arousal/hypervigilance, avoidance, and feelings of isolation and detachment from others (Taylor, Edwards, & Pooley, 2013; Yeager & Irwin, 2012; Yount, Ritchie, St. Laurent, Chumley, & Olmert, 2013). As a result of the dog's presence, individuals also report increased social confidence, enabling them to leave their houses, interact with friends and strangers, and reintegrate into society (Newton, 2014; Rubenstein, Debboun, & Burton, 2012; Stern et al., 2013; Yount et al., 2013).

Beyond anecdotal and largely retrospective reports, recent systematic reviews of the literature on animal-assisted intervention (AAI) for PTSD have revealed that there is a notable absence of peer-reviewed, empirical studies of the efficacy of service dogs for alleviating PTSD symptoms (Krause-Parello, Sarni, & Padden, 2016; O'Haire, Guérin, & Kirkham, 2015). Therefore, the need to evaluate proof of concept of the therapeutic efficacy of psychiatric service dogs for individuals with PTSD is critical, as this practice increases in its media attention and receives national financial and political attention from governmental organizations such as the United States Department of Veterans Affairs (VA; Saunders et al., 2017). There is a further need for increased public awareness of the role, and evidence-based outcomes of, service dogs for individuals with PTSD.

The objective of this research was to empirically evaluate the effects of service dogs on standardized assessments of PTSD symptomology, depression, quality of life, and social and employment functioning in military members and veterans diagnosed with PTSD. To achieve this objective, we compared two groups: (a) individuals receiving usual care while on the waitlist to receive a service dog and (b) individuals receiving usual care plus the addition of a service dog. Our hypothesis was that participants with PTSD who have been placed with a service dog would show decreased PTSD symptom severity, decreased depression, increased quality of life, and greater overall social functioning compared with those receiving usual care while waiting to receive a PTSD service dog.

Method

Participants

Participants were recruited between November 2015 and February 2016 from a national sample of 304 individuals who applied and were approved to receive a trained PTSD service dog from an accredited service dog provider, K9s For Warriors (Ponte Vedra Beach, FL). Inclusion criteria consisted of (a) military service after September 11, 2001, (b) a clinician referral letter verifying a diagnosis of PTSD or meeting the clinical cutoff of 50 on the validated *PTSD Checklist* (*PCL*; Weathers, Litz, Herman, Huska, & Keane, 1993), (c) honorable discharge or current honorable service, (d) no substance abuse, (e) no conviction of any crime against animals, and (f) no more than two pet dogs currently in the home. Having no prior history with substance or animal abuse was self-reported and confirmed by the organization through a background check. All participants had applied for and been approved to receive a service dog from K9s For Warriors. Approximately half of the sample was on the waitlist to receive a service dog and the other half had already received a service dog.

Usual Care

Both groups (participants on the waitlist and those with a service dog) had unrestricted access to usual care during the course of the study. Unrestricted access means that no constraints were made on participant treatment usage. Participants were not directed toward any specific services, and were allowed to continue to receive intervention services and seek advice from medical professionals as they normally would. No statements were made to participants about their usual care, including continuing or altering treatment services. The frequency of PTSD treatment sessions and perceived improvements were recorded.

Waitlist Group

Participants in the waitlist group had previously submitted applications to K9s For Warriors; they had been on the waitlist between 2 months and 2.4 years ($M = 0.64$, $SD = 0.36$ years). Their applications had already been approved and they were currently waiting until their scheduled date to receive a service dog. When a service dog is received is based on order of application.

Service-Dog Group

Participants in the service-dog group had already been provided their PTSD service dogs from K9s For Warriors. They had been paired with service dogs for 1 month to 4 years ($M = 1.64$, $SD = 1.07$ years). The service dogs (predominantly Labrador Retrievers, Golden Retrievers, and Mixes) were primarily rescued from animal shelters and were selected based on a suite of characteristics,

ranging from physical size to temperament. Participants placed with a service dog attended a 3-week training class on site at K9s For Warriors' headquarters, in which they learned how to live with, care for, and maintain training with their future service dogs before being sent home. Training classes consisted of 6–8 recipients on average, in which all individuals lived in dormitories on site and attended daily, scheduled activities to learn how to work with their service dogs, both in public and private settings. Trained commands for each service dog ranged from basic obedience, including "sit," "stay," "down," and "heel," as well as a variety of commands specifically trained to mitigate PTSD symptoms. Examples of these trained tasks included dogs learning how to alert and react to patients' anxiety or agitation so that panic attacks can be averted, waking their charges from nightmares, leaning against or standing in front of their veterans in social spaces to provide comfort and create personal space, retrieving and reminding patients to take medication, and allowing the veterans to physically brace on the dog for stabilization.

Procedure

The study protocol was approved by the Purdue University Human Research Protection Program Institutional Review Board (IRB Protocol 1504015973). No interactions occurred between the research team and the dogs during the course of the study; therefore a waiver was obtained from the Institutional Animal Care and Use Committee (IACUC).

The study consisted of both cross-sectional and longitudinal assessments. Cross-sectional assessments compared a single time point across the waitlist and service-dog groups at the time of study, and thus directly compared current differences between those with and without service dogs. Longitudinal assessments consisted of previously collected PTSD assessments on file with the service-dog provider, in addition to current PTSD assessments as part of the study. The aim of the longitudinal assessments was to evaluate the trajectory of PTSD symptomology across five time points: (a) baseline (i.e., the time of initial application to the service-dog provider), (b) during the waitlist period, (c) immediately prior to service-dog acquisition, (d) 3 weeks after service-dog acquisition, and (e) at follow-up once the service dog was in the home. The time points collected for each group are presented in Table 1.

Table 1
Longitudinal Assessments

Time point	n	Group	
		Waitlist (n = 66)	Service dog (n = 75)
Waitlist			
(1) Baseline (initial application for service dog)	60	X	X
(2) During waitlist	66	**X**	
(3) Before dog placement	33		X
Service dog			
(4) 3 weeks after dog placement	35		X
(5) Follow-up	74		**X**

Note. Bolded **X** indicates cross-sectional comparison. All other time points were collected from records on file from the service-dog provider.

For time points in the current study, all waitlisted or active recipients from the K9s For Warriors database were sent an initial study packet in the mail, which included information about the study protocol, participation materials, and $20 cash as remuneration for time spent reviewing materials. The mailing response rate was 46% (n = 141 of 304). Following voluntary informed consent, participants completed a battery of standardized, self-report assessments online (94%) or through the mail (6%). They also consented to allow research personnel to access their PTSD assessments on file with the service-dog provider for longitudinal assessments. Upon completion of the study protocol, participants received an additional $20 in remuneration.

Measures

Usual care. Participants' usual care treatment was assessed with a subset of questions from *The American Legion Survey of Patient Healthcare Experiences* (Greenberg, 2014). The questions asked if the participant currently received treatment for PTSD, traumatic brain injury, or MST as well as the frequency of treatment sessions and perceived level of improvement since receiving care on a scale of 1 to 10 (1 = got worse, 5 = no change, and 10 = significantly better).

PTSD. The primary outcome measure of PTSD severity was assessed both cross-sectionally and longitudinally using the *PCL* (Weathers et al., 1993), a widely used 17-item scale based on the three *Diagnostic and statistical manual of mental disorders* (4th ed.; *DSM–IV*) symptom clusters of reexperiencing (Subscale B), avoidance (Subscale C), and arousal (Subscale D). A total score above 50 on a scale of 17 to 85 indicates a positive screening for PTSD for military personnel, with a higher score indicating greater overall symptom severity (Forbes, Creamer, & Biddle, 2001). In addition, a change of 10 points is considered clinically meaningful. Cronbach's αs in the current sample were .85, .92, .92, .93 and .92 for the five assessment points, respectively.

Depression. Because of the multifaceted nature of depression, two outcome measures were enlisted to capture the breadth of self-reported depression characteristics. The *Patient Health Questionnaire (PHQ-9)* is a nine-item tool for assessing depression and is commonly used for screening and diagnosis (α = .89; Kroenke, Spitzer, & Williams, 2003). Cronbach's α for the current sample was .95, indicating high reliability. *The Patient-Reported Outcomes Measurement Information System (PROMIS)* is a another set of highly reliable, precise measures of physical, mental, and social well-being (Cella et al., 2010). The *PROMIS Depression* adult, short-form, eight-item scale was used, with a higher score indicating greater depression. Cronbach's α for the current sample was .84, indicating good reliability.

Quality of Life

The *Veteran's RAND 12-Item Health Survey (VR-12)* is a health-related quality-of-life survey summarized into two scores, a physical component summary and a mental component summary (Iqbal et al., 2007). Higher scores indicate better overall health-related quality of life in either the mental or physical domain.

The *Satisfaction With Life Scale (SWLS)* is a 5-item instrument designed to measure judgments of satisfaction with one's life (Diener, Emmons, Larsen, & Griffin, 1985). A higher score on the

SWLS indicates a higher level of life satisfaction. Cronbach's α for the current sample was .85, indicating good reliability.

The *Bradburn Scale of Psychological Wellbeing (BSPW)* is a 5-item scale that assesses positive well-being (Bradburn, 1969). A higher score on the *BSPW* indicates higher positive well-being. Cronbach's α for the current sample was .54 indicating moderate reliability.

The *Connor Davidson Resilience Scale (CDRS)* is a 25-item scale that measures resilience, or the capacity to change and cope with adversity (Connor & Davidson, 2003). A higher score on the *CDRS* indicates greater resilience. Cronbach's α for the current sample was .92, indicating high reliability.

Social and Work Functioning

Three *PROMIS* scales (Cella et al., 2010) were used to measure overall social functioning. The *PROMIS* Ability to Participate in Social Activities adult short form is an eight-item scale, with higher scores indicating greater social participation. The *PROMIS* Social Isolation adult short form is an eight-item scale, with higher scores indicating greater social isolation. The *PROMIS* Companionship adult short form is a six-item scale, with higher scores indicating a greater perceived level of companionship. Cronbach's αs for the current sample were .93, .91, and .93 for the three scales, respectively.

The *Work Productivity and Activity Impairment Questionnaire: General Health V2.0 (WPAI)* is a six-item questionnaire that assesses the effect of an individual's health problems on his or her ability to work and perform regular activities (Reilly, Zbrozek, & Dukes, 1993). It measures absenteeism and impairment at work, as well as overall activity impairment as a result of one's health.

Data Analysis

Data analyses were performed in two phases. First, demographic, military, and clinical characteristics of participants were compared using independent samples *t* tests for continuous variables and chi-squared tests for categorical variables. Second, to examine differences in outcome measures based on condition (control vs. service dog), we conducted a series of linear mixed effects models. Longitudinal data included participants followed during the waitlist period only ($n = 66$) as well as participants followed during both the waitlist and service-dog periods ($n = 75$). For data with multiple time points per participant (i.e., for the *PCL* Weathers et al., 1993), we used hierarchical linear modeling (Raudenbush & Bryk, 2002) to examine differences in outcomes over time (within subjects). For data with a single time point per participant (all other outcome measures), we compared the waitlist group with the service-dog group using linear regression (Seber & Lee, 2012) to examine differences in outcome as a function of condition (between subjects). In all models, sociodemographic variables (i.e., age, sex, marital status) were included as additional control covariates. Effect sizes are reported using Cohen's *d*, with 0.20, 0.50, and 0.80 indicating small, medium, and large effect sizes, respectively (Cohen, 1992).

Results

Demographic Characteristics

A total of 141 participants with PTSD completed the study, including 66 receiving usual care while on the waitlist and 75 receiving usual care while paired with a service dog. Demographic and military characteristics are displayed in Table 2. The sample was predominantly male ($n = 110$, 78.0%) with an average age of 37.1 years ($SD = 8.3$). Most participants had a significant other, spouse, or partner ($n = 111$, 78.7%) with an average of 3.1 people living in the household, including the participant ($SD = 1.6$). A subset of the sample ($n = 55$, 39.0%) required mobility aids. Approximately one third of the sample had completed a college degree or higher ($n = 47$, 33.3%). The most common military branch was the Army ($n = 93$, 66.0%), with deployments to both Iraq ($n = 90$, 63.8%) and Afghanistan ($n = 60$, 42.6%) and the highest proportion of participants in the E4–E5 grade ($n = 74$, 52.5%). There were no significant differences between groups (service dog vs. control) on any demographic variable, except for marital status. A higher proportion of participants were married in the service-dog group, compared with the control group, $\chi^2(1, 141) = 8.23$, $p = .004$, therefore marital status was included as a control variable in all models. At baseline (time of application to the service-dog provider), there were no significant differences in *PCL* scores ($p = .732$), indicating that both groups were similar in initial PTSD symptom severity.

Usual Care

Greenberg's (2014) *The American Legion Survey of Patient Healthcare Experiences* was used to ascertain usual care treatment participation across groups, scores for which are displayed in Table 3. These included PTSD treatments for those without service dogs. There were no significant differences between groups in the number of participants currently receiving treatment ($p = .940$, $d = 0.07$) nor in how frequently they received treatment sessions per year ($p = .482$, $d = 0.05$), indicating that both groups were roughly equivalent in their dosage of usual care services. However, compared with the waitlist group, participants with service dogs reported a significantly higher overall level of perceived improvement from their treatment, with a medium effect size ($p = .007$, $d = 0.55$), indicating that those with service dogs perceive greater improvement from the same dosage of usual care treatment services.

Service-Dog Outcomes

The longitudinal assessment compared PTSD symptomology within individuals, including up to three time points while on the waitlist and up to two time points with a service dog. Results of longitudinal *PCL* scores are reported in Table 4. Compared with baseline (initial application to the service-dog provider), there were no significant differences on the *PCL* at any point during the waitlist period (during waitlist, $p = .202$; end of waitlist, $p = .504$); however, there were significant reductions on the *PCL* at both points during the service-dog period, with large effect sizes (after 3 weeks, $p < .001$, $d = -2.11$; follow-up, $p < .001$, $d = -1.03$). Estimated reductions from baseline were between

Table 2
Demographic and Clinical Characteristics of Participants Across Groups

Variable	Group			Group difference		
	Waitlist (*n* = 66)	Service dog (*n* = 75)	Total (*N* = 141)	*t*	χ^2	*p*
Age, *M* (*SD*)	37.3 (8.1)	37.0 (8.5)	37.1 (8.3)	.206		.837
Gender, *n* (%) male	50 (75.8)	60 (80.0)	110 (78.0)		.368	.544
Marital status, *n* (%) single	21 (31.8)	9 (12.0)	30 (21.3)		8.232	.004[b]
People in household, *M* (*SD*)[a]	3.0 (1.5)	3.2 (1.8)	3.1 (1.6)	−.663		.508
Using a mobility aid, *n* (%)	27 (40.9)	28 (37.3)	55 (39.0)		.189	.664
Traumatic brain injury comorbidity, *n* (%)	13 (19.7)	13 (17.3)	26 (18.4)		.130	.718
Education, *n* (%)					2.259	.688
High school or GED	4 (6.1)	8 (10.7)	12 (8.5)			
Some college	37 (56.1)	45 (60.0)	82 (58.2)			
Bachelor's degree	16 (24.2)	13 (17.3)	29 (20.6)			
Master's degree	8 (12.1)	7 (9.3)	15 (10.6)			
Advanced graduate work or PhD	1 (1.5)	2 (2.7)	3 (2.1)			
Military Branch, *n* (%)					.700	.873
Air Force	6 (9.1)	8 (10.7)	14 (9.9)			
Army	45 (68.2)	48 (64.0)	93 (66.0)			
Marines	8 (12.1)	8 (10.7)	16 (11.3)			
Navy	7 (10.6)	11 (14.7)	18 (12.8)			
Military grade, *n* (%)					4.289	.368
E1–E3	3 (4.5)	6 (8.0)	9 (6.4)			
E4–E5	35 (53.0)	39 (52.0)	74 (52.5)			
E6–E7	17 (25.8)	20 (26.7)	37 (26.2)			
E8–E9	3 (4.5)	6 (8.0)	9 (6.4)			
Officer	8 (12.1)	3 (4.0)	11 (7.8)			
Unknown	0 (.0)	1 (1.3)	1 (.7)			
Deployment, *n* (%)						
Iraq	43 (65.2)	47 (62.7)	90 (63.8)	.759	.094	.759
Afghanistan	27 (40.9)	33 (44.0)	60 (42.6)	.711	.137	.711
PTSD Checklist M (*SD*), baseline[c]	70.2 (8.7)	69.4 (8.8)	69.7 (8.7)	.344		.732
Re-experiencing (B) subscale, *M* (*SD*)	20.3 (3.5)	19.6 (3.3)	19.8 (3.7)	.729		.469
Avoidance (C) subscale, *M* (*SD*)	28.0 (3.9)	28.5 (3.9)	28.3 (3.9)	−.493		.624
Arousal (D) subscale, *M* (*SD*)	22.0 (3.4)	21.3 (3.2)	21.6 (3.3)	.752		.455

Note. GED = general education diploma; PTSD = posttraumatic stress disorder.
[a] Including the veteran. [b] Marital status was included as a control variable in all models. [c] Baseline score at time of initial application to service dog provider.

11.54 and 21.36 points on average, which is larger than the standard cutoff of 10 points, indicating a clinically meaningful change in PTSD symptomology.

The cross-sectional, single time point assessment compared functioning between individuals receiving usual care while on the waitlist (control) to those receiving usual care in addition to a service dog (treatment). Results of linear regression models are reported in Table 5. Compared with the control group, participants with a service dog demonstrated significantly lower scores for PTSD symptomology with a medium effect size on the PCL (*p* < .001, *d* = −0.66). There was no significant correlation between baseline *PCL* score and change over time (to the cross-sectional

Table 3
Usual Care PTSD Treatment Participation Across Groups

Measure	Group		Group difference		
	Waitlist (*n* = 66)	Service dog (*n* = 75)	*b*	*t*	*d*
Receiving PTSD treatment, *n* (%)	53 (80.3)	58 (77.3)	.04	.08	.07
Treatment sessions per year, *M* (*SD*)[a]	39.0 (38.7)	41.9 (78.0)	7.87	.71	.05
Perceived level of improvement since receiving care, *M* (*SD*)	5.0 (1.9)	6.0 (1.7)	.98**	2.76	.55

Note. PTSD = posttraumatic stress disorder; *b* = standardized regression coefficient (reference category: service dog); *d* = Cohen's *d* effect size.
[a] Among those currently receiving treatment. Rated on a scale from 1 to 10, 1 (*got worse*), 5 (*no change*), 10 (*significantly better*).
** *p* < .01.

Table 4
Longitudinal Comparison of PTSD Checklist (PCL) Scores Over Time Within Participants

Condition	n	Total PCL			Re-experiencing (Subscale B)			Avoidance (Subscale C)			Arousal (Subscale D)		
		M (SD)	b	d	M (SD)	b	d	M (SD)	b	d	M (SD)	b	d
Waitlist													
Baseline (application for dog)[a]	60	69.7 (8.7)	—		19.8 (3.4)	—		28.3 (3.9)	—		21.6 (3.3)	—	
During waitlist[a]	66	66.3 (11.7)	-2.60	-.32	18.4 (4.6)	-1.19	-.35	27.1 (5.0)	-.10	-.27	20.9 (3.4)	-.43	-.34
Before dog placement[b]	33	70.7 (10.7)	1.65	.11	19.7 (3.6)	.01	-.03	29.3 (4.8)	1.26	.23	21.7 (3.4)	.39	.04
Service dog													
3 weeks after dog placement[b]	35	47.9 (11.7)	-21.36***	-2.11	14.6 (4.1)	-5.17***	-1.38	18.2 (5.0)	-9.94***	-2.25	15.1 (4.3)	-6.25***	-1.43
Follow-up[a]	74	58.2 (13.1)	-11.54***	-1.03	16.5 (4.3)	-3.28***	-.85	23.2 (6.2)	-5.17***	-.98	18.5 (4.3)	-3.08***	-.90

Note. PTSD = posttraumatic stress disorder; b = unstandardized coefficient (reference category: baseline), d = Cohen's d effect size. [a] Data from cross-sectional between-group comparison at a single time point. [b] Training consisted of a 3-week period on site at the service-dog provider.
*** $p < .001$.

survey time point) in the service-dog group, $r = -.193$, $p = .238$, indicating that initial PTSD symptom severity was not associated with service-dog outcomes on the *PCL*.

Participants with service dogs exhibited significantly lower depression symptomology with a large effect size on the *PROMIS* Depression ($p < .001$, $d = -0.91$) and a medium effect size on the PHQ-9 ($p < .001$, $d = -0.74$). Quality of life was higher among those with service dogs, with medium to large effect sizes on the *VR-12* Mental ($p < .001$, $d = 0.66$), BSPW ($p < .001$, $d = 0.81$), SWLS ($p = .003$, $d = 0.59$), and CDRS ($p < .001$, $d = 0.55$). No significant differences were reported on the *VR-12* Physical ($p = .908$, $d = -0.03$). Compared with the control group, participants with service dogs reported significantly higher social functioning with medium effect sizes, including a greater ability to participate in social activities (*PROMIS* Social Activities: $p < .001$, $d = 0.70$), lower social isolation (*PROMIS* Social Isolation: $p < .001$, $d = -0.63$), and higher perceived companionship (*PROMIS* Companionship: $p = .043$, $d = 0.52$). There were no significant differences in the proportion of individuals who were employed between groups (WPAI: $p = .451$, $d = -0.20$); however, for those who were working, individuals with service dogs reported a lower proportion of work missed because of health with a large effect size ($p = .019$, $d = -0.89$) and a lower rate of activity impairment with a small effect size ($p = .049$, $d = -0.27$), but no significant differences in their level of impairment while at work overall ($p = .051$, $d = -0.69$) or because of health ($p = .453$, $d = -0.29$).

Discussion

The purpose of this study was to examine the preliminary efficacy of trained service dogs for military members and veterans with PTSD, compared with a usual care waitlisted control group. The results indicated that, compared with usual care alone, the provision of trained service dogs was associated with clinically significant reductions in PTSD symptoms as measured with the *PCL*. However, average scores were not lower than the diagnostic cutoff of 50 on the *PCL*, indicating that in their current form, service dogs do not appear to be associated with a loss of diagnosis. This research presents proof-of-concept that, in combination with usual care, service dogs may reduce perceived PTSD symptoms among military members and veterans. These findings offer support for initial efficacy, but require further research to evaluate their integration with evidence-based treatments.

Changes in military PTSD symptomology are consistent with the emerging body of evidence suggesting that the presence of animals influences socioemotional functioning in nonmilitary PTSD populations (Bert et al., 2016; Hart, 2006; Wells, 2009). These findings map roughly onto the diagnostic criterion for PTSD related to negative alterations in cognition and mood. Studies have demonstrated that the presence of a dog can reduce feelings of social estrangement (Allen & Blascovich, 1996; Rintala, Sachs-Ericsson, & Hart, 2002; Wood, Giles-Corti, & Bulsara, 2005), motivate social participation (Barak, Savorai, Mavashev, & Beni, 2001; Fairman & Huebner, 2001; Taylor et al., 2013), produce positive emotions (Collins et al., 2006), and reduce negative emotions (Souter & Miller, 2007). It is possible that these effects are elicited by the addition of a service dog for individuals with PTSD, and that they either indirectly or directly influence pathways to

Table 5

Comparison of Outcomes Between Groups at a Cross-Sectional Time Point

	Group		Group difference		
Measure	Waitlist ($n = 66$), M (SD)	Service dog ($n = 75$), M (SD)	b	t	d
Depression					
PROMIS depression–SF 8a	28.8 (7.4)	22.1 (7.2)	−7.07***	−5.68	−.91
PHQ-9	17.9 (5.3)	14.0 (5.4)	−4.33***	−4.62	−.74
Quality of life					
VR-12 mental health	24.6 (9.7)	31.1 (10.0)	6.84***	3.87	.66
VR-12 physical health	37.1 (12.2)	36.7 (10.8)	−.24	−.12	−.03
BSPW	−2.7 (2.0)	−.8 (2.5)	1.86***	4.72	.81
SWLS	15.0 (5.8)	19.1 (8.1)	3.58**	3.00	.59
CDRS	18.6 (7.3)	23.0 (8.5)	4.89***	3.67	.55
Social					
PROMIS ability to participate in social activities–SF 8a	16.4 (5.7)	20.8 (6.8)	5.11***	4.83	.70
PROMIS social isolation–SF 8a	30.6 (6.3)	26.6 (6.6)	−4.41***	−3.95	−.63
PROMIS companionship–SF 6a	19.0 (5.3)	22.0 (6.4)	2.00*	2.05	.52
Work					
WPAI–Employed, n (%)	18 (24.7%)	22 (33.3%)	.30	.76	−.20
WPAI–Absenteeism[a]	27.6 (35.2)	5.0 (8.4)	−22.77*	−2.46	−.89
WPAI–Impairment at work (Health)[a]	52.7 (30.9)	44.4 (25.0)	−7.33	−.76	−.29
WPAI–Impairment at work (Overall)[a]	64.4 (29.7)	44.8 (27.4)	−19.99†	−2.03	−.69
WPAI–Activity impairment[a]	62.9 (27.6)	55.5 (26.7)	−9.43*	−1.99	−.27

Note. b = standardized regression coefficient (reference category: service dog); d = Cohen's d effect size; PCL = *PTSD Checklist*; PROMIS = Patient-Reported Outcomes Measurement Information System; SF = short form; PHQ-9 = Patient Health Questionnaire–9; VR-12 Mental Health = Veteran's Rand 12-Item Health Survey; BSPW = Bradburn Scale of Psychological Well-being; SWLS = Satisfaction with Life Scale; CDRS = Connor–Davidson Resilience Scale; WPAI = Work Productivity and Activity Impairment Questionnaire: General Health Problem, V2.0.
[a] Among veterans who are employed.
† $p < .10$.   * $p < .05$.   ** $p < .01$.   *** $p < .001$.

reductions in PTSD symptomology. Indeed, secondary outcomes revealed that relative to usual care alone, individuals with service dogs exhibited significant differences with medium to large effect sizes in some of these domains. Specifically, those with service dogs showed differences with respect to depression (lower symptomology), quality of life (increased mental, but not physical, quality of life; increased psychological well-being, life satisfaction, and resilience), social functioning (increased ability to participate in social activities, lower social isolation, greater feelings of companionship), and some differences with respect to work functioning (no differences in employment level or impairment at work, but lower absenteeism and activity impairment because of health).

Historically, service dogs have been partnered with individuals with physical or ambulatory disabilities by assisting with mobility tasks (Winkle, Crowe, & Hendrix, 2012). The provision of service dogs to address psychosocial needs has emerged in recent years (Tedeschi et al., 2010). The efficacy of service dogs for participants with PTSD in this sample appears to be tailored to mental health, rather than physical health outcomes. For example, on the *VR-12* quality of life item, individuals with a service dog scored significantly higher on the Mental Health component of the measure, but the Physical Health component did not differ between groups. Similarly, on the WPAI Work Productivity measure, the Overall Health Impairment at Work component was significantly lower among those with service dogs, but the Physical Impairment at Work component was not different between groups. These characteristics suggest that compared with usual care alone, trained service dogs for PTSD

are related to primarily psychosocial differences rather than purely physical differences.

Concern has been expressed that some individuals may seek animal-assisted interventions in place of evidence-based treatments, putting them at risk for not receiving effective services (Anestis, Anestis, Zawilinski, Hopkins, & Lilienfeld, 2014). The results of this study contradict this assertion; they suggest that participants with service dogs are receiving levels of PTSD treatment (usual care) similar to those on the waitlist (>75% in both groups). Thus, in the current sample, participants did not employ service dogs to substitute treatment as usual, but instead added service dogs to complement treatment as usual. The only difference was that participants with service dogs perceived a higher level of improvement (20% higher on average) from the same dosage of usual care treatment. Though significantly higher than the waitlist group, the service-dog group perceived only slightly more than "no change" from their usual care treatments. It is unclear why participants with service dogs would perceive more improvement from the same level of treatment; however, it may be a result of co-occurring increased feelings of resilience and ability to participate in social activities, which could create a more engaging space for the implementation of evidence-based practices.

The findings from this preliminary study also suggest that the outcomes from service dogs are comparable to those of evidence-based practices for PTSD. The results indicate that on average, the provision of a service dog in combination with treatment as usual contributed to a clinically significant reduction in PTSD symptoms, but not below a conservative diagnostic cutoff of 50 on the

self-reported *PCL*. These findings mirror a review of randomized clinical trials of evidence-based treatments for PTSD, where mean posttreatment scores also remained at or above the clinical cutoff for PTSD (e.g., (Monson et al., 2006; Steenkamp, Litz, Hoge, & Marmar, 2015). Within-group treatment effect sizes from this research are also similar to frequently studied psychotherapies for military PTSD (Steenkamp et al., 2015; Watts et al., 2013). For example, pre–post effect sizes for cognitive processing therapy and prolonged exposure (Cohen's *d* range = 0.78–1.10) are comparable to service dogs in the current study at the follow-up time point in the longitudinal *PCL* analysis (Cohen's *d* = 1.03; Steenkamp et al., 2015).

Limitations

Outcomes from the current study should be interpreted with consideration of some important limitations. First, the control condition was usual care, which can include participants receiving no treatment at all. It is unknown what types of treatments participants were receiving; thus although they received the same number of sessions per year, the types of sessions may have varied across groups. The control condition also does not account for the potential effects of nonspecific treatment factors such as attention or novelty. This limitation is particularly salient with respect to the first three weeks of the treatment period, which include training on site at the service-dog provider with a small cohort of fellow service-dog recipients. The active components and effects of this unique time period are a critical area for further investigation as the in-person training session may act as a form of treatment in itself with or without the service-dog component being present (Yount et al., 2013). However, following the introduction of the service dog into the home, there are minimal nonspecific treatment effects related to attention from a therapist or treatment group, given that the only component of the intervention is the dog itself.

The goal of this study was to conduct an ecologically valid preliminary efficacy study to determine the effects of a service dog compared with unrestricted access to usual care, which included evidence-based treatments. Based on the current results, further studies can be developed to enlist an active comparison that accounts for these limitations as well as possible placebo effects (Furukawa et al., 2014). The specific roles and usage of trained dog commands should also be investigated to empirically define the treatment and evaluate fidelity and best practices.

Second, allocation to treatment group was not randomized. Results may have been due to natural maturational changes over time, rather than the service dog. Given the multiyear long waitlists associated with service dogs for PTSD, it was not possible for ethical reasons to change order on the waitlist to randomize for this study. Third, the sample was self-selected as a group of individuals who had a demonstrated interest in obtaining a service dog. Recruitment consisted of contacting individuals who had already applied for or received a service dog. Thus, the results should be interpreted as generalizable only to those who are amenable to service dogs. At a minimum, our findings provide initial support that service dogs do not seem to have aversive outcomes for those who are motivated to get them.

Finally, the results include standardized self-report, which may be subject to expectancy biases (Cook, 2010). It is possible that baseline measurements were inflated at the time of applying to the service-dog provider to justify the need for a service dog. Inflation of symptoms represents an interesting shift from the documented denial and minimization among many military personnel, who underrate their PTSD symptoms to avoid a diagnosis (Davidson & Connor, 1999). If military personnel are willing to exaggerate symptoms to receive a diagnosis and be paired with a service dog, this may evidence the perceived value of the service dog despite the associated stigma. To address biases in self-reported symptomology, the incorporation of a validated diagnosis of PTSD from a private or community health provider was enlisted to authenticate baseline *PCL* values; however, a more objective measure of PTSD severity such as the Clinician-Administered PTSD scale (Blake et al., 1995) would have been beneficial.

Future studies should enlist physiological and blinded assessments to obtain additional objective indicators of change over time and between groups rather than relying on standardized self-report alone. Individual differences in evidence-based treatment receptivity and concurrent diagnoses should also be explored. Further studies should incorporate a comprehensive intake to define usage of different types of usual care. This will enable evaluation of how the provision of a service dog may change participation in usual care. It will also foster evaluation of the best ways to incorporate service dogs as an adjunct to evidence-based treatment.

Conclusion

This pragmatic, longitudinal effectiveness trial has provided initial evidence that, compared with usual care alone, military members and veterans with trained service dogs show lower PTSD symptomology, reduced depression, and increased social participation. Individual differences influencing short term and long term efficacy remain to be tested. Ongoing research is needed to determine the most effective ways to incorporate service dogs into evidence-based usual care as well as how to enhance service-dog best practices to achieve maximal clinical change.

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