Published in final edited form as:

Addict Behav. 2015 June ; 45: 191–194. doi:10.1016/j.addbeh.2015.02.002.

WEB-BASED TREATMENT FOR SUBSTANCE USE DISORDERS: DIFFERENTIAL EFFECTS BY PRIMARY SUBSTANCE

Gerald Cochran, PhD^a, Maxine Stitzer, PhD^b, Aimee N. C. Campbell, PhD^{c,d}, Mei-Chen Hu, PhD^c, Ryan Vandrey, PhD^b, and Edward V. Nunes, MD^{c,d}

^aUniversity of Pittsburgh, School of Social Work, 4200 Forbes Ave., 2117 CL, Pittsburgh, PA 15260, Phone: (412) 642-2325; fax: (412) 624-6323, gcochran@pitt.edu

^bJohns Hopkins University, School of Medicine, 5510 Nathan Shock Drive, Baltimore, MD 21224-6823

^cColumbia University, College of Physicians and Surgeons, 630 W 168th St, New York, NY 10032

^dNew York State Psychiatric Institute, 1051 Riverside Drive, New York, NY 10032

Abstract

Introduction—This secondary analysis of data from a large, multi-site effectiveness trial (NCT01104805) sought to determine whether effects of a web-based behavioral treatment (Therapeutic Education System [TES]) differed by participants' self-identified primary drug of abuse.

Methods—The all-comers sample of individuals entering outpatient psychosocial counseling treatment for substance abuse (N=497) cited cannabis (22.9%; n=114), stimulants (34.4%, n=171), opioids (21.7%, n=108), or alcohol (20.9%, n=104) as their primary substance of abuse. Participants were randomly assigned to receive treatment-as-usual (TAU) with or without TES substituted for approximately two hours of usual counseling. Multivariate analyses of abstinence outcomes examined interactions of treatment effects with primary substance.

Results—Adjusted odds ratios (AOR) demonstrated primary stimulant users receiving TES were more likely to be abstinent in the final four weeks of treatment compared to stimulant users receiving TAU (AOR=3.59, 95% CI=1.25–10.27). Adjusted odds ratios for alcohol (AOR=3.15,

© 2015 Published by Elsevier Inc.

This manuscript version is made available under the CC BY-NC-ND 4.0 license.

Correspondence to: Gerald Cochran.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Trial registration: clinicaltrials.gov identifier: NCT01104805

Contributors: Gerald Cochran conceptualized and wrote the largest portions of the manuscript. Maxine Stitzer, Aimee Campbell, and Ryan Vandrey assisted in conceptualization, wrote portions of the manuscript, and provided critical feedback on the manuscript. Mei-Chen Hu performed the statistical analyses and provided critical feedback on the manuscript. Edward Nunes was the principal investigator on the clinical trial, assisted in conceptualization, and provided critical feedback on the manuscript.

Conflicts of Interest: None

95% CI=0.85–11.65) and cannabis (AOR=2.64, 95% CI=0.73–9.52) also were of similar magnitude to stimulants but did not reach significance. Abstinence among primary opioid users was not improved by the TES intervention (AOR= 0.35, 95%CI=0.09–1.47).

Conclusions—This study supports the TES web-delivered treatment as a viable intervention for the majority of substance users entering outpatient counseling treatment, with demonstrated effectiveness among stimulant users and promising effects in alcohol and cannabis users but little or no effect in primary opioid users. Web-delivered treatments hold promise for expanding availability of effective behavioral interventions for the majority of substance use disorders.

Keywords

Web-based drug treatment; primary substance of abuse; multi-site clinical trial

1. Introduction

Web-delivered treatment (*Web-TX*) for substance use disorders holds promise for extending the reach of effective interventions beyond traditional service delivery models and settings (Kypri, 2007). The effectiveness of a behavioral *Web-TX* for substance use disorders (the *Therapeutic Education System* [TES]; (Bickel, Marsch, Buchhalter, & Badger, 2008), when substituted for two hours per week of usual care counseling, was recently demonstrated in a multisite study conducted within the National Institute on Drug Abuse Clinical Trials Network (Campbell, et al, 2014); Clinical trial registration: NCT01104805). TES includes a series of self-guided cognitive behavioral modules and a contingency management abstinence incentive program in which monetary incentives can be earned for module completion and drug- and alcohol-free biological specimens. Participants who received the TES intervention (N = 255) compared to those who received standard care without TES (N=252) had higher rates of drug abstinence (mean =11.1 versus 8.8 abstinent half-weeks; $p=0.008$) and better treatment retention at the end of the 12-week study (48% versus 40% retained; HR =0.72, CI – 0.57, 0.92, $p = 0.01$).

A unique feature of this multi-site Web-TX study was that it employed an all-comers entry strategy to enroll individuals who self-identified with a variety of primary substances of abuse. The *WEB-TX* study provides a unique opportunity to examine treatment outcomes in response to the TES intervention as a function of primary substance of abuse, which is an important step in establishing the generalizability of treatment effects.

Clinically, there is an implicit assumption that a variety of drug use patterns and profiles can be treated as equivalent in terms of counseling services offered, particularly if the primary goal of treatment is initiating abstinence and preventing relapse. It is not clear, however, that all treatments are equally effective across the spectrum of substances. Clinical outcomes for web-based interventions have not to our knowledge been examined as a function of primary drug.

In the main outcomes paper of this study, stimulant use (yes/no) was a pre-randomization stratification variable and was included in the multivariate model. Results of that analysis showed no significant main or interaction effects of stimulant use by treatment condition or

stimulant use by site (Campbell, et al., 2014). The current analysis furthers this line of inquiry by exploring four major substance use categories (stimulants, alcohol, marijuana, and opioids) to determine whether the TES intervention resulted in differential effectiveness across any of these predominant primary substances of abuse.

2. Materials and Methods

2.1 Participants

Study recruitment took place at ten regionally diverse community-based intensive outpatient substance abuse treatment programs in the US. Individuals (N=507) were eligible to participate in the study if they were: 18 years of age or older, reported having a substance use problem and had used an illicit drug within 30 days prior to the study baseline assessment or 60 days if exiting a controlled environment, indicated having a planned treatment episode of three or more months, and had begun their current treatment episode within the previous 30 days. Individuals were excluded if they were participating in an opioid treatment program or reported receiving opioid maintenance therapy, planned on moving out of the area within 90 days, were unable to provide consent, or did not speak English. The study was approved by the review boards of the New York State Psychiatric Institute and other participating sites.

Participants self-reported substances they used and identified one as a primary substance of abuse as follows: cannabis 22.5% (N=114), stimulants 33.7% (N=171), opioids 21.3% (N=108), alcohol 20.5%, (N=104), and other substances 2.0% (N=10). Primary alcohol users needed to report at least one day of illicit drug use within the previous 30 days to qualify for the study. In the present study, those in the “other” category were excluded due to insufficient sample size, leaving a sample of 497.

2.2 Study Design and Treatment Conditions

The *WEB-TX* study was a two-group randomized effectiveness trial in which participants received treatment-as-usual (TAU) or reduced TAU supplemented with the TES program (Campbell, et al., 2012). TAU consisted of usual care in each of the treatment centers. TES consisted of 62 self-guided cognitive behavioral therapy modules based on the Community Reinforcement Approach (Meyers, Roizen, & Smith, 2011; Smith, Meyers, & Miller, 2001). TES modules were substituted for two hours per week of face-to-face TAU counseling. TES also included a prize draw contingency management (CM) intervention in which up to \$114 could be earned on average for TES module completion and up to \$486 on average for provision of drug- and alcohol-free biological specimens.

2.3 Measures

Abstinence from substance use was evaluated twice weekly during the 12-week treatment phase and was defined for the previous half week by negative urine and breath alcohol tests and no self-reported drug or alcohol use during that half-week as assessed in a Timeline Follow Back interview (Sobell & Sobell, 1992). Participants were coded as abstinent if both the urine sample and self-report were negative, non-abstinent if the urine screen or self-report was positive, and missing if either the urine test or self-report (or both) was missing

with the obtained measure being negative. Treatment retention was defined as proportion of participants retained in the treatment program at week 12.

2.4 Analyses

Dichotomous half-week abstinence in the final four weeks (8 half-weeks) of treatment was pre-specified as the primary substance use outcome. At this time, the treatment effect was expected (A. N. C. Campbell, et al., 2012) and shown (Campbell, et al., 2014) to be stable. Drug abstinence data were analyzed using generalized linear mixed models to estimate effects of four variables: treatment condition, time (assessment half-week), primary substance of abuse, and baseline drug use status (positive vs. negative based on urinalysis and self-report). Interactions examined were treatment group with primary substance and baseline drug use status (retained in the final model if $p < .10$ by using backward elimination procedure). Missing data were assumed missing at random. The median number of missing half-weeks during the last 8 was 1 for both treatment arms and did not differ by treatment group.

Retention at week 12 was analyzed using a generalized linear model and was modeled as a function of treatment condition, primary substance of abuse, baseline drug use status, and their possible interactions (retained in the final model if $p < .10$). Site was treated as a random effect in both models. Logit link function for binary outcomes was used in both models. Analyses were conducted using SAS 9.3 (SAS, 2011).

3. Results

Baseline characteristics of participants ($N=497$) in the current analysis were similar across the TES and TAU study arms ($p > .05$). The majority of participants were male (62%, $n=310$), Caucasian (53%, $n=261$; 22%, $n=110$ African American; 11% Hispanic, $n=54$), not married (61%, $n=301$), and under or unemployed (59%, $n=295$). Most participants had a high school diploma or equivalent (61%, $n=305$).

3.1 Abstinence

The primary substance group by treatment interaction analysis ($F(3, 2413)=2.49, p=.06$) supported further exploration of differential treatment effects among the four primary substance groups. Table 1 displays the unadjusted treatment effect on abstinence in the final four treatment weeks by primary substance of abuse. Absolute rates of drug negative half weeks were higher for TES versus TAU in primary stimulant, alcohol, and cannabis users. Results for opioid users were striking in that higher rates of negative half weeks were seen in TAU than in TES. In the multivariate analysis, significant effects of TES versus TAU were detected only for the stimulant group, as shown in Table 2 (Adjusted Odds Ratio [AOR]=3.59, 95% CI=1.25–10.27). Adjusted odds ratios favored TES over TAU for both alcohol (3.15) and cannabis (2.64) users, but did not achieve significance.

3.2 Retention

There were no significant interactions between treatment, primary substance of abuse, and baseline drug use status on the outcome of retention at week 12 (results not shown).

Treatment condition ($t=1.52$, $p=0.13$) and primary substance of abuse ($F(3,482)=1.30$, $p=.28$) were also not associated with retention. Baseline drug use status was significantly associated with retention ($t=2.37$, $p=.02$) and was higher among those who were abstinent (48.5%) versus not abstinent (37.6%) at study entry.

4. Discussion

The present analysis provides a unique and clinically relevant examination of intervention outcomes as a function of the primary drug of abuse among a large sample of outpatients in substance abuse treatment. TES produced significantly better outcomes compared to TAU among primary stimulant users and thus may be especially effective for this group. Promising effects were also seen in primary alcohol and cannabis users. While these effects did not reach significance levels, adjusted odds ratios were similar to those seen in stimulant users. It is possible that significant effects would have been demonstrated if the sample sizes had been larger, particularly for the patients with a mixed pattern of drug and alcohol use.

The effects for opioid users were clearly different from those seen with other primary substances and suggest that the primary opioid users did not benefit from TES compared with TAU. Importantly, the negative finding among opioid users was obtained in the context of medication-free psychosocial counseling treatment. Consistent with previous research, this finding suggests that opioid users may best be served by medication-assisted therapies, including methadone, buprenorphine, or naltrexone (Amato, Davoli, Ferri, Gowing, & Perucci, 2004; VandenBrink & Haasen, 2006; WHO, 2009) as a base treatment upon which psychosocial counseling can be appropriately examined.

Treatment retention is a clinically important outcome variable that is not typically examined as a function of primary substance of abuse. In this study, individuals endorsing alcohol as their primary substance of abuse had the highest retention rates at week 12 (52% in TES, 50% in TAU; results not shown). Although effects were not significant, stimulant and cannabis users who were in the TES treatment condition (52% and 46% respectively; results not shown) had somewhat higher retention rates than those in TAU (38% in both groups; results not shown), achieving rates similar to those seen among primary alcohol users. The improvement in retention that is often associated with application of abstinence incentives in psychosocial counseling programs is a clinical benefit resulting from use of these interventions.

The present study possesses some limitations. Conclusions are limited to one particular web-based intervention, and it is unclear whether the outcomes observed in this study would extend to other web-based therapy programs based on different models of psychosocial treatment or that do not include contingency management components in the form of abstinence and treatment-completion incentives. The parent study was also not powered to detect differences by primary substance of abuse. Thus, as noted, the pattern of statistically significant and non-significant findings may have been different with larger sample sizes.

Ability to objectively detect recent drug use varied markedly across the substance classes and may have influenced the outcomes. Specifically, detection of alcohol via breath

monitoring was limited to a very short window and outcomes relied heavily on self-report of heavy use, which is likely to inflate abstinence estimates. In contrast, the cannabis use detection window is substantially prolonged relative to other substances, which may have both reduced estimates of abstinence and prevented TES participants from obtaining abstinence-contingent incentives in close proximity to when abstinence was initiated. Finally, drug use outcomes are inevitably influenced when there is differential treatment retention across experimental conditions, as was the case in this study, particularly for stimulant users. While this was partially countered by our modeling approach that uses all available data, it also reflects the reality of treatment outcome research.

4.1 Conclusion

The present study adds important information to prior research indicating that web-based treatment interventions are a viable supplement to face-to-face substance abuse treatment for the majority of substance users entering treatment. The TES program studied herein appears to be particularly effective for primary stimulant users and not effective for primary opioid users entering psychosocial counseling treatment. Web-based treatment delivery systems may increase accessibility of interventions that are effective for treatment of the majority of substance use disorders.

Acknowledgments

Role of funding sources: This work was supported by grants from the National Drug Abuse Treatment Clinical Trials Network (CTN) and National Institute on Drug Abuse (NIDA): U10 DA013034, U10 DA013035, T32 DA07209, and K24 DA022412.

References

- Amato L, Davoli M, Ferri M, Gowing L, Perucci CA. Effectiveness of interventions on opiate withdrawal treatment: an overview of systematic reviews. *Drug and Alcohol Dependence*. 2004; 73:219–226. [PubMed: 15036544]
- Bickel WK, Marsch LA, Buchhalter AR, Badger GJ. Computerized behavior therapy for opioid-dependent outpatients: A randomized controlled trial. *Experimental and Clinical Psychopharmacology*. 2008; 16:132–143. [PubMed: 18489017]
- Campbell AN, Nunes EV, Matthews AG, Stitzer M, Miele GM, Polsky D, Turrigiano E, Walters S, McClure EA, Kyle TL, Wahle A, Van Veldhuisen P, Goldman B, Babcock D, Stabile PQ, Winhusen T, Ghitza UE. Internet-Delivered Treatment for Substance Abuse: A Multisite Randomized Controlled Trial. *American Journal of Psychiatry*. 2014; 171(6):683–690.
- Campbell ANC, Nunes EV, Miele GM, Matthews A, Polsky D, Ghitza UE, Turrigiano E, Bailey GL, VanVeldhuisen P, Chapdelaine R, Froias A, Stitzer ML, Carroll KM, Winhusen T, Clingerman S, Perez L, McClure E, Goldman B, Crowell AR. Design and methodological considerations of an effectiveness trial of a computer-assisted intervention: An example from the NIDA Clinical Trials Network. *Contemporary Clinical Trials*. 2012; 33:386–395. [PubMed: 22085803]
- Kypri K. Methodological Issues in Alcohol Screening and Brief Intervention Research. *Substance Abuse*. 2007; 28:31–42. [PubMed: 18077301]
- Meyers RJ, Roozen HG, Smith JE. The community reinforcement approach: an update of the evidence. *Alcohol Research and Health*. 2011; 33(4):380–388. [PubMed: 23580022]
- SAS. SAS 9.3. In (Vol. 9.3). Cary, NC: 2011.
- Sobell, L.; Sobell, M. Timeline follow-back: a technique for assessing self-reported alcohol consumption, in *Measuring Alcohol Consumption: Psychosocial and Biological Methods*. A, J.; L, R., editors. Totowa, NJ: Humana Press; 1992.

- VandenBrink W, Haasen C. Evidenced-based treatment of opioid-dependent patients. *Canadian Journal of Psychiatry*. 2006; 51:635–646.
- WHO. Guidelines for the Psychosocially Assisted Pharmacological Treatment of Opioid Dependence. Geneva, Switzerland: World Health Organization; 2009.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Highlights

- This study reports results from a multisite clinical trial testing the effectiveness of a web-based psychosocial treatment by participants' self-identified primary drug of abuse.
- The web-based treatment showed effectiveness among stimulant users.
- The web-based treatment showed promise for marijuana and alcohol use.

Table 1

Unadjusted abstinence rates during the last 4 weeks of the 12-week treatment.

Primary Drug	Percent Abstinent Samples	
	TES	TAU
Stimulants	60.5	47.3
Alcohol	60.0	44.5
Cannabis	44.0	35.3
Opioids	29.3	39.3

Table 2

Treatment effects within primary substance groups in the analysis of abstinence in the final four weeks of treatment as a function of treatment arm (Therapeutic Education System vs. treatment-as-usual) and primary substance group controlling for baseline abstinence at study entry and time.^a

Primary Drug	Adjusted Odds Ratio ^b	95% CI	t-value	P
Stimulants	3.59	1.25–10.27	2.38	0.017
Alcohol	3.15	0.85–11.65	1.72	0.085
Cannabis	2.64	0.73–9.52	1.48	0.139
Opioids	0.35	0.09–1.47	–1.43	0.153

^aThe interaction term (treatment arm X primary drug group) was significant at the $p < .10$ level ($p = 0.06$). Baseline abstinence at study entry was a significant ($p < .001$) variable in the outcome model.

^b Adjusted odds Ratio is for TES relative to TAU within each primary substance group.