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Pilot Cases of Combined Cognitive Processing Therapy and Smoking Cessation for Smokers with Posttraumatic Stress Disorder

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Abstract

Posttraumatic stress disorder (PTSD) and smoking are often comorbid, and both problems are in need of improved access to evidence-based treatment. The combined approach could address two high priority problems and increase patient access to both treatments, but research is needed to determine whether this is feasible and has promise for addressing both PTSD and smoking. We collected data from 15 test cases who received a treatment combining two evidence-based treatments: Cognitive Processing Therapy – Cognitive version (CPT-C) for PTSD and Integrated Care for Smoking Cessation (ICSC). We explored two combined treatment protocols including a Brief (6-session) CPT-C with five follow-up in-person sessions focused on smoking cessation ($n = 9$) and a Full 12 session CPT-C protocol with ICSC ($n = 6$). The combined interventions were feasible and acceptable to patients with PTSD making a quit attempt. Initial positive benefits of the combined treatments were observed. The 6-session dose of CPT-C and smoking cessation resulted in 6-month bioverified smoking abstinence in two of nine participants, with clinically meaningful PTSD symptom reduction in three of nine participants. In the second cohort (Full CPT-C and smoking treatment), both smoking and PTSD symptoms were improved, with three of six participants abstinent from smoking and four of six participants reporting clinically meaningful

reduction in PTSD symptoms. Results suggested that individuals with PTSD who smoke are willing to engage in concurrent treatment of these problems and that combined treatment is feasible.

Keywords

Tobacco use cessation; posttraumatic stress disorder; cognitive therapy; special populations; comorbidity; psychotherapy

Smoking remains the leading cause of preventable death, harming nearly every bodily organ and accounting for an estimated one of every five deaths in the United States (National Center for Health Statistics, 2011). Population-based studies estimate the smoking rate in the United States at 19% in civilians (Centers for Disease Control and Prevention, 2011) and 20% in military Veterans (Veterans Health Administration, 2011), while the proportion of individuals with PTSD who smoke has been estimated at 45% (Lasser et al., 2000). Despite their difficulty quitting smoking, these individuals remain interested in making quit attempts, with one study indicating that approximately half of smokers with PTSD were contemplating quitting smoking and another 21% were preparing to make a quit attempt (Kirby et al., 2008). Unfortunately, treatments that are efficacious in the general population have had limited success in smokers with psychiatric disorders (Hapke et al., 2005).

The maintenance of smoking in PTSD is likely related to psychiatric symptoms based on evidence that smoking behavior is triggered and maintained by PTSD symptoms (Beckham et al., 2007; Beckham et al., 2005) and negative affect (Shiffman & Waters, 2004). Relative to non-PTSD smokers, those with PTSD report significantly greater relief of craving and psychological distress after smoking (Beckham et al., 2007). Despite evidence of the importance of PTSD symptoms in the maintenance and treatment of smoking, treatment of PTSD symptoms has been largely lacking in smoking cessation interventions.

The most effective smoking cessation approach to date for PTSD smokers, Integrated Care for Smoking Cessation (ICSC), capitalizes on the positive therapeutic relationship and repeated contacts between the patient and PTSD clinician by delivering smoking cessation treatment in the context of PTSD treatment (McFall et al., 2010). ICSC treats smoking as a chronic, relapsing condition in need of follow-up and often multiple quit attempts that occur within the context of the PTSD treatment. In a multisite clinical trial, ICSC produced significantly better quit rates than specialty clinic referral (McFall et al., 2010).

ICSC is well-suited to clinicians who have repeated long-term follow-up of patients. However, clinical care is increasingly moving toward trauma-focused, time-limited treatments, especially in Veterans Affairs medical centers (Veterans Health Administration, 2013). ICSC increases access to care by engaging a range of PTSD treatment providers who utilize various treatments. Though the smoking abstinence rates were significantly improved in the clinical trial, ICSC was associated with only modest improvements in PTSD symptoms, with no difference between ICSC and specialty smoking cessation referral alone (McFall et al., 2010). Because PTSD could trigger lapse or relapse in smokers making a quit attempt, it is possible that trauma-focused treatments reducing PTSD symptoms will have

the additional benefit of increasing the efficacy of smoking cessation treatment. Reduced PTSD symptoms could be achieved by implementing Cognitive Processing Therapy (CPT), a trauma-focused PTSD treatment that has demonstrated efficacy in reducing PTSD symptoms and diagnosis across multiple trials (Monson et al., 2006; P. Resick, Williams, Suvak, Monson, & Gradus, 2012; Resick et al., 2008; Suris, Link-Malcolm, Chard, Ahn, & North, 2013). A variant of CPT removes the written trauma accounts so that more time can be devoted to challenging cognitions, referred to as CPT – Cognitive version (CPT-C) (Resick et al., 2008). CPT-C could address psychiatric symptoms and assist in managing smoking-related cognitions that maintain smoking behavior.

Treating comorbid PTSD and substance use disorder with concurrent trauma-focused psychotherapy and substance use counseling has been tried (Feldner, Smith, Monson, & Zvolensky, 2013), but it is not the typical course of clinical treatment. Clinicians currently have very little empirical guidance for sequencing, combining, or adapting evidence-based treatments such as CPT-C with smoking cessation. Consequently, there is a need for research evaluating whether combining CPT-C and ICSC treatment could maintain and possibly improve their effectiveness.

The purpose of the current series of test cases with the combined treatment was to address the feasibility of combined treatment in terms of patient interest, tolerance, adverse events, and dropout rates. In addition, we reported psychiatric symptom and smoking outcome data to provide preliminary data on the potential for combined treatment to concurrently and effectively reduce PTSD symptoms and promote smoking cessation. Finally, we explored the relationships of PTSD symptoms and negative affect to smoking maintenance and lapse to determine whether we were targeting the correct mechanism.

Methods

Recruitment Procedures

Participants were recruited from among outpatients at local clinics as well as through Institutional Review Board-approved flyers and brochures advertising a study on PTSD and smoking cessation. In addition, potential participants were mailed a series of invitational letters (Dillman, Smyth, & Christian, 2009). All participants discussed the study with research personnel and provided informed consent. There were no conflicts of interest to disclose to participants. To be eligible, participants had to smoke > 10 cigarettes a day, meet criteria for current PTSD, be a military veteran, speak and write fluent conversational English, be between 18-65 years of age, expect a stable medication regimen during the study period, have no myocardial infarction in the past 6 months, have no contraindication to nicotine replacement therapy or gain clearance for study-related smoking cessation treatment from a physician, use no other forms of nicotine (e.g., cigars, pipes, chewing tobacco), not be pregnant, and be able to complete study measures and tasks independently. PTSD did not need to be related to military service for participants to be eligible to participate. A total of 23 participants attended a screening session, with 8 being excluded, resulting in 15 participants enrolled. The most common exclusions were current substance use disorder, not meeting criteria for PTSD, using other forms of nicotine, and smoking < 10 cigarettes a day. Psychiatric diagnoses were assessed using the Clinician-Administered PTSD Scale for

DSM-IV to diagnose PTSD (Blake et al., 1995) and the Structured Clinical Interview for DSM-IV Disorders (First, Spitzer, Gibbon, & Williams, 1996) to diagnose other Axis I disorders.

Ecological Momentary Assessment

To gain information on whether our proposed treatment mechanisms were related to treatment outcomes, we used ecological momentary assessment (EMA) to examine the extent to which PTSD symptoms, negative affect, and situational variables were related to smoking lapse for the first five post-quit weeks. EMA procedures were completed on PalmOne Treo 650 devices. We asked participants to complete situational assessments (e.g., location, activity, smoking recency and craving, negative affect, and PTSD symptoms) in response to prompts that occurred at least 5 times a day at random, stratified within every 2.5 hours to ensure sampling of different parts of the day. We also sampled critical moments by asking participants to record any smoking lapses on the electronic diary immediately, followed by a situational assessment and lapse assessment that asked about factors perceived to be related to the smoking lapse. Participants monitored smoking for the first 5 weeks following their quit date, and no subsequent EMA data were collected. A total of 13 provided EMA data, with 10 experiencing a smoking lapse, allowing them to provide lapse assessment data. Participants were paid \$25/week for monitoring, with an opportunity to earn an extra \$25/week in incentive pay for returning fully completed electronic diaries. Participants were compensated up to \$660 for travel and completion of study procedures including EMA readings. EMA data were transmitted wirelessly to a secure web-hosted database so study coordinators could monitor validity and adherence on a daily basis and offer feedback to ongoing participants. During the course of the post-quit period, participants completed a total of 1,401 random-alarm EMA readings. Thirty-seven of these assessments were recorded while the participant was smoking a cigarette.

Measures

EMA Assessments—In response to random alarms, participants reported their current PTSD symptoms and setting (home, friend/family member's home, work, car/bus, bar/restaurant, outside, or other location). They also recorded the social situation (alone, with family, strangers, coworkers, or friends) and whether others were smoking in view of them (no; yes, in my social group; yes, in view only). Participants recorded the activity in which they were engaged (work, leisure, interaction with others, telephone, inactivity, or driving) and any recent consumption of food or drink, coffee or other caffeine, alcohol, and medications. When initiating a reading after experiencing a smoking lapse, participants answered the questions asked following a random alarm, as well as the question “What factor(s) do you feel are MOST related to smoking this cigarette?” Response options included the following: “Where you were”, “Who you were with”, “What you were doing”, “Positive Emotions”, “Negative Emotions”, “Trauma Symptoms”, or “Physical Craving”.

To capture a brief assessment of PTSD symptoms without increasing participant burden enough to prevent valid assessment several times a day, all readings included four items to assess PTSD symptoms on a 5-point scale, similar to the Primary Care PTSD Screen (Prins et al., 2003). The items represented four domains of PTSD: Intrusions (“Right now, how

much are you bothered by disturbing memories, thoughts, images, or feelings related to your traumatic event”), Avoidance (“Right now, how much are you avoiding thoughts, activities, or feelings related to your traumatic experience”), Numbing (“Right now, how much are you bothered by feeling distant or cut off from other people and/or feeling emotionally numb”), and Hyperarousal (“Right now, how much are you bothered by difficulty concentrating, feeling jumpy or easily startled, feeling overly alert, or feeling irritable or angry”). Total PTSD symptom level was calculated by summing the four symptoms.

PTSD and Depressive Symptoms—At weekly study sessions, PTSD symptoms were measured with the PTSD Checklist – Stressor Specific version (Weathers, Litz, Herman, Huska, & Keane, 1993) for the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (PCL-S) and Beck Depression Inventory (BDI-II). The PCL-S is a 17-item self-report measure of PTSD symptoms related to the specific index traumatic event. The BDI-II is a widely used 21-item self-report measure of depression (Beck, Steer, & Garbin, 1988). Both measures have demonstrated evidence of good reliability and validity (Beck et al., 1988; Weathers et al., 1993). Participants completed the PCL-S and BDI-II at baseline, before treatment sessions, and at 6-month follow-up.

Therapist Training

Masters and doctoral level rehabilitation counselors, social workers, and psychologists provided therapy. Of the five therapists on this study, three had limited experience with cognitive behavioral therapy and no experience with CPT-C, and the other two had limited experience with CPT-C. Experience with ICSC included no experience (3 therapists), occasional use of ICSC (1 therapist), and extensive experience providing ICSC (1 therapist). All therapists attended a 2-day training seminar to learn CPT-C from a qualified CPT trainer. Therapists were trained in ICSC by the Principal Investigator under the direction of the investigator who led the development of ICSC. Therapists met weekly for peer discussion of cases.

Treatment Protocols

Because these were test cases to be used in combining the two treatments, we tried two iterations of the treatment protocol. Of the 15 participants who attended the first session of treatment, 9 participated in the Brief CPT-C/ICSC protocol, and 6 participated in the Full CPT-C/ICSC protocol. When medically appropriate, participants were prescribed pharmacotherapy for smoking cessation, including bupropion, nicotine patch, and either nicotine gum or nicotine lozenge as a rescue method. All participants remaining in the study until their quit date received nicotine replacement therapy, and all but two participants received bupropion.

Brief CPT-C with ICSC—To explore the feasibility and efficacy of an easily implemented version of CPT-C in providing skills for addressing PTSD symptoms while facilitating smoking cessation, we initially paired smoking cessation counseling with a 6-session version of CPT-C. Participants were asked to attend a screening session, 11 treatment sessions, and a 6-month follow-up. The treatment combined two cognitive-behavioral treatments: CPT-C for PTSD (Resick, Monson, & Chard, 2010), and ICSC (McFall, Saxon,

Kalmanson, & Carmody, 2009). The latter is a smoking cessation protocol tailored to smokers with PTSD. We initially condensed CPT-C into 6 sessions lasting 50 minutes each, followed by 25 minutes of smoking cessation counseling. In the subsequent 5 sessions, therapists met with participants for 25 minutes to prevent smoking relapse and encourage additional quit attempts for those who did relapse, resulting in a total of 11 sessions. The initial smoking quit date was set for session 5. In the ICSC treatment component, patients completed worksheets on decisional balance, tracking smoking triggers, progress on reducing number of cigarettes smoked per day, action plans for coping with triggers, quit date preparation behaviors, and specific actions to take to recruit social support for the quit attempt. Consistent with the ICSC treatment approach, participants who lapsed or relapsed to smoking during follow-up were encouraged to view this as a learning experience and make subsequent smoking cessation attempts. In this study, relapse was defined as smoking five or more cigarettes daily for at least 3 consecutive days. Lapse was defined as any smoking after the quit attempt that was below the threshold for relapse.

Six sessions of CPT-C provided enough sessions to introduce each of the major cognitive challenge skills worksheets in a different session. Relative to standard CPT-C, the Brief protocol differed in that the Challenging Questions worksheet was introduced in session 3 (instead of session 4), the Challenging Beliefs worksheet was introduced in session 5 (instead of session 6), and the final impact statement and behavioral assignments occurred in session 6. The modules on safety, trust, power/control, esteem, and intimacy were omitted from the Brief protocol. In the final five sessions, therapists could draw upon material from the 6-session version of CPT-C to address PTSD exacerbations, though the brevity of sessions prevented the more comprehensive PTSD treatment typically provided as part of CPT-C. Once participants had completed the 11-session treatment, they received a brief (approximately 10 minutes) phone call from their therapists to encourage participants to maintain or renew their quit attempt and to continue using CPT-C worksheets to address PTSD-related stuck points.

Full 12-session CPT-C with ICSC—Based on the experiences and psychiatric symptom results obtained from participants in Brief CPT-C and ICSC, we determined that the response in smoking and PTSD symptom outcomes might not be optimized with the Brief CPT-C protocol combined with ICSC. As a result, we ran a second cohort of six participants in an altered protocol that included a full course of 12 sessions of CPT-C with approximately 25 minutes of ICSC added to the session end for a total of 75 minutes per session. The Full protocol consisted of the standard CPT-C protocol for 12 sessions, with the content from these sessions integrated into the smoking counseling portion of sessions when it was clear that PTSD symptoms and stuck points were related to maintaining smoking behavior. The initial smoking quit date was set for session 5, matching the Brief protocol.

Integration of CPT-C and ICSC—Although treatment sessions were formally sequential (i.e., CPT-C then ICSC), using these protocols concurrently presented several opportunities for integration that therapists increasingly tried over time. For example, although the ICSC protocol primarily utilizes a behavioral approach, the cognitive therapy skills participants learned in CPTC were used to challenge smoking-related beliefs in some cases. Smoking-

related beliefs were also termed “stuck points” because they keep people from moving past their smoking habit. Common smoking-related beliefs included “If I get angry, I have to smoke”, “Smoking is the only thing keeping me from losing control of myself”, “This craving will never end unless I smoke”, “Smoking is the only way I can cope with being around people.” Similarly, smoking was viewed as an avoidance behavior with respect to addressing PTSD symptoms. Participants were discouraged from smoking while completing CPT worksheets addressing PTSD-related beliefs. Participants who previously smoked a cigarette in response to distress were encouraged to instead complete challenging beliefs worksheets to identify and challenge extreme and/or distorted beliefs.

Interactive Voice Response (IVR) system—From treatment initiation to 6-month follow-up, participants also had access to an interactive voice response (IVR) system that they could call at any time. When calling the IVR system, they chose from several options in a branching format to receive recorded messages from the therapist using material derived in session. CPT-C messages included treatment rationale, a personalized “stuck points” log, explanation of home practice forms with examples from sessions, and a reminder of the home practice activities for the week. ICSC messages included weekly home practice goals, the participant's reasons for quitting smoking, and common high-risk smoking situations and corresponding coping strategies. Therapists discussed IVR use with participants at treatment sessions to promote engagement with the IVR component.

Analysis Plan

We report descriptive statistics, effect sizes, and proportion of participants meeting cutoffs for clinically significant change. To calculate effect size, we used the recommended procedures and calculating tool provided by Lakens (2013) to calculate Hedges' g and 95% confidence intervals around mean differences between pre-treatment and post-treatment scores. To examine the relationship between PTSD symptoms and lapse following the quit date, we used multilevel modeling (MLM) to examine the EMA data provided in the first weeks of the quit attempt. MLM is a technique for analyzing nested data (e.g., occasions nested within individuals), and, unlike repeated-measures ANOVA, it can accommodate unbalanced designs as well as data missing at random (Searle, Casella, & McCulloch, 1992).

To identify the extent to which individual differences in PTSD symptom severity versus intraindividual change in symptoms were associated with the number of cigarettes smoked per day, we calculated each individual's *mean PTSD symptoms* by averaging across daily symptom levels. We also calculated *intraindividual PTSD symptom fluctuations* around those means by subtracting daily PTSD symptom levels from each individual's overall mean symptom level. This produced a variable with no interindividual variance (i.e., each person had a mean of zero for this variable). Negative-binomial MLM was selected to model the overdispersed daily cigarette count data. Logistic MLM was then used to determine whether either symptom variable was associated with the odds ratio (*OR*) of citing each of the seven lapse factors described previously.

Results

Participant characteristics are listed in Table 1. The overall participant sample ($n = 15$) was made up of primarily African American ($n = 13$, 87%), unmarried ($n = 10$, 67%) veterans of various eras of military service, with the most common eras being Vietnam ($n = 7$, 47%) and post-Vietnam ($n = 4$, 27%). Two participants dropped out of treatment, and their baseline PCL-S scores of 66 and 69 were similar to those of the overall sample (PCL-S: $M = 64.1$, $SD = 8.7$; BDI-II: $M = 25.3$, $SD = 10.8$; $n = 15$), though BDI-II scores of 15 and 38 at baseline for the dropouts were discrepant from the group mean.

IVR features were accessed by 7 participants (47%) for a total of 30 calls, with 15 of those calls to IVR made by the same participant. The most commonly accessed features were the CPT-C Session 1 messages (13 calls), the ICSC Session 1 messages (5 calls), and the CPT-C Impact Statement explanation (3 calls).

Brief CPT-C and ICSC Protocol

Psychiatric Symptoms—The Brief treatment protocol was associated with no serious adverse events. One participant dropped out after the first treatment session, citing competing time demands as precluding regular attendance at study appointments. The other participant dropped out after the second treatment session without communicating a reason for dropout. Neither participant reported any adverse event. PTSD and depressive symptom levels at the last session attended were near or below symptom levels at the screening appointment (see Table 2).

Though there was no comparison group, and this series of cases was not powered to detect statistically significant differences, we calculated effect sizes and several notable trends emerged from the data. We report results of the two treatment protocols (Brief vs. Full) separately. To facilitate examination of patterns and effects of dropout on the data, Table 2 provides PCL-S, BDI, and smoking status data for each session by treatment protocol. Among the nine participants who completed the Brief CPT-C protocol combined with ICSC, two dropped out of treatment (22%). PTSD symptom means from the PCL-S were 62.1 ($SD = 9.2$) at baseline for all participants ($n = 9$) and 52.3 ($SD = 9.3$) at post-treatment for completers ($n = 7$), resulting in a moderate to large effect size (Hedges' $g_{rm} = 0.81$; 95% $CI M_{diff} = -3.4 - 20.0$). Three of these completers, (43%) reported a clinically significant reduction in PTSD symptoms at the end of treatment, defined as 10 points on the PCL-S (Monson et al., 2008). Clinically significant PTSD symptom worsening was reported by zero participants at end of treatment, and one at 6-month follow-up. Depressive symptoms showed little change in the Brief treatment cohort (Baseline $M = 24.6$, $SD = 9.4$; Post-treatment $M = 23.3$, $SD = 10.8$; Hedges' $g_{rm} = 0.07$; 95% $CI M_{diff} = -11.4 - 12.8$). Using a cut-off of a 5-point change in the BDI to classify clinical significance (Hiroe et al., 2005), 2/7 (29%) completers reported clinically significant reduction, and 3/7 (43%) reported clinically significant worsening of depressive symptoms at the end of treatment, and 4/7 (57%) at 6-month follow-up.

Smoking Cessation—Smoking outcomes are summarized in Table 3. Participants provided expired CO at each post-quit visit, with CO <8ppm classified as non-smoking.³⁰

Most participants who remained in the study long enough to reach their quit date were able to achieve at least 1 week of bio-verified full abstinence from smoking and reduced smoking and CO levels substantially. In the Brief CPT-C and ICSC treatment, three participants (43% of completers) were bio-verified abstinent at the end of treatment, which was 5 weeks after their quit date, and two of them (29%) maintained bio-verified smoking abstinence to the 6-month follow-up.

Full CPT-C and ICSC Protocol

Psychiatric Symptoms—The Full treatment protocol was associated with 2 adverse events reported to IRB as serious adverse events. One participant sought medical treatment for a recurrence of migraine headache, and another participant discontinued all medications, including bupropion, based on his physician's advice after a routine medical visit revealed thrombocytopenia. One participant dropped out after the first treatment session, citing competing time demands as precluding regular attendance at study appointments. The other participant dropped out after the second treatment session without communicating a reason for dropout. Neither participant reported any adverse event. PTSD and depressive symptom levels at the last session attended were near or below symptom levels at the screening appointment (see Table 2).

Participants reported symptom reduction on the PCL-S consistent with a large effect size (Baseline $M = 67.2$, $SD = 7.8$; Post-treatment $M = 56.5$, $SD = 10.3$; Hedges' $g_{rm} = 1.08$; 95% $CI M_{diff} = -4.9 - 26.3$). Clinically significant change in PTSD symptoms was reported by 67% (4/6) of participants, with one participant reporting clinically significant increase in PTSD symptoms at end of treatment that returned near baseline levels by the 6-month follow-up. Depressive symptoms were also reduced by a small to moderate effect size (Baseline $M = 26.3$, $SD = 13.5$; Post-treatment $M = 21.0$, $SD = 8.5$; Hedges' $g_{rm} = 0.37$; 95% $CI M_{diff} = -3.62 - 14.3$). Clinically significant reduction of depressive symptoms was reported by 33% (2/6) of participants, with no clinically significant worsening at end of treatment, but one participant reporting clinically significant worsening of depressive symptoms at the 6-month follow-up.

Smoking Cessation—In the Full 12-session CPT-C and ICSC treatment, four participants (67%) were bio-verified abstinent at the end of treatment, with three (50%) maintaining bio-verified smoking abstinence to the 6-month follow-up. To illustrate longitudinal relationships across both treatment protocols between smoking status and PTSD symptoms, Figure 1 illustrates data for participants who ultimately remained abstinent to the 6-month follow-up, relative to those who relapsed.

Relationship of PTSD Symptoms to Smoking Frequency and Lapses

MLM analyses found that both mean PTSD symptoms (unstandardized regression coefficient $B = 0.45$, 95% $CI: 0.08-0.83$) and intraindividual PTSD symptom fluctuations ($B = 0.21$, 95% $CI: 0.16-0.35$) in PTSD symptoms were associated with number of cigarettes smoked per day. Neither mean nor PTSD symptoms nor intraindividual PTSD symptom fluctuations were associated with citing location, surrounding people, activity, positive emotion, or craving as a reason for lapse. Elevated mean PTSD symptoms ($OR = 1.43$, 95%

CI: 1.13-1.82), but not intraindividual PTSD symptom fluctuations (*OR* = 1.35, 95% *CI*: 0.77-2.38) were related to attributing lapse to negative affect. Intraindividual PTSD symptom fluctuations (*OR* = 2.03, 95% *CI*: 0.98-4.21), but not mean PTSD symptoms (*OR* = 1.78, 95% *CI*: 0.72-4.40), were marginally associated with increased likelihood of citing PTSD symptoms as a reason for lapse.

Discussion

This series of test cases provides the first report of responses to a combination of two evidence-based treatments, CPT-C and ICSC, which address frequently comorbid and costly problems. Due to the very small sample size and lack of randomization with a comparison group, observed effect sizes are not reliable and no conclusions can be drawn regarding the efficacy of the combined approach. Observed post-treatment PTSD symptom levels were reduced in most participants, but many remained above suggested cut-point scores for clinical severity (Veterans Health Administration, 2014). However, these cases support the feasibility and initial promise of the combined intervention. Dropout was low for the Brief CPT-C protocol, and did not occur in the full CPT-C protocol, when they were combined with ICSC. Participants tolerated the treatment well and preliminary results were consistent with a positive response for both PTSD symptoms and smoking. These results also provide evidence for the possibility that veterans with PTSD who were motivated to seek treatment for smoking are willing to engage in CPT-C. Similarly, veterans who were motivated to seek trauma-focused therapy to address PTSD-related distress and impairment might be willing to engage in smoking cessation treatment. The multisite trial of ICSC improved smoking cessation rates by combining smoking counseling with the existing treatment the veteran was receiving, so a variety of PTSD treatment were used. In that trial, PTSD symptoms remained relatively stable throughout the trial (McFall et al., 2010). The current report demonstrates procedures and feasibility of a treatment protocol that could concurrently and effectively address both PTSD symptoms and smoking cessation.

Further research is needed to determine whether a smoking cessation attempt influences CPT-C treatment. We observed improved treatment response in the full CPT-C protocol with ICSC, in which participants reported symptom reduction that was in range of some previous trials (Alvarez et al., 2011; Morland et al., 2014), but remained lower than some other CPT-C trials (Chard, 2005; Monson et al., 2006; Resick et al., 2008). Treatment response for the full CPT-C protocol was at its greatest in session 11, when symptom reduction was at 18 points. However, there was a subsequent increase for the last session. This increase has not been observed in previous trials of CPT, which had the statistical power to detect symptom changes. It is possible that anxiety regarding the reduction of treatment contact for support of the smoking cessation attempt, and possible relapse, caused symptoms to increase in the final face-to-face treatment session. This is consistent with the data, because the three participants who reported increases of more than 5 points between the 11th and 12th sessions of the full CPT-C protocol were also the only three participants receiving the full protocol who relapsed to smoking by the 6-month follow-up. A previous CPT-C trial found that some people needed more than 12 sessions to achieve symptom remission (Galovski, Blain, Mott, Elwood, & Houle, 2012). With this in mind, it is possible that people with PTSD who are

quitting smoking would benefit from treatment that extended until symptom remission, rather than a fixed course of 12 sessions.

In addition, there was an increase in PTSD symptoms between the end of treatment and the 6-month follow-up. This has also not been observed in previous CPT trials. Increase in PTSD symptoms after CPT-C treatment completion could be due to demoralization following smoking relapse or the destabilizing psychiatric effects of smoking, which have been observed in previous EMA research observing people with PTSD who smoke (Dedert et al., 2014). In that study, PTSD symptoms decreased during the period that participants were abstinent from smoking, but then increased in the period following smoking lapse. It is also possible that concurrent smoking cessation counseling interfered with acquisition of core CPT-C skills to prevent return of symptoms. More data will be needed to evaluate whether maintenance of PTSD symptom reduction is limited by smoking-related factors. Future treatment combining CPT-C with ICSC might benefit from emphasizing the material in the treatment protocols pointing out the patient's strengths and coping resources that they will have available after the completion of treatment. The IVR component was designed to extend treatment beyond the termination of in-person therapy sessions, but it was not heavily utilized. As an alternative, patients now have access to a freely available mobile app called CPT Coach that include the CPT psychoeducational materials, worksheets, and symptom monitoring tools.

The Brief CPT-C protocol might be expected to have reduced efficacy for PTSD symptoms. However, it is noteworthy that the sustained 6-month abstinence from smoking was higher in those completing the Full treatment protocol (3/6, 50%), relative to those completing the Brief treatment protocol (2/7, 29%). This could be a result driven by the small sample, or due to baseline differences such as increased cigarettes per day in those completing the Brief treatment protocol. It is also possible that the overall dose of CPT-C, or the five modules on safety, trust, power/control, esteem, and intimacy over the last half of CPT-C provide skills that are critical to quitting smoking. Future research on PTSD treatment and smoking cessation could inform treatment models by attending to relationships of process variables in CPT-C to sustained smoking cessation. In the absence of more research on the topic, the Full treatment protocol could reasonably be expected to provide more benefit for the PTSD it was designed to treat, as well as providing longer follow-up to address relapse to smoking.

Because the aim was initial feasibility testing with these cases, there were a number of limitations to this result. Evidence of feasibility in veterans might not generalize to civilians with PTSD who smoke cigarettes. Participant utilization of the IVR component was limited. It is possible that the avoidance that is characteristic of PTSD contributed to decreased engagement with this between-session technology. It is also possible that participants viewed the concurrent home practice of two treatments as sufficient between-session engagement with treatment, limiting interest in investing more time in the IVR component. Engagement with electronic treatment supports might be improved by using mobile health technologies such as the CPT Coach. Treatment was provided by novice therapists whose previous experience with CPT-C was limited, aside from the initial training seminar. There was no clinical supervision, which is typically provided in clinical trials and in clinical implementation. Later stages of research will also include treatment fidelity checks and

videotape review of sessions by a clinician experienced in CPT-C. This limits internal validity because the fidelity of the treatment to CPTC as designed is not verified. Given these limitations, it is encouraging that most of these test cases reported clinically meaningful reductions in PTSD symptoms. Finally, cautious interpretation of these results is merited due to the variability of small sample sizes used in reports of case series.

The current results are consistent with an enhanced effect of combined CPT-C with ICSC on smoking cessation, with possible benefits for CPT-C treatment resulting from preventing people from avoiding trauma processing through smoking behavior. EMA data from this study suggested that PTSD symptoms and negative affect early in the quit attempt were related to more frequent smoking during the quit attempt. In contrast, common environmental predictors of smoking lapse were not related to smoking, suggesting a primary role of PTSD symptoms and negative affect in smoking maintenance. This supports our conceptualization of PTSD and depressive symptom reduction as key variables in improving smoking cessation rates. There are several potential mechanisms or correlates for improved smoking cessation in patients with reduced PTSD symptoms resulting from CPT-C. These include neurobiological mediators such as the hypothalamic–pituitary–adrenal axis (Rasmusson, Picciotto, & Krishnan-Sarin, 2006) and stress-related increases in nicotine metabolism that decrease smoking cessation rates (Kaufmann et al., 2015). These neurobiological mechanisms could be significant components of models explaining the ways in which reduction and management of PTSD and depressive symptoms might promote smoking cessation.

Our experience treating these test cases lead to several treatment modifications and lessons learned to be applied to future clinical research on combined treatment. Enlightening observations included anticipation of end-of-treatment anxiety as individuals begin trying to maintain smoking abstinence in the absence of weekly treatment sessions, limited interest in between-session IVR support through messages derived from therapy session content, and the opportunities to capitalize on skills and goals from each treatment to assist in the concurrent treatment. Given the frequent co-morbidity present with PTSD (including substance abuse disorders), further investigation of combined evidence-based treatment approaches to address both disorders is warranted and brings the potential to address two important problems.

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Figure 1. PTSD Symptom Totals For Smokers Abstinent vs. Relapsed at 6 Months
PCL-S scores throughout the course of treatment and 6-month follow-up across both Brief and Full treatment. The symptom course is represented for those who were ultimately abstinent at 6 months separately from those who relapsed.

Table 1

Baseline Sociodemographic Information

	Brief Protocol (<i>n</i> = 9)	Full Protocol (<i>n</i> = 6)
<u>Sociodemographic Variable</u>	<u><i>n</i> (%)</u>	<u><i>n</i> (%)</u>
Race		
African American	8 (89%)	5 (83%)
Caucasian	1 (11%)	1 (17%)
Marital Status		
Married	3 (33%)	2 (33%)
Never Married	2 (22%)	1 (17%)
Separated/Divorced	4 (44%)	3 (50%)
Era of Military Service		
Vietnam	4 (44%)	3 (50%)
Post-Vietnam	2 (22%)	2 (33%)
Gulf War	1 (11%)	0 (0%)
OEF/OIF	1 (11%)	1 (17%)
Peacetime	1 (11%)	0 (0%)
Current Major Depressive Disorder	5 (56%)	2 (33%)
<u>Baseline Value</u>	<u><i>Mean (SD)</i></u>	<u><i>Mean (SD)</i></u>
Age (years)	56.3 (5.0)	54.2 (9.3)
Education (years)	13.0 (1.7)	13.0 (2.4)
Age of Smoking Onset (years)	16.6 (3.2)	16.5 (3.4)
Years Smoking	37.1 (7.2)	35.5 (8.1)
Cigarettes/day	22.7 (8.1)	15.8 (3.8)
Expired Carbon Monoxide (CO)	13.5 (2.9)	20.2 (7.1)
# of Past Quit Attempts >24hrs	5.3 (5.3)	7.3 (6.8)

OEF/OIF = Operation Enduring Freedom/Operation Iraqi Freedom. SD = Standard Deviation. CO = carbon monoxide.

Table 2

Psychiatric Symptoms by Session for All Participants ($n = 15$).

Patient	Base	Brief CPT-C with ICSC for Smoking Cessation (n = 9)												
		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	6 Month
PTSD Checklist (PCL-S Version 4)														
1	80	70	67	67	67	68	63 ^A	59 ^A	60 ^A	60 ^A	46 ^A	46 ^A	n/a	28 ^A
2	50	42	46	56	43	46	40 ^A	43 ^A	40 ^A	33	38 ^A	39	n/a	42
3	66	61	58	-	-	-	-	-	-	-	-	-	n/a	-
4	58	55	57	54	45	42	50	60	57 ^A	51	56	51	n/a	61
5	53	46	54	55	54	49 ^A	53 ^A	56 ^A	54 ^A	- ^A	50 ^A	52 ^A	n/a	64 ^A
6	56	48	54	53	46	47	41 ^A	47	48	53	47	57	n/a	51
7	62	59	62	66	62	60 ^A	57 ^A	58 ^A	56	60	51	52 ^A	n/a	69
8	69	73	-	-	-	-	-	-	-	-	-	-	n/a	-
9	65	65	63	66	66	63	61 ^A	62	59	61	56	69	n/a	68
Mean (SD)	62.1 (9.2)	57.7 (10.8)	57.6 (6.5)	59.9 (6.8)	54.7 (10.3)	53.6 (9.9)	52.1 (9.1)	55.0 (7.2)	53.4 (7.1)	53.0 (10.6)	49.1 (6.3)	52.3 (9.3)	---	54.7 (15.3)
Beck Depression Inventory BDI														
1	35	34	38	30	28	23	14 ^A	15 ^A	13 ^A	17 ^A	12 ^A	9 ^A	n/a	0 ^A
2	17	20	22	24	17	19	15 ^A	17 ^A	18 ^A	13	17 ^A	14	n/a	17
3	15	12	12	-	-	-	-	-	-	-	-	-	n/a	-
4	27	27	25	30	30	26	34	36	34 ^A	33	33	38	n/a	42
5	24	25	26	30	27	26 ^A	21 ^A	22 ^A	19 ^A	21 ^A	19 ^A	18 ^A	n/a	38 ^A
6	18	29	25	31	34	34	15 ^A	25	26	28	28	30	n/a	9
7	13	18	20	19	17	24 ^A	12 ^A	12 ^A	16	17	17	20 ^A	n/a	19
8	38	38	-	-	-	-	-	-	-	-	-	-	n/a	-
9	34	36	34	50	40	37	24 ^A	34	34	24	32	34	n/a	48
Mean (SD)	24.6 (9.4)	26.6 (8.7)	25.3 (8.0)	30.6 (9.6)	27.6 (8.4)	27.0 (6.3)	19.3 (7.7)	23.0 (9.3)	22.9 (8.6)	21.9 (7.0)	22.6 (8.3)	23.3 (10.8)	---	24.7 (18.1)

Full CPT-C with ICSC for Smoking Cessation (n = 6)														
Patient	Base	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	6 Month
PTSD Checklist (PCL-S Version 4)														
1	73	72	75	71	75	75	71	73	68	54 ^A	57 ^A	48 ^A	55 ^A	67
2	64	63	52	59	59	65	48	42 ^A	38 ^A	41 ^A	32 ^A	39 ^A	43 ^A	60 ^A
3	73	76	71	64	73	67	78	65	55 ^A	77	66	52	67	63
4	53	69	58	59	56	59	37	50 ^A	55 ^A	60 ^A	58 ^A	69 ^A	70 ^A	56 ^A
5	72	57	51	67	60	64	63 ^A	56 ^A	63 ^A	56 ^A	44 ^A	46 ^A	49 ^A	68 ^A
6	68	60	60	62	50	47	48	50	48	54 ^A	57	44	55	72
Mean (SD)	67.2 (7.8)	66.2 (7.4)	61.2 (9.9)	63.7 (4.7)	62.2 (9.8)	62.8 (9.3)	57.5 (15.7)	56.0 (11.3)	54.5 (10.7)	57.0 (11.7)	52.3 (12.2)	49.7 (10.4)	56.5 (10.3)	64.3 (5.8)
Beck Depression Inventory (BDI)														
1	28	33	44	46	45	43	40	47	36	27 ^A	24 ^A	24 ^A	29 ^A	27
2	4	28	29	29	26	24	18	16 ^A	10 ^A	9 ^A	8 ^A	6 ^A	5 ^A	15 ^A
3	25	42	34	30	34	26	47	43	32 ^A	42	29	23	24	24
4	22	25	20	18	15	14	13	18 ^A	19 ^A	21 ^A	18 ^A	23 ^A	19 ^A	22 ^A
5	35	25	26	41	31	29	30 ^A	24 ^A	30 ^A	24 ^A	20 ^A	28 ^A	26 ^A	28 ^A
6	44	25	25	26	20	30	21	13	17	27 ^A	28	14	23	45
Mean (SD)	26.3 (13.5)	29.7 (6.8)	29.7 (8.4)	31.7 (10.2)	28.5 (10.7)	27.7 (9.4)	28.2 (13.3)	26.8 (14.6)	24.0 (10.1)	25.0 (10.7)	21.2 (7.8)	19.7 (8.1)	21.0 (8.5)	26.8 (10.0)
SD = Standard Deviation														

SD = Standard Deviation.

CPT-C = Cognitive Processing Therapy – Cognitive Version. IC = Integrated Care. Base = Baseline. S1 = Session 1. PTSD = posttraumatic stress disorder. PCL-S = PTSD Checklist – stressor-specific. BDI = Beck Depression Inventory.

^ABio-verified Abstinence from Smoking at Study Session.

Table 3

Smoking Outcomes for Different Treatment Protocols.

Smoking Outcome	Definition	Brief Protocol (<i>n</i> = 9)	Full Protocol (<i>n</i> = 6)	Completers (<i>n</i> = 13)
Successful Quit Week	Participants who were bioverified abstinent for an entire week at any point during treatment.	7/7 (100%)	4/6 (67%)	11/13 (85%)
Not Relapsed by End of Treatment	Smoking < 5 cigarettes/day by self-report in the week preceding the last treatment session.	6/7 (86%)	5/6 (83%)	11/13 (85%)
Full Abstinence Maintained to End of Treatment	Bioverified smoking abstinence in the week preceding the last treatment session.	3/7 (43%)	4/6 (67%)	7/13 (54%)
Not Relapsed at 6-month Follow-up	Smoking < 5 cigarettes/day by self-report at 6-months after initial target quit date.	2/7 (29%)	3/6 (50%)	5/13 (38%)
Full Abstinence Maintained thru 6-month Follow-up	Successful quit attempt followed by no instances of smoking at 6 months after initial target quit date.	2/7 (29%)	3/6 (50%)	5/13 (38%)

When bioverification data (CO > 8) suggested smoking that conflicted with participant report of abstinence, the participant was classified as smoking. Completers column includes two participants who dropped out before reaching their quit date.