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Predictors of Treatment Discontinuation During Prolonged Exposure for PTSD

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Background: Post-traumatic stress disorder (PTSD) is a highly prevalent and impairing condition for which there are several evidence-based psychotherapies. However, a significant proportion of patients fail to complete a 'sufficient dose' of psychotherapy, potentially limiting treatment gains. **Aims:** The present study investigated predictors of premature treatment discontinuation during a trial of prolonged exposure (PE) therapy for PTSD. **Method:** Combat veterans with PTSD were recruited to participate in a randomized clinical trial of PE delivered in person or via telehealth technologies. Of the 150 initial participants,

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61 participants discontinued the trial before the completion of eight sessions (of an 8–12 session protocol). Treatment condition (telehealth or in person) and factors identified by prior research (age, combat theatre, social support, PTSD symptoms) were tested as predictors of treatment discontinuation. **Results:** A Cox proportional hazards model (a subtype of survival analysis) was used to evaluate predictors of treatment discontinuation. Disability status and treatment condition were identified as significant predictors of discontinuation, with a noted disability and use of telehealth demonstrating higher risk. **Conclusions:** The present findings highlight the influence of telehealth and disability status on treatment discontinuation, while minimizing the role of the previously identified variables from studies with less sensitive analyses.

Keywords: PTSD, drop-out, discontinuation, veteran, telehealth, disability

Introduction

Post-traumatic stress disorder (PTSD) is a highly impairing mental health condition, with prevalence estimated at 8.3% in the general population (Kilpatrick et al., 2013), and as high as 38.7% in military and veteran samples (Miller et al., 2013). PTSD is associated with reduced quality of life and difficulty in various domains of functioning, including employment, memory, physical health, and social support and relationships (Boscarino, 2004; Burriss et al., 2008; King et al., 2006b; Monson et al., 2009; Schnurr et al., 2009). Other difficulties associated with PTSD include increased severity of pain (Otis, Keane and Kearns, 2003), suicide (Gradus et al., 2010), diagnostic co-morbidity with depression and anxiety (Gros et al., 2012), and substance use disorders (McCauley et al., 2012). The two-year direct cost to society for PTSD has been estimated at between 4 and 6.2 billion dollars (2007) in recent combat veterans alone, with higher estimates with the inclusion of indirect costs, such as loss in productivity (Tanielian and Jaycox, 2008).

Given the high prevalence of psychiatric symptomatology, severe impairment, and large societal costs associated with PTSD, emphasis has been placed on the development, refinement, and dissemination of evidence-based psychotherapies for PTSD. Several evidence-based psychotherapies are effective in treating PTSD, including cognitive behavioural treatments such as prolonged exposure therapy for PTSD (PE) and cognitive processing therapy for PTSD in veterans and military personnel (CPT), as well as effective alternatives such as eye movement desensitization and reprocessing (Foa et al., 2007, 2008; Gros et al., 2011a; Resick et al., 2007; Shapiro and Solomon, 1995). These psychotherapeutic interventions are administered by highly trained providers for 8–16 weekly sessions, guided by a treatment protocol that includes specific session-by-session psychoeducation, skills training, and between-session practices. The two primary mechanisms of these treatments are exposure techniques, involving both situational and imaginal exposures, and cognitive restructuring (Gros et al., 2011a).

Despite their efficacy and effectiveness, a large proportion of participants discontinue, or drop out of, evidence-based psychotherapies for PTSD prematurely, potentially preventing the required time and practice necessary for sustained symptom remission. Across studies, a pooled discontinuation rate of 36.0% has been reported, with an average of 42.0% discontinuation in clinical care settings and 28.0% discontinuation in clinical trials (Goetter et al., 2015). Although discontinuation rates have been reported in many outcome studies (Goetter et al., 2015), there have been far fewer studies to specifically investigate predictors of treatment discontinuation in either in-patient (Szafranski et al., 2014, 2016) or out-patient settings (Erbes et al., 2009; Garcia et al., 2011; Gros et al., 2011b, 2013b; Szafranski et al., 2016). Across the few studies

to date, findings are inconsistent, with each study highlighting different variables that predict treatment discontinuation (e.g. age and combat theatre, disability status, marital status and social support, employment, and PTSD symptom severity).

There are several explanations for the inconsistent pattern of findings in the PTSD treatment discontinuation literature. First, there may be slight differences in the evidence-based psychotherapies delivered in these studies. However, the majority of investigated interventions all fall within the umbrella of cognitive behavioural therapies, and contain overlapping treatment components (Gros et al., 2011a). Moreover, discontinuation rates do not differ between psychotherapy protocols (Goetter et al., 2015). A second explanation for inconsistent findings relates to differences in how discontinuation is defined across studies (Schottenbauer et al., 2008). In some studies, participants are considered to have discontinued psychotherapy if they did not complete 100% of the protocol-based number of sessions (Gros et al., 2013b). In contrast, other studies have created their own definitions for discontinuation based on number of sessions completed (Tuerk et al., 2010), clinical judgement of the treating provider (Garcia et al., 2011), or chart review of past patients (Erbes et al., 2009). In addition, discontinuation is typically dichotomized, further complicating explanations for potential differences between studies and reducing power to find differences between those who discontinue and those who remain in treatment. For example, patients discontinuing treatment after two out of 12 sessions are typically coded the same as patients leaving treatment after seven out of 12 sessions (Goetter et al., 2015).

The present study sought to address these gaps in the treatment discontinuation literature in veterans receiving an evidence-based psychotherapy for PTSD in a clinical trial testing treatment delivery method (i.e. PE delivered via telehealth technology *vs* in-person procedures). The parent trial demonstrated non-inferiority between in-person and telehealth delivery of a number of predictors (Acierno et al., 2017). Given the Veterans Affairs (VA) guidelines of eight sessions as a minimally effective dose (*Veterans Health Administration Handbook* 1160.01, amended 16 November 2015), the study protocol targeted 8–12 sessions and we therefore investigated predictors of treatment discontinuation up through session 8 of the protocol. Survival analyses bypass the need to define discontinuation dichotomously, thereby allowing us to capture predictors of discontinuation with greater statistical power and sensitivity (Singer and Willett, 1993). Discontinuation predictors included in our models were based on the existing literature (Goetter et al., 2015), as well as factors unique to the procedures of the present study (i.e. treatment delivery). As each of these predictors have been supported in separate studies (Goetter et al., 2015), no specific hypotheses were made to favour a predictor(s) over the others.

Method

Participants

One hundred and fifty participants were recruited via referrals from medical staff at a large southeastern Veterans Affairs Medical Center (VAMC) and its affiliated community-based out-patient clinics, as well as self-referrals resulting from flyers, billboards, health fairs, online advertisements and media announcements. Eligibility was determined by an in-person intake assessment delivered by masters-level clinicians. Combat veterans and military personnel, from any conflict, meeting DSM-IV-TR criteria for PTSD as per the Clinical Administered PTSD Scale (CAPS; Blake et al., 1995) were eligible. Exclusion criteria included active alcohol

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or substance dependence within the past 6 months and/or an active psychotic disorder (from chart review), and severe suicidal ideation with plan and intent (from baseline interview and Beck Depression Inventory-II; Beck et al., 1996). Alcohol dependence was assessed using the Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001; score of 21 or higher) and substance dependence was assessed using the Drug Abuse Screening Test (DAST-10; Skinner, 1982). To maximize the generalizability of results, the presence of other forms of psychopathology (e.g. mood disorders or anxiety disorders) and/or use of a psychiatric medication, after a 21 day stabilization period, were not a basis for exclusion.

Measures

Structural clinical interviews

Clinician Administered PTSD Scale. The CAPS is a clinician-administered scale designed to diagnose current and lifetime PTSD (Blake et al., 1995). The CAPS targets the 17 specific PTSD symptoms from the DSM-IV (American Psychiatric Association, 2000) to assess the intensity and frequency of each symptom on a five-point Likert scale. Although a full assessment of past trauma was completed, active combat-related PTSD was the focus of the symptom assessments and related diagnosis. The CAPS has been shown to have adequate internal consistency (α values ranged from .73 to .95), inter-rater reliability on the same interview (r values ranged from .92 to .99), and test–retest reliability over a 2–3 day period across different interviewers (r values ranged from .77 to .98; Orsillo, 2002).

Structured Clinical Interview for DSM-IV. The SCID-IV is a semi-structured clinician-administered, diagnostic interview designed to assess the DSM-IV diagnostic criteria for axis I disorders (American Psychiatric Association, 2000; First et al., 1996). The SCID has shown adequate inter-rater reliability for all disorders (r value range: .69 to 1.0) and adequate test–retest reliability over a 1–3 week interval in patient samples (r value range: .40 to 1.0; Zanarini and Frankenburg, 2001).

Self-report measures

Beck Depression Inventory – 2nd edition. The BDI-II is a 21-item self-report measure designed to assess the cognitive, affective, behavioural, motivational and somatic symptoms of depression in adults and adolescents (Beck et al., 1996). All items are scored on a different four-point Likert severity scale. The scale score is sum of all items with a range of 0 to 63. Sample items include: 'sadness', 'loss of pleasure' and 'self-dislike'. The BDI-II has demonstrated excellent test–retest reliability over a 1-week interval ($r = .93$), excellent internal consistency ($\alpha < .92$), and convergent and discriminant validity in multiple samples (Beck et al., 1996). The internal consistency of the BDI-II in the present findings was high ($\alpha = .94$).

Deployment Risk and Resiliency Inventory. The DRRI consists of 13 subscales to assess pre-deployment, active duty, and post-deployment factors in recently returning combat veterans (King et al., 2006a). For the current study, the social support subscale was of interest – the DRRI-L (Post-Deployment Support; items include: 'I am carefully listened to and understood by family members or friends' and 'Among my friends or relatives, there is someone I go to when I need good advice'). Work with veterans has shown the DRRI to demonstrate acceptable

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internal consistency for the subscales ($\alpha > .81$) and convergent and discriminative validity (Vogt et al., 2008). The internal consistency in the present study was $\alpha = .85$.

PTSD Checklist-Military. The PCL-M is a 17-item self-report measure designed to assess DSM-IV PTSD symptom severity related to military/combat-related trauma (Blanchard et al., 1996). Respondents are presented with 17 specific symptoms of PTSD and asked to rate 'how much you have been bothered by that problem in the last month' on a five-point Likert scale, ranging from 1 (not at all) to 5 (extremely). The scale score is sum of all items with a range of 17 to 85. Sample items include: 'feeling very upset when something reminded you of a stressful military experience from the past', 'avoid activities or situations because they remind you of a stressful military experience from the past' and 'feeling jumpy or easily startled'. The PCL has been shown to have excellent internal consistency in veterans, victims of motor vehicle accidents, and sexual assault survivors ($\alpha > .94$) and excellent test–retest reliability in civilians and veterans ($r = .96$). In addition, the PCL-M has demonstrated excellent convergent validity with alternative measures of PTSD (r values range from .77 to .93; Orsillo, 2002). The internal consistency of the PCL-M in the present findings was high ($\alpha = .91$).

Procedures

The authors assert that all procedures contributing to this work comply with the ethical standards of, and was approved by, the local VAMC Research and Development committee (1695) as well as the Institutional Review Board at the affiliated university (1695) and with the Helsinki Declaration of 1975, and its most recent revision. Participants meeting eligibility requirements were block randomized to the home-based telehealth and in-person conditions. After intake, participants in both conditions received a binder of PE handouts and assessment materials to complete during treatment (e.g. exposure recording forms, PCL, BDI-II). Participants in the telehealth condition had several home-based videoconferencing service options, including: (1) use of their own computer or tablet and high-speed internet connection with encrypted videoconferencing software (e.g. AK Summit), (2) use of a study-provided tablet with Jabber, Facetime or Skype on a 3G or 4G wireless network, or (3) analogue videophone with a built-in camera and video screen that operated through an analogue telephone line. Participants in the telehealth condition received assistance from research staff in setting up their software and hardware before their first treatment session (e.g. a test call). Greater detail on the telehealth set-up and related procedures are described elsewhere (Acierno et al., 2017; Strachan et al., 2012; Yuen et al., 2015).

All participants were scheduled to receive PE administered by three masters-level therapists, all with experience in conducting exposure-based therapy for PTSD in prior clinical trials. Therapists were licensed master's level counsellors who completed a 32-hour workshop-training programme in PE and observed a senior-level clinician throughout a complete course of PE. Therapists met weekly with a senior-level PE trainer/therapist for supervision throughout the duration of the study. Treatment fidelity was maintained at or above 90% across and within conditions, assessed through random sampling of 20% of therapy session audiotapes rated according to session-specific procedures directly corresponding to the PE treatment manual (Acierno et al., 2017). Each therapist was randomly assigned to provide treatment to participants in both the in-person and telehealth conditions. The main components of PE are described by Foa et al. (2007) and included psychoeducation, situational (*in vivo*) exposure,

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and imaginal exposures that involved recounting aloud the most upsetting traumatic memory followed by processing of the imaginal exposure experience. Participants in the telehealth condition sent their homework forms to their therapist via pre-addressed stamped envelopes that were provided when they received their initial PE binder after the intake. After completing treatment, participants were administered a 1-week post-treatment assessment that consisted of a structured clinical interview (CAPS and SCID) and a battery of self-report measures (PCL and BDI-II). Clinical assessors were blind to participant condition.

Consistent with standard PE treatment procedures, the specific number of sessions for each participant was determined on a case-by-case basis, dependent on participant–therapist agreement on participant's progress/readiness for treatment completion. In later sessions, the therapist and participant discussed the participant's Subjective Units of Discomfort Scale scores for exposure exercises, as well as their scores on the BDI-II and PCL in order to mutually agree on how many more sessions were necessary. The mean number of sessions completed was 10.25 ($SD = 1.22$) with 25% of participants receiving the maximum of 12 sessions.

Data analytic plan

Discrete time survival analysis (Muthén and Masyn, 2005; Singer and Willett, 1993, 2003) was used to examine treatment discontinuation. Survival analysis was conducted in Mplus version 7.4 (Muthén and Muthén, 2012). The Cox proportional model assumes that rate of treatment discontinuation was relatively stable across time. For all analyses, treatment session was used as the time metric. Remaining in treatment was scored as 0, discontinuation as 1, and data were coded as missing following treatment discontinuation. Baseline predictors were entered as bivariate predictors due to sample size restrictions. Discontinuation was calculated based on individuals attending at least the first treatment session, as is recommended in the literature (Goetter et al., 2015). Life tables were first constructed providing information regarding survival probability, hazard ratios, and cumulative survival rates. Predictors of treatment discontinuation were then examined. To compare PCL scores at discontinuation *versus* when eight sessions were completed (considered a treatment completer), the last session for which PCL data was available was indicated as the PCL score for a participant who did not complete treatment, and the session 8 score was indicated as the PCL score for treatment completers. For one participant, data from session 8 were not available and so data from session 10 were used instead.

Results

Demographics and group assignment

A total of 150 veteran participants completed the baseline assessment and were randomized to a treatment condition. Participants had a mean age of 41.4 years ($SD = 14.1$), ranging from 20 to 75 years old. The majority of participants were male (98.1%), mostly White (59.3%) or Black (34.7%) with 4.7% identifying as Hispanic, and exactly half reporting positive VA disability status (50.0%). Combat theatres included Operations Iraqi Freedom, Enduring Freedom, and New Dawn (OIF/OEF/OND; 63.3%), Vietnam (20.7%), and Persian Gulf (16.0%). Given the variation in combat theatre, much variability was observed in the self-reported duration in months of PTSD symptomatology (mean = 118.5; $SD = 147.8$). Approximately half of the

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Table 1. Life table displaying treatment discontinuation and corresponding survival and hazard probabilities

Session	In treatment	Discontinued	Survivor probability	Hazard ratio	Cumulative survival
1	132	–	1.00	.00	1.00
2	126	6	.95	.05	.95
3	120	6	.95	.05	.91
4	111	9	.92	.08	.84
5	103	8	.93	.07	.78
6	98	5	.95	.05	.74
7	94	4	.96	.04	.71
8	93	1	.99	.01	.70

Note. People are considered to have discontinued treatment if they failed to return for the indicated session. For example, six people who showed for session 1 did not return for session 2.

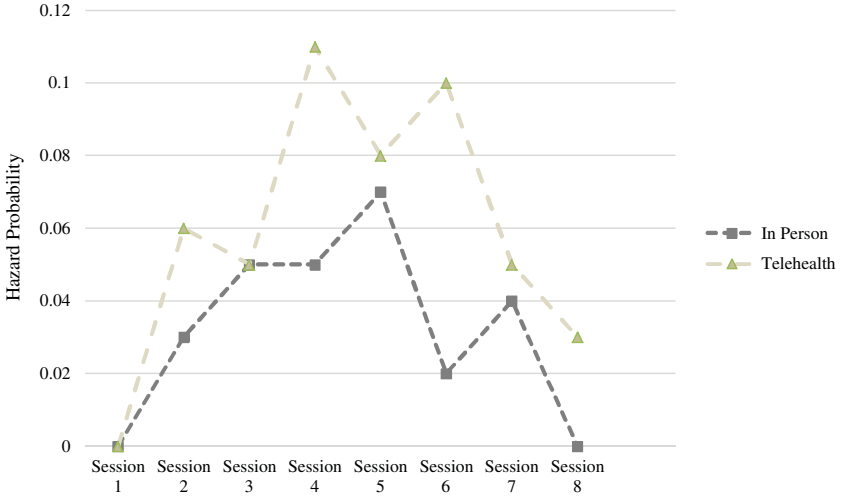

Figure 1. (Colour online) Hazard function demonstrating proportion of participants who discontinued at each session, based on those remaining in treatment at that time

sample endorsed co-morbid major depressive disorder (53.9%) on the SCID-IV. Additionally, approximately a quarter of the sample endorsed co-morbid panic disorder (22.7%). Participants were equally randomized into the telehealth (50.0%) and in-person (50.0%) conditions.

Treatment discontinuation

A life table was constructed prior to survival analysis to quantify the number of people who discontinued treatment at each session (see Table 1). The hazard ratio and cumulative survival analysis function plots are provided in Figs 1 and 2. Results of the life table revealed that 63% of participants who were assigned to a treatment condition completed treatment and

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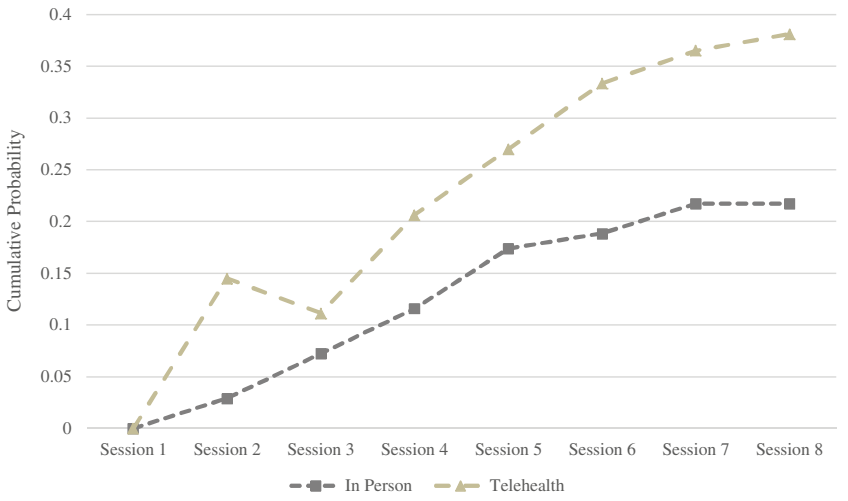

Figure 2. (Colour online) Survival probability function demonstrating cumulative proportion of participants discontinuing treatment across sessions

Table 2. Baseline predictors of treatment discontinuation

Univariate predictors	*B*	*SE*	*p*
Age	− .01	.01	.69
Race	− .56	.37	.13
Combat theatre	− .23	.34	.49
Disability status	− .99	.44	.02
Baseline BDI-2	.01	.02	.53
Baseline PCL	.001	.01	.96
DRRI social support	− .04	.02	.36
Treatment condition	.68	.29	.05
Last observed PCL	.04	.01	< .001

Note. Predictors were first entered individually, with all marginal predictors entered in a final model. Race was coded as 0 = white, 1 = other. Combat theatre was coded as 0 = OEF/OIF, 1 = Persian Gulf or Vietnam. Disability was coded as 0 = on disability, 1 = not on disability. BDI-2 = Beck Depression Inventory-2. PCL = PTSD checklist. DRRI = Deployment Risk and Resilience Inventory. Treatment condition was coded as 0 = in person, 1 = telehealth. Last observed PCL is the last PCL score recorded prior to discontinuing, or, if participant completed session, first recorded PCL score at session 8 and beyond.

71% of participants who attended the first treatment session completed treatment. Rates of discontinuation were fairly stable across sessions.

Survival analysis

The impact of predictors on treatment discontinuation is provided in Table 2. Disability status significantly predicted treatment discontinuation (coded as 0 = on disability, 1 = no disability;

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$B = –.99$, $p < .05$) with an odds ratio of .36 [95% confidence interval (CI): .16, .88], indicating that the discontinuation rate was greater in those on disability compared with those not on disability. Treatment condition significantly predicted treatment discontinuation (coded as 0 = in-person, 1 = telehealth; $B = .68$, $p < .05$) with an odds ratio of 1.97 (95% CI: 1.02, 3.82). To examine differences in discontinuation rates across treatment conditions, hazard ratios and cumulative survival analysis plots by condition are also provided in Figs 1 and 2. As displayed in the figures, the discontinuation rate was greater in the telehealth condition compared with the discontinuation rate in the in-person condition. Of the 69 who attended the first treatment session in the in-person condition, 54 (78%) completed treatment. Of the 63 who attended the first treatment session in the telehealth condition, 39 (62%) completed treatment. PCL scores at discontinuation also significantly predicted treatment discontinuation ($B = .04$, $p < .001$) with an odds ratio of 1.04 (95% CI: 1.02, 1.06). PCL scores for those who remained in treatment (mean = 48.17, $SD = 18.27$) were lower than PCL scores for those who discontinued treatment (mean = 62.87, $SD = 12.74$). Given these significant predictors, a model including an interaction between PCL scores and condition was examined. This interaction term was not significant.

Discussion

The present study investigated the discontinuation of PE within a clinical trial comparing telehealth and in-person delivery methods. The study expanded upon previous research in that discontinuation, as opposed to previous studies with dichotomous definitions of discontinuation, was investigated as a continuous variable based on session attendance via survival analyses. Among the previously identified predictors (Goetter et al., 2015), only disability status was found to be a significant predictor of discontinuation in the present analyses. In addition, treatment condition (telehealth *vs* in-person) also was found to be a significant predictor of treatment discontinuation during the course of treatment. More specifically, participants that self-identified as having a VA service connected disability and participants in the telehealth treatment condition were at significantly higher risk for discontinuing PE prior to session 9. In addition, treatment discontinuation was associated with greater PTSD symptomatology, suggesting that it may be associated with poorer outcomes. Although the telehealth finding was unexpected and the variable was primarily included due to the design of the parent study (Acierno et al., 2017; Strachan et al., 2012), this finding has important implications for the research and current dissemination efforts of telehealth delivery of care.

The overall discontinuation rate of 29% (of those completing the first session) in the study was roughly consistent with reported overall pooled rate of 36% found across 20 studies and 1191 overall veteran participants (Goetter et al., 2015). Interestingly, discontinuation rates do not vary across the most common psychotherapeutics, such as exposure and cognitive therapies (Goetter et al., 2015). However, of note, there may be promising discontinuation findings in alternative PTSD treatments, still yet to be studied in veterans. One such example is cognitive therapy for PTSD (CT-PTSD), for which a discontinuation rate as low as 13.9% has been demonstrated (Duffy et al., 2007; Ehlers et al., 2013). Although participant selection criteria and treatment discontinuation/completion definitions differed significantly from the present study, CT-PTSD still holds promise for lower discontinuation rates and should be investigated in veteran samples. In addition, newer technology-based treatments, such as internet-delivered

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cognitive therapy (Wild et al., 2016) and PTSD Coach mobile application (Kuhn et al., 2017), also may provide improved discontinuation rates upon further study.

Delivering evidence-based psychotherapies through telehealth services has been growing in popularity over the past decade, spurred on by patient demand and improvements to technology and bandwidth capability (Gros et al., 2013a; Wangelin et al., 2016). In general, telehealth may have numerous advantages over standard in-person care, such as decreasing patients' and providers' costs (e.g. transportation costs, travel time, missed work) and increasing system coverage area to providers, and is equally well received by patients (Dunn et al., 2000; Gros et al., 2017; Trott and Blignault, 1998). Although the telehealth studies have yet to report differences in treatment discontinuation across conditions (Gros et al., 2011b; Tuerk et al., 2010), this study included a much larger sample, random assignment, and more sensitive analyses to detect said differences and included random assignment. Survival analyses should be completed in similarly powered evidence-based psychotherapy telehealth studies to determine if this finding replicates (Acierno et al., 2016; Morland et al., 2014).

It is challenging to hypothesize the reason for the differences across treatment conditions, especially with evidence of equal treatment effectiveness, satisfaction (Gros et al., 2017) and lack of influence of past experience and comfort with technology in telehealth treatments (Price and Gros, 2014). Possible candidates proposed elsewhere in the literature include inconsistency of equipment and/or signal stability, poorer rapport, more difficult communication, and general dissatisfaction with the telehealth procedures (Gros et al., 2013a; Sabesan et al., 2014). An alternative explanation involves the time and commitment necessary for the two treatment conditions. More specifically, the home-based telehealth condition is designed to address obstacles to treatment completion by eliminating travel time, expense, and related logistical stressors. In effect, home-based telehealth made receipt of evidence-based psychotherapy for PTSD as simple as turning on a computer or tablet. However, researchers have long hypothesized that incurring less expense and effort could actually devalue psychotherapy, in line with cognitive dissonance theory (Clark and Kimberly, 2014). Or, more directly, participants in the home-based telehealth condition may not have taken treatment as seriously as those who had to go through tremendously increased effort and expense to obtain it. Indeed, the casual approach that some participants adopted with respect to their treatment is evidenced by the fact that a 'dress code' rule had to be put into effect after treatment started for telehealth participants. Although effort and expense required to obtain treatment has not been shown to influence therapy attendance or outcomes within in-person therapy conditions (Clark and Kimberly, 2014; Jensen and Lowry, 2012), time, expense and effort in telehealth studies should be considered for further study.

The second identified predictor of treatment discontinuation was disability status, in that disabled participants were more likely to discontinue treatment than participants that were not disabled. These findings are consistent with a previous study on treatment discontinuation during exposure therapy for PTSD (Gros et al., 2013b). In that study, two primary interpretations were presented for the finding. The first interpretation is that disability status is associated with more severe symptoms (PTSD and depression), and more severe symptoms are associated with treatment discontinuation (Garcia et al., 2011). This interpretation is limited by the null findings for the symptoms of PTSD and depression in the present study, and their limited/marginal support previously (Gros et al., 2013b). A second interpretation is related to the potential unintentional influence of disability on full participation in treatment programmes (Frueh et al., 2007), and therefore result in higher rates of treatment discontinuation. Interestingly,

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this interpretation is quite similar to the hypotheses regarding the home-based telehealth finding and the related lower motivation to complete services.

From a clinical implications perspective, the present studies for treatment condition should be interpreted with caution pending replication. While the initial reaction may be to move away from psychotherapies delivered via telehealth, there are components of the present study that should be highlighted first. Primarily, the present study randomized largely local participants into the in-person and home-based telehealth conditions. Although home-based telehealth was more convenient, in-person services also were likely to be possible for these patients due to their proximity to the VAMC. Based on this design and past hypotheses (Gros et al., 2013a), telehealth services may be most effective with, and more valued by patients in rural and underserved areas who are unable to seek services elsewhere, whereas very proximally residing patients receiving telehealth services may be at greater risk to prematurely discontinue services. These are, of course, empirical questions for future investigations. Other related limitations of the present design include: (1) limiting the sample to combat veterans with PTSD, (2) inclusion of a single evidence-based psychotherapy for PTSD, (3) lack of a measure of treatment credibility, and (4) not recording zip code or geographic region to allow for urban/rural comparisons. Of note, if replication reveals that motivation is in fact contributing to treatment discontinuation, in terms of influences from telehealth and disability status, motivation building techniques, such as motivational interviewing (MI) (Miller and Rollnick, 2002), could be incorporated into evidence-based psychotherapy protocols to improve treatment completion. In fact, there is preliminary support for the use of telephone MI to enhance treatment engagement in veterans (Seal et al., 2012).

The present study investigated predictors of treatment discontinuation during a trial of evidence-based psychotherapy for PTSD via an alternative and more sensitive analysis. In contrast to the previously identified predictors (Goetter et al., 2015), the present study only identified disability status and treatment condition. Possible examples for these limited findings could include a larger sample, survival analyses, inclusion of all variables entered at once, and relative influence of treatment condition variable. As for the variables identified, the reasons for their heightened risk could involve poorer rapport and communication difficulties related to technology (telehealth) as well as less commitment to or motivation in the treatment (telehealth and disability status). Together, the finding for telehealth was unexpected, but potentially valuable, in informing future study and related dissemination of the rapidly growing technology.

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References

Acierno, R., Knapp, R., Tuerk, P., Gilmore, A. K., Lejuez, C., Ruggiero, K. et al. (2017). A non-inferiority trial of prolonged exposure for post-traumatic stress disorder: in person versus home-based telehealth. *Behaviour Research and Therapy*, *89*, 57–65.

American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders* (4th edition, text revision). Washington DC: American Psychiatric Association.

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B. and Monteiro, M. G. (2001). *AUDIT: the Alcohol Use Disorders Identification Test guidelines for use in primary care*. Geneva, Switzerland: World Health Organization.

Beck, A. T., Steer, R. A. and Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio: Psychological Corporation.

Blake, D. D., Weathers, F. W., Nagy, L. M., Kaloupek, D. G., Gusman, F. D., Charney, D. S. and Keane, T. M. (1995). The development of a clinician-administered PTSD scale. *Journal of Traumatic Stress*, *8*, 75–90.

Blanchard, E. B., Jones-Alexander, J., Buckley, T. C. and Forneris, C. A. (1996). Psychometric properties of the PTSD Checklist (PCL). *Behaviour Research and Therapy*, *34*, 669–673.

Boscarino, J. A. (2004). Post-traumatic stress disorder and physical illness: results from clinical and epidemiologic studies. *Annals of the New York Academy of Sciences*, *1032*, 141–153.

Burriss, L., Ayers, E., Ginsberg, J. and Powell, D. A. (2008). Learning and memory impairment in PTSD: relationship to depression. *Depression and Anxiety*, *25*, 149–157.

Clark, P. and Kimberly, C. (2014). Impact of fees among low-income clients in a training clinic. *Contemporary Family Therapy*, *36*, 363–368.

Duffy, M., Gillespie, K. and Clark, D. M. (2007). Post-traumatic stress disorder in the context of terrorism and other civil conflict in Northern Ireland: randomised controlled trial. *British Medical Journal*, *334*, 1147–1150.

Dunn, B. E., Hongyung, C. and Almagro, A. (2000). Telepathology networking in VISN-12 of the Veterans Health Administration. *Journal of Telemedicine and e-Health*, *6*, 349–354.

Ehlers, A., Grey, N., Wild, J., Stott, R., Liness, S., Deale, A. et al. (2013). Implementation of cognitive therapy for PTSD in routine clinical care: effectiveness and moderators of outcome in a consecutive sample. *Behaviour Research and Therapy*, *51*, 742–752.

Erbes, C. R., Curry, K. T. and Leskela, J. (2009). Treatment presentation and adherence of Iraq/Afghanistan era veterans in outpatient care for posttraumatic stress disorder. *Psychological Services*, *6*, 175–183.

First, M. B., Spitzer, R. L., Gibbon, M. and Williams, J. B. W. (1996). *Structured Clinical Interview for DSM-IV Axis I Disorders – Clinician version* (SCID-I/P, version 2.0). New York: New York Psychiatric Institute, Biometrics Research Department.

Foa, E. B., Hembree, E. A. and Rothbaum, B. O. (2007). *Prolonged Exposure Therapy for PTSD: Emotional Processing of Traumatic Experiences, Therapist Guide*. New York: Oxford University Press.

Foa, E. B., Keane, T. M., Friedman, M. J. and Cohen, J. A. (eds). (2008). *Effective Treatments for PTSD: Practice Guidelines from the International Society for Traumatic Stress Studies*. New York: Guilford Press.

Frueh, B. C., Grubaugh, A. L., Elhai, J. D. and Buckley, T. C. (2007). US Department of Veterans Affairs disability policies for posttraumatic stress disorder: administrative trends and implications for treatment, rehabilitation, and research. *American Journal of Public Health*, *97*, 2143–2145.

Garcia, H. A., Kelley, L. P., Rentz, T. O. and Lee, S. (2011). Pretreatment predictors of dropout from cognitive behavioral therapy for PTSD in Iraq and Afghanistan war veterans. *Psychological Services*, *8*, 1–11.

Goetter, E. M., Bui, E., Ojserkis, R. A., Zakarian, R. J., Weintraub Brendel, R. and Simon, N. M. (2015). A systematic review of dropout from psychotherapy for posttraumatic stress disorder among Iraq and Afghanistan combat veterans. *Journal of Traumatic Stress*, *28*, 1–9.

Gradus, J. L., Qin, P., Lincoln, A. K., Miller, M., Lawler, E., Sørensen, H. T. and Lash, T. L. (2010). Post-traumatic stress disorder and completed suicide. *American Journal of Epidemiology*, *171*, 721–727.

Gros, D. F., Lancaster, C. L., López, C. M. and Acierno, R. (2017). Treatment satisfaction of home-based telehealth versus in-person delivery of prolonged exposure for combat-related PTSD in veterans. *Journal of Telemedicine and Telecare*. doi: 10.1177/1357633X16671096

Gros, D. F., Magruder, K. M., Ruggiero, K. J., Shaftman, S. R. and Frueh, B. C. (2012). Comparing the symptoms of posttraumatic stress disorder with the distress and fear disorders. *Journal of Nervous and Mental Disease*, *200*, 967–972.

Gros, D. F., Morland, L. A., Greene, C. J., Acierno, R., Strachan, M., Egede, L. E. et al. (2013a). Delivery of evidence-based psychotherapy via video telehealth. *Journal of Psychopathology and Behavioral Assessment*, *35*, 506–521.

Gros, D. F., Price, M., Yuen, E. K. and Acierno, R. (2013b). Predictors of completion of exposure therapy in OEF/OIF veterans with posttraumatic stress disorder. *Depression and Anxiety*, *30*, 1107–1113.

Gros, D. F., Tuerk, P. W., Yoder, M. and Acierno, R. (2011a). Post-traumatic stress disorder. In M. Hersen and J. C. Thomas (eds), *Handbook of Clinical Psychology Competencies, Volume II: Intervention and Treatment for Adults* (pp. 785–809). New York: Springer.

Gros, D. F., Yoder, M., Tuerk, P. W., Lozano, B. E. and Acierno, R. (2011b). Exposure therapy for PTSD delivered to veterans via telehealth: predictors of treatment completion and outcome. *Behavior Therapy*, *42*, 276–283.

Jensen, S. A. and Lowry, L. S. (2012). Payment schedules do not affect attendance/completion of group behavioral parent training. *Psychological Services*, *9*, 101–109.

Kilpatrick, D. G., Resnick, H. S., Milanak, M. E., Miller, M. W., Keyes, K. M. and Friedman, M. J. (2013). National estimates of exposure to traumatic events and PTSD prevalence using DSM-IV and DSM-5 criteria. *Journal of Traumatic Stress*, *26*, 537–547.

King, L. A., King, D. W., Vogt, D. S., Knight, J. and Samper, R. E. (2006a). Deployment Risk and Resilience Inventory: a collection of measures for studying deployment-related experiences of military personnel and veterans. *Military Psychology*, *18*, 89–120.

King, D. W., Taft, C., King, L. A., Hammond, C. and Stone, E. R. (2006b). Directionality of the association between social support and posttraumatic stress disorder: a longitudinal investigation. *Journal of Applied Social Psychology*, *36*, 2980–2992.

Kuhn, E., Kanuri, N., Hoffman, J. E., Garvert, D. W., Ruzek, J. I. and Taylor, C. B. (2017). A randomized controlled trial of a smartphone app for posttraumatic stress disorder symptoms. *Journal of Consulting and Clinical Psychology*, *85*, 267–273.

McCauley, J. L., Killeen, T., Gros, D. F., Brady, K. T. and Back, S. E. (2012). Post-traumatic stress disorder and co-occurring substance use disorders: advances in assessment and treatment. *Clinical Psychology: Science and Practice*, *19*, 283–304.

Miller, W. R. and Rollnick, S. (2012). *Motivational interviewing: Helping people change*. New York: Guilford Press.

Miller, M. W., Wolf, E. J., Kilpatrick, D., Resnick, H., Marx, B. P., Holowka, D. W. et al. (2013). The prevalence and latent structure of proposed DSM-5 posttraumatic stress disorder symptoms in US national and veteran samples. *Psychological Trauma: Theory, Research, Practice and Policy*, *5*, 501–512.

Monson, C. M., Taft, C. T. and Fredman, S. J. (2009). Military-related PTSD and intimate relationships: from description to theory-driven research and intervention development. *Clinical Psychology Review*, *29*, 707–714.

Morland, L. A., Mackintosh, M. A., Greene, C. J., Rosen, C. S., Chard, K. M. and Resick, P. (2014). Cognitive processing therapy for posttraumatic stress disorder delivered to rural veterans via telemental health: a randomized noninferiority clinical trial. *Journal of Clinical Psychiatry*, *75*, 470–476.

Muthén, B. and Masyn, K. (2005). Discrete-time survival mixture analysis. *Journal of Educational and Behavioral Statistics*, *30*, 27–58.

Muthén, L. K. and Muthén, B. O. (2012). *Mplus User's Guide*, 7th edition. Los Angeles, CA: Muthén and Muthén.

Orsillo, S. (2002). Measures for acute stress disorder and posttraumatic stress disorder. In M. M. Antony, S. Orsillo and L. Roemer (eds), *Practitioner's Guide to Empirically Based Measures of Anxiety* (pp. 255–307). New York: Kluwer Publications.

Otis, J. D., Keane, T. M. and Kerns, R. D. (2003). An examination of the relationship between chronic pain and post-traumatic stress disorder. *Journal of Rehabilitation Research and Development*, *40*, 397406.

Price, M. and Gros, D. F. (2014). Examination of prior experience with telehealth and comfort with telehealth technology as a moderator of treatment response for PTSD and depression in veterans. *International Journal of Psychiatry in Medicine*, *48*, 57–67.

Resick, P. A., Monson, C. M. and Chard, K. M. (2007). *Cognitive Processing Therapy: Veteran/Military Version*. Department of Veterans' Affairs: Washington, DC.

Sabesan, S., Allen, D., Caldwell, P., Loh, P. K., Mozer, R., Komesaroff, P. A. et al. (2014). Practical aspects of telehealth: doctor–patient relationship and communication. *Internal Medicine Journal*, *44*, 101–103.

Schottenbauer, M. A., Glass, C. R., Arnkoff, D. B., Tendick, V. and Gray, S. H. (2008). Non-response and dropout rates in outcome studies on PTSD: review and methodological considerations. *Psychiatry: Interpersonal and Biological Processes*, *71*, 134–168.

Schnurr, P. P., Lunney, C. A., Bovin, M. J. and Marx, B. P. (2009). Post-traumatic stress disorder and quality of life: extension of findings to veterans of the wars in Iraq and Afghanistan. *Clinical Psychology Review*, *29*, 727–735.

Seal, K. H., Abadjian, L., McCamish, N., Shi, Y., Tarasovsky, G. and Weingardt, K. (2012). A randomized controlled trial of telephone motivational interviewing to enhance mental health treatment engagement in Iraq and Afghanistan veterans. *General Hospital Psychiatry*, *34*, 450–459.

Shapiro, F. and Solomon, R. M. (1995). *Eye Movement Desensitization and Reprocessing*. New York, NY: Guilford Press.

Singer, J. D. and Willett, J. B. (2003). *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York, NY: Oxford University Press.

Singer, J. D. and Willett, J. B. (1993). It's about time: using discrete-time survival analysis to study duration and timing of events. *Journal of Educational Statistics*, *18*, 155–195.

Skinner, H. A. (1982). The Drug Abuse Screening Test. *Addictive Behavior*, *7*, 363–371.

Tanielian, T. and Jaycox, L. H. (2008). Invisible wounds of war: psychological and cognitive injuries, their consequences, and services to assist recovery. Santa Monica, CA: RAND.

Strachan, M., Gros, D. F., Yuen, E., Ruggiero, K. J., Foa, E. B. and Acierno, R. (2012). Home-based telehealth to deliver evidence-based psychotherapy in veterans with PTSD. *Contemporary Clinical Trials*, *33*, 402–409.

Szafranski, D. D., Smith, B. N., Gros, D. F. and Resick, P. A. (2016). High rates of PTSD treatment dropout: a possible red herring? *Journal of Anxiety Disorders*, *47*, 91–98.

Szafranski, D. D., Gros, D. F., Norton, P. J., Menefee, D. and Wanner, J. (2016). Treatment adherence: an examination of why OEF/OIF/OND Veterans discontinue inpatient PTSD treatment. *Military Behavioral Health*, *4*, 25–31.

Szafranski, D. D., Gros, D. F., Wanner, J., Menefee, D. and Norton, P. J. (2014). Predictors of length of stay among OEF/OIF/OND Veteran inpatient PTSD non-completers. *Psychiatry: Interpersonal and Biological Processes*, *77*, 263–274.

Trott, P. and Blignault, I. (1998). Cost evaluation of a telepsychiatry service in northern Queensland. *Journal of Telemedicine and Telecare*, *4*, 66–68.

Tuerk, P. J., Yoder, M., Ruggiero, K. J., Gros, D. F. and Acierno, R. (2010). Open trial of prolonged exposure for post-traumatic stress disorder delivered via telehealth technology. *Journal of Traumatic Stress*, *23*, 116–123.

Vogt, D. S., Proctor, S. P., King, D. W., King, L. A. and Vasterling, J. J. (2008). Validation of scales from the Deployment Risk and Resilience Inventory in a sample of Operation Iraqi Freedom veterans. *Assessment*, *15*, 391–403.

Wangelin, B. C., Szafranski, D. D. and Gros, D. F. (2016). Telehealth technologies in evidence-based psychotherapy. In J. K. Lioselli and A. J. Fisher (eds), *Computer-Assisted and Web-Based Innovations in Psychology* (pp. 119–140). New York: Elsevier.

Wild, J., Warnock-Parkes, E., Grey, N., Stott, R., Wiedemann, M., Canvin, L. et al. (2016). Internet-delivered cognitive therapy for PTSD: a development pilot series. *European Journal of Psychotraumatology*, *7*, doi: 10.3402/ejpt.v7.31019.

Yuen, E., Gros, D. F., Price, M., Zeigler, S., Tuerk, P. W., Foa, E. B. and Acierno, R. (2015). Randomized controlled trial of home-based telehealth versus in-person prolonged exposure for combat-related PTSD in Veterans: preliminary results. *Journal of Clinical Psychology*, *71*, 500–512.

Zanarini, M. C. and Frankenburg, F. R. (2001). Attainment and maintenance of reliability of axis I and axis II disorders over the course of a longitudinal study. *Comprehensive Psychiatry*, *42*, 369–374.