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Vets Prevail Online Intervention Reduces PTSD and Depression in Veterans With Mild-to-Moderate Symptoms

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Objective: Despite heightened rates of depression and posttraumatic stress disorder (PTSD) among in Iraq/Afghanistan veterans, the majority of distressed veterans will not receive mental health care. Overcoming barriers to mental health services requires innovative approaches to broaden the reach of evidence-based treatment. The current study examined the efficacy and acceptability of an innovative and dynamic online cognitive–behavioral therapy intervention for PTSD and depression called Vets Prevail. ***Method:*** A randomized clinical trial conducted between 2011 and 2013 assessed changes in PTSD and depression in veterans with mild-to-moderate distress. Veterans randomized to Vets Prevail (n = 209) were aged 34.2 ± 7.6 years, mostly male (81.3%), and nonminority (73.7%). Veterans randomized to adjustment as usual (n = 94) were aged 34.7 ± 8.9, mostly male (81.9%), and White (67.0%). Veterans completed the PTSD Checklist—Military Version and the Center for Epidemiological Studies Depression scale (10-item version) postintervention and at 12-week follow-up. ***Results:*** Veterans in the Vets Prevail condition reported significantly greater reductions in PTSD, $t(250) = 3.24$, $p = .001$ ($M_{reduction} = 5.51$, $SD = 9.63$), and depression, $t(252) = 4.37$, $p = .001$ ($M_{reduction} = 2.31$, $SD = 5.34$), at 12-week follow-up compared with veterans in the adjustment as usual condition (PTSD $M_{reduction} = 1.00$, $SD = 7.32$; depression $M_{reduction} = 0.48$, $SD = 4.95$), with moderate effect sizes for PTSD (Cohen's $d = 0.42$) and depression (Cohen's $d = 0.56$). Exploratory analysis shows that Vets Prevail may be effective regardless of combat trauma exposure, gender, and ethnic minority status. ***Conclusion:*** Vets Prevail circumvents many barriers to care and effectively addresses the dire mental health needs of veterans.

What is the public health significance of this article?
This study describes one of the first interactive online programs (Vets Prevail) offered anonymously to veterans. The study shows that Vets Prevail is effective for treating mild-to-moderate symptoms of PTSD and depression and may be effective for veterans with high combat exposure, female veterans, and veterans from ethnic minority groups.

Keywords: veterans, posttraumatic stress disorder (PTSD), depression, online interventions, treatment

Rates of posttraumatic stress disorder (PTSD) and depression in Iraq/Afghanistan veterans are nearly 2.5–5 times higher than their civilian counterparts, affecting 11.5–18.0% of all returning soldiers (Hoge et al., 2004; Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Estimates of distress are even greater among Veterans Affairs (VA)-enrolled veterans, affecting 17.4–36.9% (Seal et al., 2009). Correspondingly, the suicide rate is twice that of civilians: Twenty-two veterans take their lives each day, resulting in more than 8,000 deaths every year (Kemp & Bossarte, 2012). The estimated 8,000 suicides per year are higher than the total number of veterans lost in direct war conflict since 2004 (Brinkerhoff, 2013). Veterans with subthreshold PTSD are at risk for worsening psychological distress and even suicide (Dickstein, Walter, Schumm, & Chard, 2013; Jakupcak et al., 2011), and veterans with threshold and subthreshold PTSD benefit from cognitive–behavioral psychotherapy (Dickstein et al., 2013). Despite high rates of distress and the availability of efficacious face-to-face treatments, between 60% and 75% of distressed veterans do not seek treatment (Blais, Tsai, Southwick, & Pietrzak, in press; Hoge et al., 2004). There are several barriers to care among veterans, including logistical and access barriers, such as not being able to take time off from work, not knowing where to access care

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(Hoge et al., 2004; Vogt, 2011), and stigma (Blais & Renshaw, 2013; Blais et al., in press).

Several evidenced-based cognitive–behavioral therapy (CBT) interventions for PTSD and depression are available to veterans through the Department of Veterans Affairs for free or low cost during the first 5 years after deployment (U.S. Department of Veterans Affairs, 2014). Such interventions, which focus on behavioral activation, changing unhealthy cognitions, and regulating painful or interfering emotions, have been shown to reduce distress in the vast majority of patients who complete therapy (Bisson et al., 2007), and prior meta-analyses examining treatment efficacy for PTSD indicate that CBT interventions produce the highest treatment effect sizes (Bradley, Greene, Russ, Dutra, & Westen, 2005; Mello, Silva, Donat, & Kristensen, 2013).

The extant research on barriers to care in veterans suggests that veterans need more flexible treatment options that they can access on their own time and one that protects their privacy, thereby circumventing stigma and access barriers. Although face-to-face CBT interventions are effective in ameliorating postdeployment distress, such interventions may be unavailable or inaccessible for those who experience barriers to care. In addition, given the high need for treatment in this population, some treatment facilities are overburdened and understaffed, resulting in long wait times that may discourage help-seeking (Veterans Affairs Office of Inspector General, 2012). For some young people, particularly veterans, web-based information and interaction may be a preferred treatment environment (Sayer et al., 2010; Simon-Arndt, Hurtado, & Partriarca-Troyk, 2006). Online interventions, such as web-based psychotherapy, are a promising way to overcome barriers to care. Meta-analyses examining the efficacy of online CBT interventions for depression, generalized anxiety, panic disorder, and social phobia in civilians have demonstrated strong treatment efficacy with moderate-to-large effect sizes (Andrews, Cuijpers, Craske, McEvoy, & Titov, 2010; Mureşan, Montgomery, & David, 2012). Such interventions may be particularly helpful for veterans. Indeed, a therapist-assisted web-delivered self-management for PTSD program reduced PTSD symptoms in post-9/11 veterans (Litz, Engel, Bryant, & Papa, 2007).

Few treatment protocols for postdeployment distress, particularly PTSD, have been developed for veterans that are offered anonymously online. Although there are some web-assisted interventions aimed at treating psychological difficulties among veterans, these programs do not use dynamic graphics, interactive programming, or personalized programming. One of the newest online programs (Afterdeployment.org; Belsher et al., 2015) offers a mostly self-administered intervention, but still involves telephone contact with care managers throughout treatment and has not yet been fully examined for efficacy. Most existing web-assisted interventions for veterans with PTSD that have been tested for efficacy are therapist-based and require substantive mental health professional-level involvement and are therefore neither anonymous nor self-directed (Hirai & Clum, 2005; Interapy, Lange et al., 2003; DE-STRESS, Litz et al., 2007). One of the pioneering programs currently available, developed by Litz and colleagues (DE-STRESS, 2007), uses a one-size-fits-all web design and incorporates static links to educational materials and worksheets. Because these programs still rely on a mental health professional with direct patient contact and do not use dynamic or interactive web-based intervention, we do not yet know whether such an engaging online intervention would be effective for veterans.

To address the unique needs of veterans who experience barriers to face-to-face therapy as well as the dearth of engaging web-based programs, Vets Prevail offers a dynamic treatment that is both personalized and anonymous. Specifically, Vets Prevail leverages a next-generation behavioral health platform developed by Prevail Health Solutions (Chicago, IL) in collaboration with the National Science Foundation. Unlike other therapist-assisted online programs, Vets Prevail is an interactive, dynamic web-based intervention for postdeployment distress that delivers CBT over seven interactive sessions. The program's unique blend of personalized media lessons, real-time interactions with a community of other veterans, and gaming platform engage reluctant care-seekers (see detailed program description in the Method section). The purpose of the current study was to examine whether participation in Vets Prevail produced clinically significant reductions in PTSD and depression compared with an adjustment as usual (AAU) control condition among mildly to moderately distressed veterans.

Method

Participants

Participants were non–active-duty veterans who served since September 11, 2001. Veterans who were at least 18 years of age, spoke and read English, were able to use computers without assistance, had regular access to a cell phone and broadband Internet, and met criteria for at least mild-to-moderate distress based on scores on screening assessments (described in more detail below) were eligible for the randomized clinical trial (RCT). Veterans who were at risk for suicide, as evidenced by a past suicide attempt(s), psychiatric hospitalization during the past 5 years, and/or started or altered the dose of their psychiatric medication within 10 days prior to enrolling in study, as well as those reporting higher than moderate distress, were excluded from the study. Veterans who reported higher than moderate distress on screening measures were provided with feedback and encouraged to seek face-to-face intervention at the nearest VA facility. They were subsequently provided with the address of the nearest facility and information for the national suicide hotline for veterans. We made the decision to exclude individuals with these risk factors to minimize further risk of harm to a vulnerable population given that Vets Prevail is a fully web-based intervention with no assistance from a therapist other than emergency crisis backup.

Recruitment and Randomization

Veterans who visited the Iraq and Afghanistan Veterans Association (IAVA) website could follow a link directing them to a secure website where they could navigate to a secure online website and complete a screening consent form and a study screening measure that assessed demographic characteristics, PTSD, and depression symptoms. E-mails containing this link were sent to potential participants via the IAVA listserv. Veterans who were deemed initially eligible for the RCT were contacted via phone by a study coordinator to confirm relevant demographic information and inclusion/exclusion criteria and were provided a more thorough explanation of the RCT. Veterans who were interested in

participating in the RCT were subsequently enrolled, completed informed consent for participation in the RCT, and randomized.

During the recruitment period, web estimates show that approximately 14,000 e-mails were sent, approximately 1,700 individuals clicked the online link, 628 completed the eligibility screening, 475 were initially determined to be eligible, and 303 were confirmed eligible and randomized. Figure 1 shows the recruitment and randomization procedure. Because the eligibility screening process consisted of an automated online procedure, specific data regarding the reason for exclusion from the study are not available. Of the 475 veterans who were initially determined to be eligible based on their responses to the online screening process, 157 could not be reached by phone, 12 indicated that they were no longer interested, and an additional three individuals were excluded because they had altered the dose of their psychiatric medications within the past 10 days. These three individuals were given the option to enroll in the study at a later time but could not be reached by phone for follow-up.

This randomized, waitlist-controlled clinical trial used an allocation ratio of 2:1, Vets Prevail versus AAU. Computer-generated randomization assigned participants to either Vets Prevail or AAU. Roughly twice as many participants were randomized to the Vets Prevail intervention for two reasons: (1) to provide adequate power for analyses of subgroup differences (i.e., gender, race, combat exposure) as possible moderators of associations being examined and (2) to minimize loss of power due to attrition (Dumville, Hahn, Miles, & Torgerson, 2006).

General Procedure

The trial was monitored by the institutional review board at Rush University Medical Center. The trial was initiated in 2011

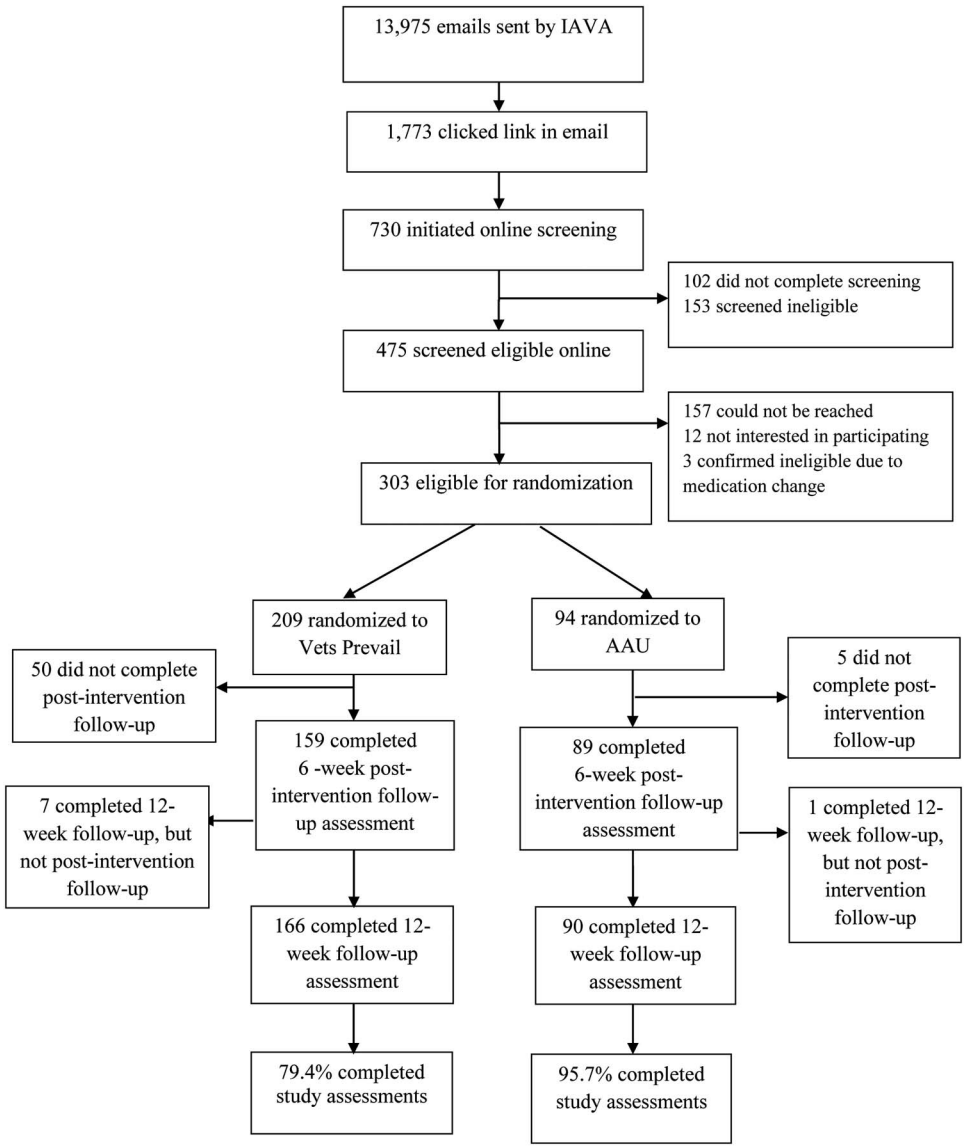

Figure 1. Screening, enrollment, randomization, and study participation.

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using the online IAVA and Vets Prevail interfaces and ended in 2013. Baseline measures of PTSD and depression were collected postrandomization. Participants completed all outcome measures of PTSD and depression postintervention (at 6 weeks) and again at 12-week follow-up online via Surveymonkey. Participants were provided with compensation for each survey completed. Participants in both groups were compensated up to $150 for their time in completing baseline and follow-up assessments throughout the course of the trial. Payments in the form of personal checks were mailed to participants in the amount of $25 upon completion of the baseline assessment, $50 upon completion of the 6-week postintervention assessment, and $75 upon completion of the 12-week follow-up assessment.

Measures

Participants completed a demographic questionnaire that assessed age, gender, race/ethnicity, education level (at least some/no college), marital status (partnered/not partnered), and employment status (employed or in school at least part time vs. not). PTSD symptom severity was assessed using the PTSD Checklist—Military Version (PCL–M; Weathers, Huska, & Keane, 1994), a 17-item Likert-scored inventory of PTSD. Scores on the inventory range from 17 to 85, with higher scores indicating greater distress. Veterans had to report at least mild but not severe PTSD as evidenced by scores of 24–61. Clinical levels of PTSD were evidenced by scores of 35 or higher, which has a sensitivity and specificity of .68 and .92 for detecting PTSD, respectively (Bliese et al., 2008), and such scores are the suggested PTSD cutoff for veterans presenting to a primary care clinic or to a Department of Defense screening (National Center for PTSD, Department of Veterans Affairs, 2014). Given that there are no established cutoff scores to indicate "mild" or "just-below clinical levels," we selected a minimum score of 24 as an informed estimate of a reasonable criterion for inclusion. Cronbach's alphas for the PCL–M at baseline, postintervention, and 12-week follow-up were .93, .91, and .93, respectively.

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Depression symptom severity was assessed using the Center for Epidemiological Studies Depression scale—10 (CES-D–10; Radloff, 1977). Scores on the inventory range from 0 to 30, with higher scores indicating greater depressive symptoms. Veterans had to report at least mild but not severe depression as evidenced by scores of 8–25. Some suggest using a cutoff of 10 or higher to denote clinical depression (Andresen, Malmgren, Carter, & Patrick, 1994). As cutoffs on the 10-item version have not been established for Iraq/Afghanistan veterans, we opted to use this same cutoff. Similar to the PCL–M, there are no established cutoff scores to indicate "mild" or "just-below clinical levels" of depression using the CES-D–10; thus, a minimum score of 8 was selected as an informed estimate as a reasonable criterion for inclusion. Cronbach's alphas for the CES-D at baseline, postintervention, and 12-week follow-up were .81, .84, and .84, respectively. Combat experience was assessed via three questions developed specifically for this study. Items constructed to have high salience for veterans asked whether they (1) were in danger of being killed or injured "many times," (2) caused injury to another person, or (3) suffered an injury during service. Veterans were categorized as having low combat exposure if they endorsed "yes" to only one of the above experiences. Veterans were categorized as having higher combat exposure if they endorsed "yes" to at least two of the three experiences above.

Interventions

Vets Prevail. Vets Prevail comprises seven online CBT lessons, a community message board, and peer chat support. Vets Prevail is both interactive and individually tailored using participant-provided sociodemographic information such as race/ethnicity, employment, educational background, and relationship status to inform lesson examples and session content. Veterans using Vets Prevail progress through the seven lessons at their own pace with a minimum of 2 days required to lapse prior to beginning the next lesson. Each lesson reinforces cognitive–behavioral principles and strategies for managing PTSD symptoms and depressed mood. Specifically, lessons explain how veterans' thoughts, feelings, and behaviors affect mental health symptoms and functioning. Vets Prevail assists veterans in identifying their problematic patterns of thinking and behaving while prompting veterans to set specific goals, engage in adaptive coping behaviors, and problem solve. Veterans are prompted to complete CBT activities called "to-dos" at several time points before proceeding to the next lesson and are eligible to earn "reward points" for completing these activities. The program does not involve a specific trauma-focused component. For information about specific session content, see Table 1. Figure 2 shows a screen capture of the web display, but as is the nature of dynamic web-based programming, this amounts to showing a screen shot from a video game or movie. The actual program is interactive, includes voice and directed options, and is warm and engaging, using key aspects of motivational treatment.

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Significant innovation informed the development of Vets Prevail. First, the program is fully web-based, with peer counselors playing a supportive role to build a strong social support component into treatment. The program emphasizes behavioral "action" strategies to combat avoidance, given that staying active is a highly salient message for veterans. Cognitive and emotional aspects of the CBT lessons follow from emphasis on active coping. Vets Prevail appreciates that some individuals are "readers" and others are "listeners." Therefore, the program uses friendly, encouraging voice narration to guide veterans through the program. Vets Prevail begins by eliciting information about age, gender, ethnicity, marital status, level of education, and employment status. Using these answers, the program creates a personally relatable "avatar" for each user (i.e., the avatar develops to be a caricature of the participant). The program also requests information regarding specific stressors including romantic relationships, friendships, educational concerns, financial stress, and substance abuse. Storylines and vignettes are customized with this information to frame cognitive–behavioral session content that is relevant to the user. This type of program tailoring overcomes the one-size-fits-all approach seen in existing web-based interventions (e.g., Hirai & Clum, 2005), adding a feature that is inherent in in-person treatment.

Advanced web programming such as this is designed to have the appearance of an interactive game website rather than an online "journal" with static links to worksheet repositories. Vets Prevail is designed similarly to attractive, sophisticated "gaming" websites. Gaming principles are built in and integrated throughout Vets Prevail, creating a system designed to be reinforcing for veterans.

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Table 1
Session Content of Vets Prevail

Lesson	Content/objective
1. Introduction to cognitive–behavioral approaches to symptom reduction and to Vets Prevail	Session describes posttraumatic stress disorder and depression from a cognitive–behavioral therapy perspective and discusses ways to intervene and change unhelpful thoughts, behaviors, and emotions. Session also describes how Vets Prevail will work with veterans to decrease their distress using cognitive–behavioral therapy techniques.
2. Understanding behaviors	Session focuses on helping veterans understand the link between pleasant activities and positive mood, unpleasant behavior and negative mood. Helps veterans understand that it is important to have a sense of pleasure from activities and to experience a sense of mastery over their behavior.
3. Monitoring activities and modifying unproductive behaviors	Session focuses on helping veterans develop a balanced lifestyle that incorporates time: for work/school, friends/family, hobbies; to take care of their physical health; to create a healthy living space; to pursue spiritual/cultural/intellectual needs. An activity-scheduling tool helps veterans manage their time.
4. Identifying cognitive distortions	Session focuses on helping veterans identify maladaptive thought patterns and how thoughts relate to mood and behavior. Session introduces veterans to common thinking errors (e.g., mind reading, all-or-nothing thinking).
5. Modifying thoughts	Session teaches veterans how to modify unhelpful thoughts using an electronic thought record. The thought record walks veterans through the situation, corresponding emotions, automatic thoughts, rationale explanation, and outcome of their thoughts.
6. Understanding emotions	Session helps veterans understand the importance of emotion. Distinguishes between emotional experience versus emotional reasoning and encourages veterans to react to emotions rationally. Session introduces veterans to a feelings log, where they can record the intensity, valence, and duration of their emotions to help them understand how their emotions impact their mood. The session also helps veterans practice awareness of their environment and triggers to negative emotions.
7. Relaxation	Session teaches veterans how to deal with distressing emotions using relaxation techniques, including mindful breathing and progressive muscle relaxation.

For example, each lesson is presented as a "level" with a number of structured tasks and exercises to complete to earn rewards points. In addition to rewards points, participants advance in "rank" as they progress through the program and their rank is displayed alongside their selected username when signed on to the community message board. Achieving higher rank also means more points. Veterans can redeem rewards points for modest financial incentives (up to $10 per user) made possible through charitable donations. These small rewards, as well as the opportunity to achieve rank within the online community network, serve as innovative strategies to bolster engagement with the community of veterans and reinforce active coping, as seen in behavioral intervention research (Sutherland, Christianson, & Leatherman, 2008).

Vets Prevail is run by other veterans, which works to further decrease stigma and increase veterans' confidence and comfort in using a program operated by peers who understand them. For example, in addition to the seven CBT lessons, participants are prompted to use the community message board. The community message board promotes veteran community-building by allowing participants to post and answer questions and to rate answers based on their usefulness. The message board is available 24 hr per day and is monitored by peer chat coaches twice each day. Veterans are also encouraged to chat with peer coaches.

The peer chat portal is managed by trained military veterans. When chatting with a peer, the veteran is identified only by the username that he or she selects. All personal identifying information on the user is stored separately. Peer chat coaches are provided with a clear protocol to provide supportive guidance and "cheerleading" through the program, and not to offer counseling. Training in counseling is purposely not included in the protocol given that Vets Prevail emphasizes an exclusively peer-to-peer interaction rather than a professional interaction. Training involves emphasizing the limits of their interaction, being supportive, encouraging veterans to keep moving forward in the program, and encouraging veterans to seek professional help if the individual feels overwhelmed or highly distressed or if the online program is not enough to meet their needs. The peer chat portal emphasizes bidirectional communication in which both participants and peer coaches can initiate chats during times when the chat rooms are staffed. Veteran peer coaches introduce themselves at the beginning of the first lesson and continue to guide participants and address content issues (e.g., how to complete a homework assignment) as well as logistic issues (e.g., how to log on or redeem points). In addition to providing emotional support and building rapport, peer chat coaches are instructed to identify signs of distress, confusion, or decreased motivation when interacting with veterans. Importantly, the peer chat portal serve to safeguard participants against risk because coaches are instructed to refer participants to mental health services in the participants' geographic area. The chat interface allows peer coaches to conduct a warm, automated handoff with the VA's suicide crisis line when necessary. There are also features allowing the peer to freeze a user account for 24 hr and send them an automatic message to call 911 if the situation warrants. A licensed clinical psychologist or psychiatrist is on-call to facilitate any crisis process.

AAU condition. Participants randomized to the AAU group were instructed to "go about their lives as they normally do over the next 3 months." These participants functioned as the waitlist comparison group and did not take part in any portion of the Vets Prevail program. Upon completion of the 12-week assessment, participants in the AAU control group were offered the opportunity enroll in the non-RCT version of Vets Prevail. Risk of negative impact for participants was considered when select-

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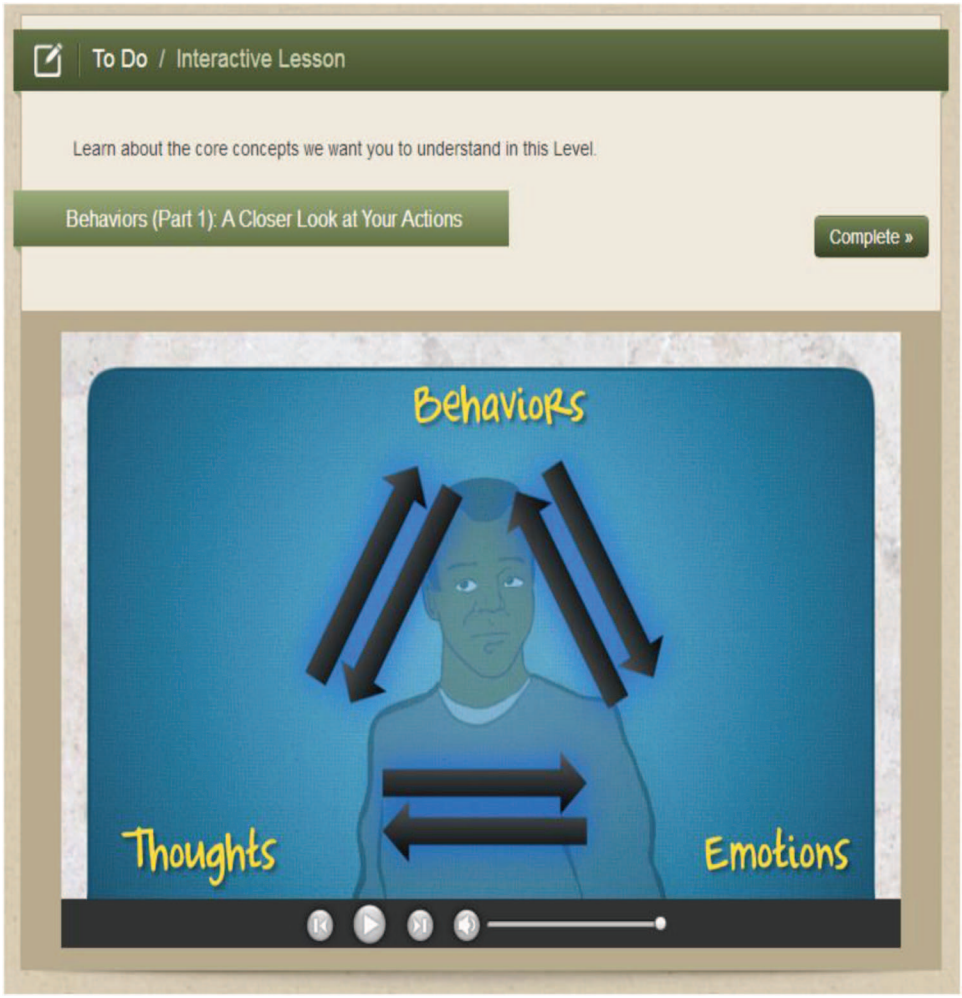

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Figure 2. Screen capture of Vets Prevail web display. See the online article for the color version of this figure.

ing a waitlist control condition. Individuals who were severely distressed were not impacted because these individuals were excluded from participation, and they were encouraged to seek treatment at their nearest VA facility. Risk of negative impact for moderately distressed participants was determined to be low given the availability of resources offered through the VA and the IAVA. For example, the IAVA, from which the sample was recruited, already offers a host of educational and self-help materials as well as resources for veterans with psychological symptoms.

Analytic Plan

Differences in the demographic and psychological distress profiles of veterans in the Vets Prevail condition and AAU control group were tested using chi-square and *t* tests. We modeled changes in PTSD and depression symptom severity over time as a function of study condition using mixed models with full information maximum likelihood. Analyses followed an intent-to-treat approach such that all participants were included in the analyses regardless of whether they completed the intervention (in the Vets Prevail group). Moreover, mixed models with full information maximum likelihood is a preferred method of handling missing data due to incomplete outcome data at the 6-week and 12-week follow-up assessments (Lane, 2008). To examine treatment effects across gender, race, and combat exposure level, we used mixed models with interactions (Time × Condition). Significant Time × Condition interactions were evidenced by a significant λ value, which indicates that there was a significant change in symptom reduction across groups. Mean differences at 6-week and 12-week follow-up were assessed using *t* tests. Statistical significance was set at $p \leq .05$. Effect sizes of symptom reduction by treatment condition were calculated using Cohen's *d*.

Results

Participant Characteristics

We randomized 209 veterans (68.97%) to Vets Prevail and 94 veterans (31.03%) to AAU. Demographic and psychological distress characteristics of the full sample are shown in Table 2. Nearly T2

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Table 2
Demographic and Baseline Assessment of Outcome Measures

Variable	Vets Prevail	AAU	Test of difference
Male, *n* (%)	170 (81.34)	77 (81.91)	$\chi^2(1) = 0.01$
Mean (*SD*) age (years)	34.22 (7.61)	34.67 (8.88)	$t(301) = 0.46$
Race, *n* (%)[a]			
Nonminority (White)	154 (73.68)	63 (67.02)	$\chi^2(1) = 1.12$
Asian	9 (4.31)	3 (3.19)	$\chi^2(1) = 0.20$
Black	13 (6.22)	8 (8.51)	$\chi^2(1) = 0.56$
Hispanic	29 (13.88)	18 (19.15)	$\chi^2(1) = 1.47$
American Indian	4 (1.91%)	1 (1.06)	$\chi^2(1) = 0.28$
Partnered, *n* (%)	113 (54.07)	55 (58.51)	$\chi^2(1) = 0.67$
Some college, *n* (%)	124 (59.33)	60 (63.83)	$\chi^2(1) = 0.73$
Employed/student, *n* (%)	166 (79.43)	74 (78.72)	$\chi^2(1) = 0.00$
No combat exposure, *n* (%)	75 (35.9)	27 (29.0)	$\chi^2(1) = 1.35$
Low combat exposure, *n* (%)	70 (33.5)	35 (37.6)	$\chi^2(1) = 0.49$
High combat exposure, *n* (%)	64 (30.6)	31 (33.3)	$\chi^2(1) = 0.22$
Mean (*SD*) PCL–M			
Baseline	40.03 (11.19)	37.46 (11.48)	$t(301) = -1.84$
6-week follow-up	35.95 (10.93)	39.21 (11.18)	$t(241) = 2.20^{*}$
12-week follow-up	34.06 (11.05)	38.99 (12.17)	$t(250) = 3.24^{***}$
Above clinical cutoff for PTSD: Baseline, *n* (%)	124 (59.33)	50 (53.1)	$\chi^2(1) = 1.00$
Mean (*SD*) CES-D–10			
Baseline	12.45 (5.36)	12.40 (5.36)	$t(300) = -0.08$
6-week follow-up	11.11 (5.52)	12.17 (5.08)	$t(245) = 1.48$
12-week follow-up	9.86 (4.91)	12.93 (6.08)	$t(252) = 4.37^{***}$
Above clinical cutoff for depression: Baseline, *n* (%)	140 (67.0)	60 (63.83)	$\chi^2(1) = .18$

Note. AAU = adjustment as usual; PTSD = posttraumatic stress disorder; PCL–M = PTSD Checklist—Military Version; CES-D–10 = Center for Epidemiological Studies Depression scale (10-item version).
[a] All tests examined specified race versus all others (e.g., Asian vs. non-Asian).
* $p \leq .05$. ** $p \leq 01$. *** $p \leq .001$.

all participants (97.01%; $n = 293$) deployed at least one time and the majority reported at least some exposure to combat (66%; $n = 200$). More than half of the sample (57.4%; $n = 174$) reported levels of PTSD above the clinical cutoff on the PCL–M and two thirds (66%; $n = 200$) reported levels of depression above the clinical cutoff on the CES-D–10. Thus, a sizable minority (roughly 40%) of the sample entered the study with mild levels of psychological distress, which allowed us to examine the efficacy and the effect size of the intervention for individuals with symptom levels ranging from mild to moderate. There were no significant differences between demographic or psychological distress variables of veterans randomized to Vets Prevail or AAU ($ps > .05$).

Attrition

Nearly 76% and 95% of veterans randomized to Vets Prevail and AAU completed postintervention follow-up, respectively. Nearly 80% and 96% of veterans randomized to Vets Prevail and AAU completed 12-week follow-up, respectively. Veterans who completed the RCT were more likely to have been randomized to AAU, $\chi^2(1) = 13.18$, $p < .001$, compared with veterans who did not complete the RCT. No other differences on variables of age, gender, race, marital status, college education, employment status, or baseline distress variables were observed ($ps > .05$).

Uptake of Vets Prevail

The vast majority (73%) of veterans randomized to Vets Prevail completed five or more lessons, 27 (13%) completed between two and four lessons, 16 (5.3%) completed only one lesson, and 14 (4.6%) completed no lessons. Participants completed, on average, the same number of lessons regardless of PTSD and depression symptom severity at baseline. In other words, there were no differences in the average number of lessons completed between participants who entered the study with clinical levels of PTSD and depression compared with those who entered the study with subclinical levels of PTSD and depression ($ps > .05$). For those who completed all seven lessons, most completed them within 4–6 weeks of enrollment. Outcome data from all veterans randomized to Vets Prevail were included in the analyses regardless of the number of lessons they completed, following an intent-to-treat approach. Given that most participants completed the majority of sessions, this variable was not included in the mixed models.

Participants received an average of $6 cash value in exchange for rewards points. Participants were prompted to access a special portal via a navigation tab called "My Rewards" and once they redeemed their points, they received an Amazon.com gift card sent to their e-mail. Although data regarding frequency of use of the community message boards and peer chat for each participant were not tabulated in this study, web estimates showed that 387 questions were posted to the community boards by trial users between October 2012 and October 2013. Estimates show that 1,359 responses to questions from other users were logged. The average number of questions posted per user was 1.9 and the average number of responses received was 6.5. These data indicate a robust amount of activity on the community message boards. There were

no adverse incidents requiring a warm hand-off to the VA's crisis line (or mental health professional) for veterans showing signs of increased distress or suicidality.

Reductions in PTSD

We found a significant Time × Condition interaction, AQ: 3 $\lambda = -3.42$, $t(257) = -5.82$, $p < .001$. Plotting this interaction across baseline, postintervention, and 12-week follow-up demonstrated that veterans in the Vets Prevail condition exhibited a greater decline in PTSD symptom severity over time compared F3 with veterans in AAU (see Figure 3). Significant mean differences were observed postintervention, $t(241) = 2.20$, $p = .03$, Cohen's $d = 0.29$, and 12-week follow-up, $t(250) = 3.24$, $p = .001$, Cohen's $d = 0.42$. Average changes in PTSD symptom severity for participants in the Vets Prevail condition from baseline to postintervention and 12-week follow-up were 3.69 ($SD = 9.05$) and 5.5 ($SD = 9.63$), respectively, which was significantly greater, $t(241) = 4.55$, $p = .001$, than scores at postintervention ($M_{reduction} = 1.64$, $SD = 8.01$) and 12-week ($M_{reduction} = 1.00$, $SD = 7.32$) follow-up observed in the AAU condition. Twenty-two percent and 27.7% of veterans evidenced symptom reductions of at least 10 points on the PCL–M at postintervention and follow-up, respectively, compared with 7.1% and 8.1% of participants in the AAU condition at postintervention and follow-up, respectively.

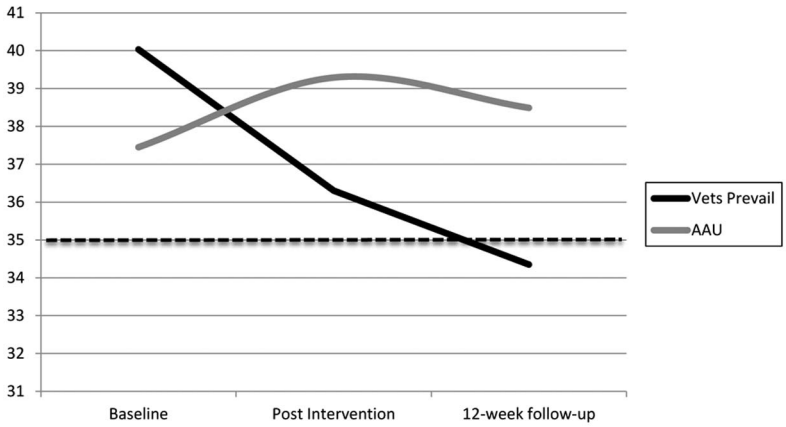
Reductions in Depression

We found a significant Time × Condition interaction, $\lambda = -1.48$, $t(262) = -4.34$, $p < .001$. Plotting this interaction across baseline, postintervention, and 12-week follow-up demonstrated that veterans in the Vets Prevail condition exhibited a greater decline in depressive symptom severity over time compared with veterans in AAU (see Figure 4). The mean difference F4 observed postintervention was nonsignificant ($p > .05$). A significant mean difference was observed at 12-week follow-up, $t(252) = 4.37$, $p = .001$, Cohen's $d = 0.56$, with average change in symptom severity falling below the 10-point cutoff for clinical levels of depression. The average change in depression symptom severity for participants in the Vets Prevail condition from baseline to 12-week follow-up was 2.31 ($SD = 5.34$), which was significantly greater, $t(251) = 4.06$, $p = .001$, than scores at follow-up observed in the AAU condition ($M_{reduction} = 0.48$, $SD = 4.95$).

Symptom Remission Analyses

Among participants who reported clinical levels of PTSD at baseline ($n = 174$), significantly more participants in the Vets Prevail condition (30.6%; $n = 38$) experienced symptom remission to a subclinical level of less than 35 on the PCL–M by 12 weeks compared with participants (12%; $n = 6$) in the AAU condition, $\chi^2(1) = 6.69$, $p < .01$. Furthermore, individuals in the Vets Prevail condition who completed more online lessons were significantly more likely to experience symptom remission to below clinical levels compared with those who completed fewer lessons. Specifically, individuals who experienced symptom remission completed an average of 6.11 lessons versus those who did not experience symptom remission who completed an average of 5.19 lessons ($p < .05$).

We found a similar pattern of results for depression. Of those who reported clinical levels of depression at baseline ($n = 200$), more participants in the Vets Prevail condition (22.9%; $n = 32$) experienced symptom remission to a subclinical level of less than 10 points on the CES-D–10 by 12 weeks compared with participants in the AAU condition (16.6%; $n = 10$), and this difference approached significance, $\chi^2(1) = 3.08$, $p = .079$. In the Vets



		Baseline	6 Weeks	12 Weeks
Vets Prevail	PCL-M Total Score *Estimated Mean (SE)*	40.03 (0.78)	36.30 (0.82)	34.35 (0.83)
AAU	PCL-M Total Score *Estimated Mean (SE)*	37.45 (1.16)	39.29 (1.18)	38.49 (1.19)

Figure 3. Follow-up assessments of posttraumatic stress disorder (PTSD) symptoms based on full information maximum likelihood estimates. Est = estimates; AAU = adjustment as usual; PCL–M = PTSD Symptom Checklist—Military Version. Dotted line denotes clinically significant symptoms of PTSD.

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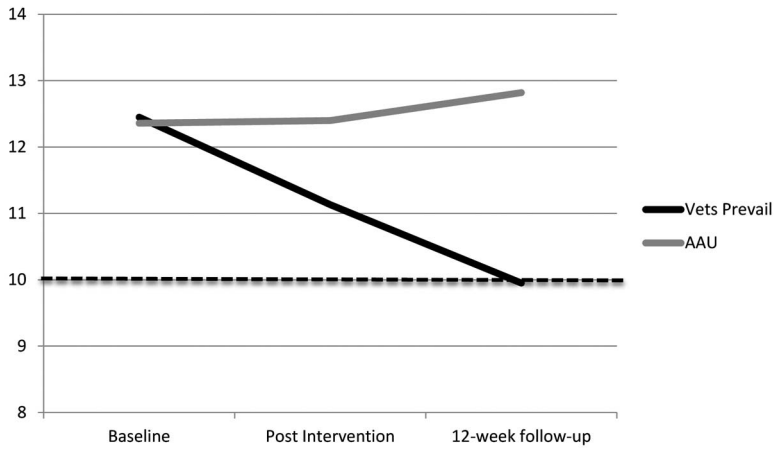

		Baseline	6 Weeks	12 Weeks
Vets Prevail	CESD-10 Total Score *Estimated Mean (SE)*	12.45 (0.37)	11.13 (0.41)	9.95 (0.40)
AAU	CESD-10 Total Score *Estimated Mean (SE)*	12.36 (0.56)	12.40 (0.56)	12.82 (0.56)

Figure 4. Follow-up assessments of depression symptoms based on full information maximum likelihood estimates. AAU = adjustment as usual; Est = estimates; CES-D–10 = Center for Epidemiological Studies Depression scale (10-item version). Dotted line denotes clinically significant symptoms of depression.

Prevail group, completion of more lessons was also associated with an increased likelihood of symptom remission. Specifically, individuals who experienced symptom remission from depression completed an average of 6.30 lessons versus those who did not experience symptom remission who completed an average of 5.15 lessons ($p < .01$).

Exploratory Moderator Analyses

We conducted a set of exploratory analyses to examine possible treatment differences across gender, race (White vs. non-White), and levels of combat exposure. Post hoc analyses revealed no significant gender, race, or combat exposure differences in reductions of PTSD symptoms based on study condition ($ps > .05$).

Discussion

Participation in Vets Prevail was associated with significant reduction in PTSD and depression symptom severity with moderately sized effects for PTSD (Cohen's $ds = 0.29–0.42$) and depression (Cohen's $d = 0.56$). These effect sizes provide support for the efficacy and usefulness of Vets Prevail for individuals with moderate as well as mild levels of psychological distress, although the inclusion of veterans with subclinical levels of distress likely attenuated the size of treatment effect. The proportion of participants reporting symptom remission as measured on the PCL–M was consistent with an earlier RCT targeting PTSD (Eftekhari et al., 2013), although rates of reliable clinical change in PTSD symptoms was lower than observed in some earlier studies (Monson et al., 2006; Schnurr et al., 2003). Treatment gains, particularly decreases in PTSD symptoms, were observed shortly after participation began in the Vets Prevail condition, and these gains showed sustained effect at 3 months postbaseline. Vets Prevail, in its online format, circumvents many of the perceived barriers to psychotherapy, such as logistical or access barriers. Moreover, given that Vets Prevail can be completed at the veterans' leisure and in the privacy of homes or offices, it is possible that Vets Prevail may also circumvent the stigma associated with help-seeking (Blais & Renshaw, 2013; Blais et al., in press).

Among those who endorsed clinical levels of PTSD at baseline (i.e., ≥35 on the PCL–M), participants who were randomized to Vets Prevail were more likely to experience symptom remission to below clinical levels compared with participants randomized to AAU. We observed a similar trend for participants who endorsed clinical levels of depression at baseline (i.e., >10 on the CES-D–10), whereby those in the Vets Prevail group were more likely to report below clinical levels of depression at follow-up compared with the AAU group, with effects trending toward statistical significance. This finding makes sense given that Vets Prevail was designed to target PTSD symptoms specifically and supports the notion that the intervention is useful for treating depression symptoms. Moreover, completion of more lessons was associated with a higher likelihood of symptom remission to below clinical levels for both PTSD and depression, providing evidence of a dose–response effect.

Given that a large proportion of our sample (approximately 40%) comprised individuals with mild symptoms at the start of the study, it is important to place findings in context where they may be generalized to a broader population. Analysis of participants in the Vets Prevail condition revealed no distinction between veterans with clinical versus subclinical levels of psychological distress

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in terms of average number of lessons completed. Although it was beyond the scope of the current study to tease apart specific components of Vets Prevail that led to better treatment engagement or symptom reduction (see limitations for additional discussion), our results demonstrate that the intervention appears to be as useful and engaging for veterans with both mild and moderate levels of distress.

Exploratory analyses suggest that Vets Prevail may be effective at reducing distress across several military subgroups including female veterans and racial/ethnic minorities. According to 2012 estimates, females and ethnic minorities compose 15% and 30% of the current military, respectively (U.S. Department of Defense, 2012). Female veterans experience several unique logistical and access barriers, including scheduling conflicts and discomfort receiving care in a male-dominated medical facility (Owens, Herrera, & Whitesell, 2009; Vogt et al., 2006). Similarly, minority veterans report unique barriers to care and worse outcomes when they feel that their therapist does not appreciate their ethnic differences (Sohn & Harada, 2008). Female and minority veterans may be able to overcome these difficulties with face-to-face therapy through the Vets Prevail program. At the same time, our sample comprised 18.5% females and 29.1% minorities. It is possible that moderation analyses of gender and race on symptom reduction and treatment condition were underpowered.

Given the nearly daily advances with the Internet, it is perhaps not surprising that only one prior web-assisted trauma intervention did not involve participant interactions with either trained mental health professionals or supportive care staff (Hirai & Clum, 2005), and that study used a static one-size-fits-all intervention that delivered noninteractively via the Internet. Three other web-assisted studies (Belsher et al., 2015; Lange et al., 2003; Litz et al., 2007) involved mental health professionals or other clinical staff who had appreciable contact with participants. Thus, although these might reduce therapist burden, they are not scalable to the extent that an actual web-based program is. Moreover, only the study by Lange et al. (2003) included numbers of participants beyond pilot or proof of concept parameters. Given our web-based, interactive design and large sample size, this study essentially constitutes the first web-based, interactive intervention that has been studied in an RCT design.

Vets Prevail may be particularly helpful for veterans in rural areas. Forty percent of Iraq/Afghanistan veterans live in rural areas (Weeks et al., 2004), making it difficult to easily access care through the Department of Veterans Affairs or other treatment centers. Indeed, veterans living in rural areas are more likely to report higher PTSD and lower quality of life than their urban veteran counterparts (Whealin et al., 2014), suggesting that these veterans could greatly benefit from care that is easily accessible. Additional research is needed to examine the efficacy of Vets Prevail in veterans who live in rural communities.

The use of Vets Prevail has the potential to reduce the significant financial burden associated with PTSD, depression, and face-to-face mental health care. In 2008, the 2-year estimated financial burden associated with PTSD and depression was $6.2 billion (Tanielian & Jaycox, 2008). The high rate of distress also produces longer than average wait times for appointments and treatment. Although VA guidelines mandate that veterans be scheduled for a psychological intake within 2 weeks of referral or their request for an appointment, evidence demonstrates that these guidelines are difficult to meet. Indeed, some estimates have suggested that veterans have waited nearly 4 times as long for an evaluation (Veterans Affairs Office of Inspector General, 2012). Although a detailed cost-comparison analysis was not the focus of this study, a simple comparison of Vets Prevail's cost per user (scaled to a large population) is estimated to be $15 to $20 compared with an average estimated cost of $7,033.00 to deliver prolonged exposure therapy in the VA setting (Le, Doctor, Zoellner, & Feeny, 2014). Given the online format, Vets Prevail can also be administered to veterans without long wait times.

Limitations of this study should be considered. First, as a fully automated self-management web intervention, tracking uptake of all program components is challenging and information is limited. Although we tracked the number of lessons each participant completed, and indeed this was related to symptom remission, information regarding each participant's use of peer chat, community message boards, completion of structured "to-dos" within each lesson, or application of these skills after the completion of the lessons was not possible to tabulate with the current platform. Future research will be needed to tease apart these components and the extent to which they influence outcomes. For example, participants in the Vets Prevail group continued to experience symptom improvement following the 6-week assessment, and it is possible availability of peer chat and community online support was a strong driver of this outcome; this will need to be tracked in future studies to examine within-person effects. Future dismantling studies will also need to examine the unique contribution of specific gaming aspects of the intervention, including rewards points, very modest cash rewards, and achieving higher ranks as individuals progress through the program. It is noteworthy that retention in the intervention was higher in Vets Prevail than in other web-based interventions (e.g., Brief et al., 2013), which may be attributable to these factors, especially given that web estimates show a relatively strong use of the community message boards. In fact, programs that emphasize a strong social support component along with interactive programming may inform a future wave of effective web-based interventions. Future studies are needed to examine which components are potentially most impactful.

Second, sample characteristics and procedures limit the generalizability of results. Our sample was limited to veterans experiencing mild-to-moderate distress, so it is unclear how efficacious Vets Prevail would be in a group of severely distressed veterans. For example, we do not know whether the strong social support component or interactive features of Vets Prevail would be effective without at least minimal aid from a trained therapist. In the current trial, the decision to exclude individuals with severe distress was based on minimizing risk to a vulnerable population. However, Vets Prevail may be effective and useful for this population and should be explored in future studies with appropriate safety supports in place to determine whether an online program has the potential to effect meaningful change. The high rate of attrition from an initial online screening procedure to actual enrollment means that we cannot easily generalize findings to all veterans. Attrition at assessment time points is also a limitation. Attrition at assessment points was much higher for the Vets Prevail condition than the AAU condition (79.4% vs. 95.7%) and it is unclear why this occurred. To prevent bias in interpretation of the data, our analyses accounted for missing data using full information maximum likelihood mixed models. Finally, veterans were

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provided with monetary compensation to participate in the trial. Providing veterans with monetary compensation may have encouraged participation among veterans who may not have opted to participate had compensation not been provided (Cleary, Walter, & Matheson, 2008). However, providing compensation is typical in these clinical trials.

Also, although the reductions in PTSD and depression were significant and reduced average distress scores below clinical cutoffs, the levels of distress were such that further treatment might prove helpful. In this regard, our effect sizes were lower than other therapist-assisted online treatments (e.g., Litz et al., 2007; Spence et al., 2014), but nearly identical to in-person psychotherapy with veterans in controlled trials for PTSD (for review, see Goodson et al., 2011) and moderate in size (PTSD $d = 0.42$; depression $d = 0.56$).

Notwithstanding these limitations, Vets Prevail is an effective intervention for reducing PTSD and depression in Iraq/Afghanistan veterans. Rates of retention were higher in this RCT compared with other RCTs using web-delivered interventions (e.g., Brief et al., 2013; Litz et al., 2007; van Straten, Cuijpers, & Smits, 2008). As mild to moderate PTSD and depression is likely, if untreated, to become increasingly debilitating and distressing over time, Vets Prevail may also be seen as a preventive, early intervention that could greatly decrease pain, suffering, and financial costs for individuals and society that would otherwise take a multidecade toll.

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