Feasibility of a computerized intervention for offenders with substance use disorders: a research note

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Abstract

Objectives Despite evidence that treatment is effective in reducing recidivism among inmates with substance use problems, scarce resources mean that few of those in need of treatment actually receive it. Computerized substance abuse interventions could be used to expand access to treatment in prisons without placing an undue burden on resources. The major aim of the study was to compare treatment conditions in terms of their service utilization, skills acquisition, and treatment satisfaction.

Methods The study recruited men and women with substance use disorders from 10 prisons in 4 states. In an open label clinical trial, 494 subjects were randomly assigned either to the Experimental condition, a computerized drug treatment

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intervention, the *Therapeutic Education System* (TES; *n*=249), or to the Control condition, *Standard Care* (*n*=245). Chi-square tests compared groups on categorical variables and independent samples *t* tests were used for interval level continuous variables.

Results Initial evidence demonstrated: (1) comparable group rates of session attendance and high rates of TES module completion for experimental subjects; (2) comparable group gains in the development of coping skills; and (3) a more favorable view of TES than of *Standard Care*.

Conclusions Collectively, these results show that a computerized intervention, such as TES, can be implemented successfully in prison. Given the barriers to the delivery of substance abuse treatment typically encountered in correctional settings, computerized interventions have the potential to fill a significant treatment gap and are particularly well suited to inmates with mild to moderate substance use disorders who often are not treated.

Keywords Computerized intervention · Correctional settings · Offenders · Substance abuse treatment · Substance use

Introduction

Substance use and incarceration

The criminal justice system supervises some 7.2 million adults; of these, 2.2 million are incarcerated (Glaze and Parks 2012). Offenders exhibit disproportionately high rates of substance use and HIV risk behavior, such as injection drug use and risky sexual behaviors (Calsyn et al. 2006; Maruschak and Beaver 2009; Prendergast et al. 2001). An estimated 50–66 % of offenders meet DSM-IV criteria (American Psychiatric Association [APA] 2000) for substance dependence or abuse (Mumola and Karberg 2006), whereas the rate in the general U.S. population aged 12 or older is only 9 % (Substance Abuse and Mental Health Administration [SAMHSA] 2011).

Correctional facilities are ideal settings in which to deliver substance abuse and HIV prevention interventions. Incarcerated persons are accessible, with few demands on their time, and are encouraged to re-evaluate their life choices. Once released from prison, untreated substance-abusing offenders are more likely to relapse to drug use and be reincarcerated than those who have received treatment (Knight et al. 1999; Matheson et al. 2011). Yet, despite the clear need for and success of substance abuse

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treatment, fewer than 25 % of inmates with substance use conditions are treated while incarcerated (Belenko and Peugh 2005; Chandler et al. 2009; Mumola and Karberg 2006; National Institute on Drug Abuse [NIDA] 2011; Taxman et al. 2007). Access to evidence-based HIV prevention is also limited in prisons (Arriola et al. 2002; Hammett 2006).

Significant barriers impede the widespread adoption of evidence-based psychosocial interventions in correctional settings. Prison resources (monetary and human) for treatment services and for staff training are typically limited. The remote location of many prisons hinders staff recruitment, and counselors trained to provide community-based treatment are not always well suited to working in prison environments (Center for Substance Abuse Treatment [CSAT] 2005; Farabee et al. 2011; Mears et al. 2003). Even if correctional staff were to implement an evidence-based intervention, staff turnover and high patient caseloads would threaten fidelity. Furthermore, because treatment needs within prison populations are variable, available treatment options are often inappropriate. The variability of treatment needs found within prison populations (Belenko and Peugh 2005), along with the institutional realities of accommodating treatment options within correctional settings, further limit the viability of evidence-based practices for substance use disorders, despite mounting evidence to suggest that treatment is effective in reducing crime and recidivism among offenders (Mitchell et al. 2007).

Computerized treatments and the Therapeutic Education System (TES)

Computerized interventions can expand access to psychosocial treatment in settings where treatment options are limited or not available. Computer programs have been developed for substance use (Marsch 2012; Marsch et al. 2007; Marsch and Dallery 2012; Riper et al. 2008), mental health (Postel et al. 2008), and HIV (Kiene and Barta 2006; Marsch and Bickel 2004). Computers have the capability to deliver complex interventions with fidelity at relatively low cost, and with minimal demands on staff time, which increases the potential for large-scale dissemination. Unfortunately, such computerized interventions have not been adequately tested in prisons or in other criminal justice settings.

The *Therapeutic Education System* (TES) is an interactive computerized psychosocial treatment program grounded in the *Community Reinforcement Approach* (CRA) and in *Cognitive Behavioral Therapy* (CBT). TES has been tested in several clinical trials and has a growing evidence base. A randomized clinical efficacy trial among opioid-dependent outpatients demonstrated that TES was as efficacious as CRA delivered by trained therapists, and was superior to standard treatment in promoting toxicology-verified drug abstinence among clients in outpatient substance abuse treatment (Bickel et al. 2008). Another clinical trial demonstrated that, as compared to standard treatment, the modules related to HIV prevention resulted in significantly greater knowledge of HIV prevention, increased self-reporting of risk behaviors, and a greater likelihood of intentions to practice safe sex. Furthermore, participants perceived the HIV prevention modules to be more useful (Marsch and Bickel 2004). TES has the potential to overcome resource challenges encountered in delivering treatment in prison and to make effective treatment more readily available to offenders in need of substance abuse treatment. The goals of this paper are to

establish the feasibility of implementing TES in a prison setting by demonstrating inmate participation in treatment sessions, satisfaction with the computerized intervention, and skills acquisition.

Materials and methods

Trial design

The study recruited incarcerated men and women with substance use disorders from 10 prisons in 4 states (7 prisons in Colorado and one prison in each of Kentucky [KY], Pennsylvania [PA], and Washington [WA]). This was an open label trial; both participants and researchers knew the study conditions (i.e., treatment assignments). The investigators randomly assigned subjects to either the Experimental (E) condition, *Therapeutic Education System* (E-TES; n=258), or to the Control (C) *Standard Care* condition (C; n=255). Randomization was stratified to ensure equal representation of E versus C in each prison.

Study participants

A total of 660 eligible male and female inmates were recruited to participate in the study. Eligibility required: (1) diagnosed as having a substance use disorder, but not currently receiving treatment services; (2) parole review or mandatory release within 4 to 6 months; (3) at least 18 years old; (4) English literacy; and (5) provision of signed informed consent form. A research assistant conducted an informed consent interview with each eligible inmate who expressed interest in the study. In this interview, the purposes of the study were reviewed, and the subject's role in the study was clearly explained. At the conclusion of the interview, those inmates who wanted to take part in the study signed an itemized form to attest to his/her voluntary participation. No coercion was used, and participation (or refusal to participate at any time prior to or during the study) did not affect the inmate's release or treatment status.

The NDRI *Institutional Review Board* (IRB) reviewed the study and its protocols prior to commencing data collection and annually thereafter. The NDRI IRB requested approval from the *Office of Human Research Protections* (OHRP), which was received on November 2, 2009, to apply to all participating sites. The IRBs from each of the three participating sites (Temple University, University of Kentucky, and University of California, Los Angeles) conducted initial and annual reviews of the study as conducted at the respective site; in some cases (e.g., the University of Kentucky), although a blanket approval was in place, the participating site also requested and received OHRP approval for their site.

A 3-member *Data and Safety Monitoring Board* (DSMB) was established to provide oversight to the study. Research staff obtained information about each Serious Adverse Event (SAE) and compiled a preliminary report, which was sent to the Principal Investigator (PI) for review and his assessment of whether or not the SAE was related to study activities. The PI's final SAE report was then sent to the DSMB for their definitive determination of study-relatedness. Twenty-five reports were reviewed, none

of which was found to be related to the study. The DSMB convened each year of the study to review the overall study, data collection, and preliminary results.

Although the study was open to all substance abusing offenders in need of treatment, both the E and C interventions targeted inmates with low and moderately severe substance use, and was not intended to be an alternative to higher levels of care, such as intensive outpatient or residential (e.g., Therapeutic Community) treatment. Approximately 13 % (*n*=85) of all eligible inmates declined to participate in the study, citing such reasons as: not wanting more treatment, not wanting to participate in research, a conflict between study participation and the inmate's post-release plans, or assigning higher priority to other activities during their remaining time in prison. Of the 575 eligible inmates, 89 % (*n*=513) completed a baseline interview (administered immediately after the informed consent form was signed) and were randomly assigned to treatment. When prison authorities denied access to an inmate, or when parole eligibility changed, the baseline interview and randomization were not completed. Another 19 (9 E-TES; 10 C) subjects were removed from the study post-randomization because they were not released from prison during the follow-up period as had been expected. The final sample consisted of 494 offenders with substance use disorders who had been randomly assigned to E-TES or C-*Standard Care*.

Treatment conditions

Therapeutic Education System (E-TES)

TES comprised 48 interactive, multimedia modules delivered for 2 h each week over 12 weeks. TES sessions were held in a classroom located in the correctional facility; each week, participants attended either one 2-h session or two 1-h sessions, depending on the facility. A "Core" set of 32 modules was typically completed in the first 8 weeks. In the remaining 4 weeks, participants either completed the 16 "Optional" modules, re-visited Core modules, or chose modules from both categories.

The Core modules were classified as: (1) *Substance Use/Abuse* (e.g., drug refusal skills, coping with thoughts about using); (2) *Risk Reduction for HIV, AIDS and Sexually Transmitted Infections* (e.g., drug use, HIV and hepatitis, identifying/managing triggers for risky sex); (3) *Cognitive and Emotional Regulation* (e.g., Managing Negative Thinking, Anger Management); and (4) *Psychosocial Functioning* (e.g., Effective Problem Solving, Communication Skills). The Optional modules provided more advanced information on risk reduction and psychosocial functioning. Because modules focused on developing improved approaches to decision-making skills, all modules had particular relevance for substance-abusing offenders.

TES content is theoretically grounded in research-based psychosocial treatments (*Community Reinforcement Approach* [CRA] and *Cognitive Behavioral Therapy* [CBT]). In delivering this content, TES employs state-of-the-art, proven informational technologies to enhance knowledge, skills acquisition, and behavioral change. Specifically, TES uses "fluency-based" *Computer-Assisted Instruction* (CAI), grounded in the "precision teaching" approach (e.g., Binder 1993; Doane et al. 2005), which continually assesses an individual's grasp of the

material, and adjusts the pace and level of repetition of material to promote mastery of the skills and information being taught. TES also creates an experiential learning environment, using interactive videos of peer actors who model various behaviors (e.g., drug refusal skills) to help the program user absorb the modeled behavior. Furthermore, TES employs a variety of interactive exercises to enhance learning (e.g., graphics and animation) and to personalize content (e.g., personalized functional analysis). In this way, TES ensures the delivery of science-based psychosocial treatment in a manner that promotes mastery of key information and skills. An electronic reporting system generates summaries of participant activity.

Standard Care (C)

Offenders in the C (*Standard Care*) control condition received substance abuse treatment from a Certified Addictions Counselor in 2-h group sessions (held once each week in a 2-h session or twice each week in 1-h sessions) over 8–12 weeks. The *Standard Care* curriculum addressed inmate recognition of the connections between feelings, thoughts and behaviors, and aimed to improve coping mechanisms to handle relapse triggers. In addition, the *Standard Care* program was designed to increase awareness of the connections between substance use and health/HIV risk to individuals. In Kentucky, Pennsylvania, and Washington, the control treatment condition met the Department of Corrections requirements for addiction treatment. In Colorado, the control condition was offered to individuals who were diagnosed with substance use disorders, but who had not been mandated to receive treatment prior to release, which meant their participation in treatment was essentially voluntary.

Measures

The primary measures of interest for this article span three domains: (1) treatment utilization (attendance for both groups and TES module completion for the E-TES group only); (2) skills acquisition (i.e. development of coping strategies); and (3) participant satisfaction. Attendance measures included the number of sessions inmates attended for both treatment conditions (these data were available for Colorado only; session attendance data were not obtained for the control groups at sites in KY, PA, or WA) and the number of TES modules completed for E-TES clients (TES software tracked this information for all sites). Skills acquisition was measured using the *Coping Strategy Scale (CSS)*, a 48-item questionnaire that assesses key processes involved in modifying drug use behavior ($\alpha=0.95$; Litt et al. 2003)

Using a 4-point scale (from "Never" to "Frequently"), subjects rated the frequency of their use of each of the strategies (e.g., "I avoid people associated with my drug or alcohol use"; "I leave places where people are using drugs or alcohol"; or "I spent time with people who reward me for not using drugs or alcohol") during the past 3 months (baseline interviews asked about the 3 months prior to incarceration; follow-up interviews asked about the 3 months prior to the interview). Client perceptions of treatment were derived from a 10-point scale (higher scores being

more favorable) on 5 questions that explored the extent to which the subject found treatment satisfying, interesting, useful, easy to understand, and to yield new information. The participant satisfaction measure was added to the follow-up battery midway through the 3-month follow-up period, and was included in the 6-month battery only to capture those who did not report these data at the time of the 3-month follow-up; in the end, treatment satisfaction data were obtained for 376 study participants.

Follow-up data were collected for 87 % of the sample at 3 months (89 % for E-TES and 84 % for C) and 80 % at 6 months (81 % for E-TES and 79 % for C). Few differences between the groups were found for the vast majority of measures; however, retrieval bias did emerge for three measures. Compared to subjects not retrieved (n=64), those with follow-up data (n=430) were more likely: to have a lifetime arrest for a violent offense (61 vs. 45 %); to have ever used cannabis (88 vs. 78 %); and to have used alcohol to intoxication in the 6 months prior to incarceration (59 vs. 41 %).

Analytic plan

The major aim of this article was to report comparisons of the E-TES and C-*Standard Care* conditions on service utilization, skills acquisition, and treatment satisfaction. A profile comparison of subjects in the two treatment conditions was conducted to achieve a better understanding of the population and to detect any between-group baseline differences (see Table 1). Chi-square tests compared groups on categorical variables, and independent sample t tests were used for interval level continuous variables.

With regard to service utilization, t tests were used to compare the two treatment groups on attendance (e.g., number of sessions) in Colorado only, while descriptive statistics (e.g., percentages and means) were used to describe the number and types of TES modules that E-TES participants completed. Regarding skills acquisition, *Generalized Linear Modeling* was used to compare groups on repeated measures of the *Coping Strategy Scale* (CSS). Results are presented for the unadjusted model and for a model that included covariates selected on the basis of group differences at baseline or on findings from prior outcome studies. For the unadjusted model, CSS was the dependent measure and condition (E-TES; C-*Standard Care*) was the independent measure or factor. To improve the efficiency of the estimates and tests (Zhang et al. 2008), seven baseline covariates were added to the model: age, ethnicity, high school diploma/GED, age at first substance use, number of arrests, opioid use (past 6 months), and mean scores on the *Circumstances, Motivation and Readiness* (CMR) scales (i.e., *Treatment motivation*). Variables that captured group differences at baseline were included as covariates in the model to ensure that the observed effects could not be attributed to differences in group characteristics. The remaining covariates were included in the model according to their historical precedence (i.e., prior evidence of a strong correlation with an outcome). The model assumed a normal distribution and a log-link function. The C-*Standard Care* condition was scored as the reference group. Regarding participant satisfaction, t tests were used to compare mean scores across treatment conditions.

Table 1 Demographic and other background characteristics

Domain/Measure	E-TES (n=249) %/M (SD)	C (n=245) %/M (SD)	Total (n=494) %/M (SD)	χ^2 (t test) p
Demographics				
Age	36.7 (9.4)	36.5 (9.8)	36.6 (9.6)	0.799
Gender – male	69.5	69.8	69.6	0.939
Race/ethnicity				0.009**
Black/African American	21.8	21.2	21.5	
White	44.9	53.3	49.1	
Hispanic	13.2	12.5	12.8	
High school diploma/GED	77.5	82.0	79.7	0.219
L6 employment	67.9	70.2	69.0	0.575
Never married	46.0	45.7	45.8	0.407
Children	76.2	72.2	74.2	0.314
Motivation for treatment	39.0 (10.2)	40.5 (9.4)	39.7 (9.8)	0.091
Mental health				
LT mental health treatment	37.6	34.0	35.8	0.415
LT any mental health symptom	59.4	57.8	58.6	0.710
Depression	45.0	40.6	42.8	0.323
Anxiety	47.0	44.7	45.8	0.606
Hallucinations	13.7	14.8	14.2	0.727
LT prescribed medication	29.3	30.7	30.0	0.731
Criminality				
Age first arrest	17.4 (6.9)	17.2 (6.1)	17.3 (6.5)	0.772
LT number of arrests	18.2 (18.7)	18.3 (21.5)	18.2 (20.1)	0.994
LT arrest –substance-related offense	71.1	72.2	71.7	0.775
LT arrest –property offense	76.3	74.7	75.5	0.677
LT arrest –violent offense	59.8	58.0	58.9	0.671
Substance use				
Age first alcohol/drug use	14.1 (5.6)	13.8 (4.7)	14.0 (5.2)	0.509
LT crack/cocaine	70.3	71.0	70.6	0.857
LT opiates	35.7	44.1	39.9	0.058
LT meth/amphetamines	54.2	59.6	56.9	0.228
L6 drug use	77.0	81.6	79.3	0.214
L6 substance most problematic				0.009**
Alcohol	38.7	25.2	32.0	
Cannabis	12.6	12.8	12.7	
Crack/cocaine	18.5	17.1	17.8	
Opiates	4.6	11.1	7.8	
Meth/amphetamines	17.2	23.9	20.6	
Prior substance-abuse treatment	59.5	60.3	59.9	0.854

Table 1 (continued)

Domain/Measure	E-TES (n=249) %/M (SD)	C (n=245) %/M (SD)	Total (n=494) %/M (SD)	χ^2 (t test) p
HIV risk				
LT injection drug use	22.3	28.0	25.1	0.145
L6 injection drug use	14.5	20.9	17.6	0.061
L6 num sex partners	4.1 (7.8)	3.7 (7.7)	3.9 (7.8)	0.567
L3 unprotected sex risk[a]	63.2	68.7	65.9	0.194

LT Lifetime; *L6* last 6 months prior to involvement with the criminal justice system; *L3* last 3 months prior to involvement with the criminal justice system

[a] Includes unprotected sex while high/partner high, when exchanging sex for money/drugs, with an intravenous drug user, with someone HIV+, with partner who refused to use condom, when afraid to ask for condom use

*p<0.05, **p<0.001

Results

Profiles

Overall

Table 1 presents profile information for the baseline sample (n=494). The majority was male (70 %), in their mid-30s (mean 36.6; standard deviation [SD] 9.6), with a high school diploma/GED (80 %). More than two-thirds (69 %) were employed in the 6 months prior to incarceration. Nearly half were Caucasian (49 %); 46 % had never been married, and three-fourths (74 %) had children. Treatment groups were significantly different regarding their racial/ethnic composition; specifically, 53 % of C participants were Caucasian compared to 45 % of E-TES participants (race was a statistical control in outcome analysis).

Early onset for both substance use (mean 14.0 years; SD 5.2) and arrest (mean 17.3 years; SD 6.5) was evident. On average, inmates had 18.2 arrests (SD 20.1), and were most often arrested for drug-related offenses (72 %), property offenses (76 %), and violent crimes (59 %). The majority of inmates reported lifetime use of cocaine (71 %) or methamphetamines/amphetamines (57 %), and 40 % reported opioid use. In the 6 months prior to incarceration, 79 % had used illegal drugs, with 32 % reporting alcohol as the most problematic substance, followed by amphetamines/methamphetamines (21 %), crack/cocaine (18 %), cannabis (13 %), and opioids (8 %). Most (60 %) had received some drug treatment prior to their current incarceration. Treatment groups differed significantly on the substance cited as most problematic during the six months prior to incarceration; 39 % of E-TES participants versus only 25 % of C participants reported alcohol as most problematic; while C participants were more likely to report opiates (11 %) and methamphetamines (24 %) as the most problematic compared to E-

TES participants (5 and 17 %, respectively). This variable was included as a statistical control in the outcome analysis.

High HIV/AIDS risk was observed for study subjects. A quarter (25 %) reported lifetime injection drug use and/or an STD (29 %; data not shown), and the average number of sex partners in the 6 months prior to incarceration was 3.9 (SD 7.8). Two-thirds (66 %) engaged in unprotected sex during the same period.

Study participants reported considerable mental health treatment histories and symptomatology. Approximately one-third (36 %) had received mental health treatment (23 % received inpatient mental health treatment; data not shown) and/or had been prescribed psychotropic medication (30 %). Nearly two-thirds (59 %) reported serious mental health symptoms, including depression (43 %), anxiety (46 %), and/or hallucinations (14 %). No significant differences were found between groups on these measures.

Attendance

Comparison of sessions attended

Treatment session attendance data were available only for Colorado subjects (n=325), because the Departments of Corrections (DOCs) in KY, PA, and WA were unable to provide attendance data for C subjects. Table 2 indicates that, in Colorado, participants in both treatment conditions completed an average of 6 sessions (mean=6.3 for TES; mean=5.8 for C), or roughly half of the 12 sessions planned. A categorization of the attendance data showed that 17 % of the E-TES group and 14 % of C participants did not attend a single treatment session, meaning that inmates consented to participate in the study, completed the baseline interview and were randomized into a treatment condition, but failed to engage in treatment. Otherwise, reasons for absence typically included a facility transfer, early release, or a subject deciding to end his/her participation (often communicated simply by not attending scheduled treatment sessions). As is evident in Table 2, attendance was quite similar across each of the five levels or categories for both treatment conditions. In summary, no significant

Table 2 Group comparison on sessions attended (Colorado site only)

Attendance rates	TES (E) (n=165) %/Mean (SD)	Standard Care (C) (n=160) %/Mean (SD)	Total (n=325) %/Mean (SD)	χ^2 (t test) p
Mean no. sessions	6.3 (4.4)	5.8 (4.3)	6.1 (4.4)	0.302
No. of sessions attended				0.220
No sessions	17.0	14.2	15.7	
1–3 sessions	15.2	22.5	18.8	
4–7 sessions	19.4	24.4	21.8	
8–11 sessions	32.1	23.8	28.0	
12 sessions	16.4	15.0	15.7	

differences in treatment dose (defined as the number of prescribed sessions attended) were apparent between the E and C groups in Colorado prisons.

TES module completion

Table 3 presents an alternative view of treatment dosage for E-TES *only*, which illustrates the number of TES modules that participants completed. In this study, TES was planned for 2 h each week for 12 weeks. The 32 core modules were estimated to require 8 weeks to complete, leaving 4 weeks to explore the 16 optional modules, to repeat core modules, or to select some combination of modules in each category. In fact, modules were completed at a faster pace than anticipated. So, to arrive at a better understanding of treatment dosage, exposure to modules was examined, irrespective of the number of sessions completed.

As shown in Table 3, exposure to TES was relatively high. On average, inmates assigned to E-TES completed 35 modules (SD=19), including 25 core modules (SD=12) and 10 optional modules (SD=8). In addition, nearly three-quarters (73 %) completed at

Table 3 TES modules completed (*n*=249 TES participants)

Modules (maximum)	Completed any % (*n*)	No. completed M (SD)
Total modules completed (core and optional)	86.7 (216)	34.84 (18.71)
Core modules completed	86.7 (216)	24.61 (12.06)
Completed 8 modules	81.5 (203)	–
Completed 16 modules	77.1 (192)	–
Completed 24 modules	72.7 (181)	–
Completed 32 modules	55.8 (139)	–
Optional modules completed	65.9 (164)	10.23 (7.50)
Completed 8 modules	65.5 (163)	–
Completed 16 modules	59.0 (147)	–
Core modules detailed		
Learning to use the program — Training Module (1)	86.7	–
Relapse Prevention Skills (5)	86.3	4.27 (1.73)
Improving Problem Solving, Decision Making and Self-Management (9)	82.7	7.21 (3.50)
Improving Communication and Emotional Self-Regulation Skills (8)	77.1	5.97 (3.33)
Risk Reduction for HIV, AIDS, STIs (9)	72.7	6.29 (4.06)
Optional modules detailed		
Relaxation (3)	64.7	1.94 (1.44)
Time Management (1)	64.3	–
Anger Management (3)	65.1	1.94 (1.44)
Financial Management (1)	65.9	–
Communication II (3)	65.5	1.95 (1.43)
Social Recreation (1)	63.1	–
Risk Reduction (4)	63.9	2.48 (1.91)

least 24 core modules, and more than half (56 %) completed all 32 core modules, with 59 % completing the 16 optional modules. The number of modules contained in each core section varied from 1 (the Training Module in the "*Learning to Use the Program*" topic) to 9 (in each of 2 topics, "*Risk Reduction for HIV, AIDS, and STIs*" and "*Improving Problem Solving, Decision-Making and Self-Management*"). The proportion of TES participants completing each topic ranged from 87 % (*Learning to Use the Program*) to 73 % (*Risk Reduction for HIV, AIDS, and STIs*).

Skills: the Coping Strategies Scale

The *Coping Strategies Scale* was used to assess how well inmates applied coping strategies to support abstinence and to detect changes in coping skills from baseline to post-prison follow-up. Items, and the mean scale score, ranged from 1 (*never*) to 4 (*frequently*) for specific strategies used in the past 3 months (the baseline interview asked about the 3 months prior to their arrest; the two follow-up interviews asked about the 3 months since being released from prison and for months 4–6 post-prison). In general, inmates in both groups showed statistically significant improvement in coping skills from baseline to 3 months post-prison release, and the improvement was maintained at 6 months post-prison release (i.e., for months 4–6 since returning to the community). No significant difference in the degree of improvement between the groups was found (Table 4).

Client satisfaction

Inmates were asked several questions about their satisfaction and overall experience of the substance abuse treatment. Inmates assigned to E-TES rated the treatment experience significantly more favorably on 3 of the 5 scale items. Specifically, compared to control subjects, E-TES subjects reported that their treatment experience was more interesting, yielded more new information, and was more satisfying. Study participants in both groups had low ratings regarding their ability to comprehend the information received in treatment; group differences on these measures were not statistically significant (Table 5).

Discussion

TES feasibility

Overall, results from this study demonstrate that it is feasible to implement a computerized substance abuse treatment intervention such as TES in a prison setting. TES was successfully implemented in 10 different prisons operated by four State Department of Corrections systems, each of which presented some challenges regarding installation and implementation. To achieve a successful network in 10 prison computer labs, barriers such as space limitations and compliance with restrictions on inmate access to the internet had to be addressed. In some prisons, space had to be retrofitted, which involved building computer desks and having prison industries install suitable wiring. TES is most conveniently networked using a web browser, but,

Table 4 The Coping Strategies Scale (CSS)

CSS mean score	E-TES			C			Treatment by time (TES vs. C)[a]		
	Baseline (n=248)	3MPP (n=221)	6MPP (n=201)	Baseline (n=244)	3MPP (n=207)	6MPP (n=194)	Overall	Baseline–3MPP	Baseline–6MPP
	M	M	M	M	M	M		Odds/Estimate	Odds/Estimate
							p	p	p
Adjusted[a]	2.5	2.9	2.9	2.4	2.9	2.9	0.318	0.972 (0.392)	0.953 (0.145)
Unadjusted	2.5	2.9	2.9	2.4	2.9	2.9	0.292	0.971 (0.377)	0.952 (0.129)

Mean scores range from 1 (never) to 4 (frequently). A higher score indicates more positive coping skills

3PP 3-month post-prison release; 6MPP 6-months post prison release

[a] GENLIN model includes: age, ethnicity/race, education, age 1st drug/alcohol, number of arrests, L6 opiate use, and treatment motivation

Table 5 Satisfaction and knowledge

Question	E-TES (n=193) M (SD)	C (n=183) M (SD)	p
How *interesting* was the education you received from your program?	7.65 (2.45)	7.11 (2.70)	0.043*
How *useful* was the education you received from your program?	7.83 (2.46)	7.39 (2.70)	0.095
How much *new information* did you learn while participating in your program?	7.06 (2.92)	6.32 (3.36)	0.024*
How *easy to understand* was the information you received from your program?	3.35 (4.00)	3.24 (3.80)	0.436
How *satisfied are you* with the substance abuse treatment you received?	8.28 (2.48)	7.44 (2.88)	0.003**

Scores range from 0 (not) to 10 (very)

*$p<0.05$; **$p<0.01$

since inmates were not allowed access to the internet, a locally secure set-up was necessary in KY, PA and WA prisons; in these prisons, TES was networked on a standalone server, which provided access only to the intervention and restricted access to all other online content. In Colorado, an online security infrastructure had been established that linked all prison facilities while restricting access to online content, which simplified setting up the TES network. Finally, the project had to ensure that computer equipment met DOC specifications. The investigative team was able to work closely with DOC administrative and IT staff to identify viable solutions to each of these challenges. The result was that 10 computer laboratories, each with 12 individualized workstations, were established.

Once these computer laboratories were established in each prison, additional challenges were encountered in implementing TES. First, because the prison (parole board) required each study participant to complete substance abuse treatment prior to their release, it was necessary to ensure that the experimental intervention (TES) satisfied that treatment mandate for those inmates who agreed to participate in the study. Second, while not required for treatment administered in other settings (e.g., outpatient), prison security protocols required supervision for inmates during TES sessions (TES is intended to be entirely self-directed). Third, although computer laboratories in a few of the prisons were dedicated to TES, prisons in Colorado offered other programming, which competed for laboratory time. In these prisons, research staff had to be particularly flexible around scheduling, and needed to negotiate laboratory time that suited both the project and the facility. Fourth, in many of the prisons, the study expanded inmates' access to treatment, which strained prison staff resources that had been delivering *Standard Care*. That is, many study subjects received treatment only as a condition of the research study, and some prisons did not have enough counseling staff to accommodate the extra subjects assigned to *Standard Care* through participation in the study. In these instances, the investigative team supplemented staff resources, hiring counselors to conduct the *Standard Care* sessions or to assist in delivering *Standard Care*, thus relieving prison staff of the additional burden. Despite these and other barriers to implementation, TES was made

available to 258 inmates across 10 prisons during a 6-month period. The results (discussed below) regarding service utilization, skills acquisition, and client satisfaction suggest that TES was feasible to implement, beneficial to participants, and well received.

Service utilization

Results demonstrated that subjects assigned to the E-TES condition were receptive to the intervention, primarily indicated by the number of TES modules completed. In Colorado, where E-TES and C-*Standard Care* subjects could be compared on their rates of session attendance, subjects in both groups attended, on average, approximately half (6 of 12) of the prescribed treatment sessions, indicating that TES was at least as attractive and accessible to participants as *Standard Care*. TES subjects in all 10 prisons completed an average of three-quarters (24.61 or 77 %) of the 32 core TES modules (a range of 18.7–31.0) while more than half (56 %) of TES subjects completed all 32 core modules (a range of 0–96.7 %). It may be that the low rate of session attendance among TES subjects was influenced, at least in part, because inmates completed the modules at a faster pace than had been anticipated. Taking into account TES module completion, results suggest that E-TES subjects received a higher treatment dose than session attendance alone might indicate. That is, C-*Standard Care* subjects who attended 6 of 12 treatment sessions completed half of the prescribed treatment dose, whereas E-TES subjects who attended the same number of sessions (6 of 12) completed 24 of 32 core TES modules, which is essentially three-quarters of the prescribed treatment dose. Furthermore, using Colorado as an example, where attendance data were available for the control group, more than half (56 %) of all E-TES subjects received a full treatment dose (i.e., completed all 32 core modules), compared to only 15 % of C-*Standard Care* subjects who received a full dose (i.e., attended all 12 sessions). Those E-TES subjects who went on to explore the 16 additional modules received an additional dose; an average of 10 optional modules were completed, while 58 % completed all 16 optional modules, many of whom re-visited some of the core modules (data not shown in Table 3).

The above finding highlights a distinguishing feature of computerized interventions, which is the flexibility offered with regard to implementation and administration, which can be advantageous in prison settings. In the context of this study, not only could sessions be scheduled at times that were best for inmates to ensure better attendance but more importantly, this self-directed computer intervention allowed subjects to move through the modules at their own pace, facilitating exposure to optional treatment content. C-*Standard Care* subjects had no opportunity to make-up missed sessions or to accelerate the pace of treatment; missed sessions often meant missed content, while the pace could have met client interest and need or not. Because inmates must reconcile competing demands, and drug treatment rarely emerges as a priority, a flexible computerized intervention like TES has the capacity to deliver needed treatment to a large number of inmates with substance use disorders.

Skills acquisition

Results demonstrated that subjects assigned to both treatment interventions significantly increased their total and mean scores on the *Coping Strategies Scale* from baseline to

follow-up. In addition, the gains that both groups achieved at 3 months were maintained at 6 months. Significant differences were not evident between groups on this measure; in other words, both interventions were equally effective at improving coping skills. TES modules address a number of coping skills that include but are not limited to: managing thoughts and cravings for use (e.g., distracting oneself, delaying the decision to use or not, leaving the situation and seeking support), negative thinking (e.g., thought-stopping, positive self-talk, substituting positive cognitions for negative cognitions), pleasant activities, decision-making (i.e., thinking ahead to the possible consequences of decisions that are made), problem-solving (i.e., generating multiple solutions and identifying the risks and benefits of each and then choosing a solution), planning for emergencies, drink/drug refusal (e.g., avoiding people who use, saying "no" assertively, changing the topic of conversation), handling criticism, and enhancing positive social support networks. Learning to apply these specific coping skills, whether cognitive or behavioral, is an important component of relapse prevention and for maintaining sobriety. Results from this study suggest that TES imparted healthy and effective coping strategies, thus providing participants with many of the necessary tools to deal with stress and other triggers, potentially helping to prevent relapse to substance use.

Client satisfaction

Client satisfaction is a critical factor for the successful implementation of any intervention. Compared to subjects who received C-*Standard Care*, subjects assigned to the TES condition rated their treatment experience more favorably regarding interest, usefulness, and satisfaction. Certainly, it is possible that the positive perception of TES among users contributed to increased participation (i.e., module completion). Findings of a positive client reception to TES are of particular significance in offsetting potential concerns about the willingness to adopt a novel treatment approach, as well as about a treatment approach that involves technology rather than face-to-face contact. Given the challenges of delivering substance abuse treatment in prison, any intervention that inmates view favorably can represent great potential for engagement. Interestingly, subjects in both groups gave their respective interventions low ratings in terms of their ability to comprehend the information presented in treatment, indicating a need to improve both services to be appropriate for the population served so that the most effective treatments can be delivered.

Effectiveness of computerized interventions

Results from this study are consistent with numerous previous studies that have demonstrated computerized interventions to be as effective as counselor-delivered approaches (Bickel et al. 2011). In fact, computer programs have been used effectively in various therapeutic contexts for over a decade (Murphy and Mitchell 1998; Newman et al. 1997; Selmi et al. 1990). Several recent studies, many of which were controlled clinical trials, have supported the effectiveness of interactive, computer-delivered therapy for the treatment of addictive disorders (see, e.g., Campbell et al. 2013; Carroll et al. 2008; Marsch and Bickel 2004; Marsch et al. 2011; Ondersma et al. 2005, 2007). These studies document typical findings from computer-based treatments where participants report greater program engagement, longer periods of

abstinence, and greater satisfaction than more standard therapist-based treatments (Bickel et al. 2011). TES was the subject of several of these studies (Campbell et al. 2013; Marsch and Bickel 2004; Marsch et al. 2011), and evidence for its effectiveness is mounting when compared to interventions with similar content delivered by trained therapists, as well as when compared to standard treatment being implemented. In some of these studies, TES has been compared as a standalone treatment, but often it is employed as a "clinician extender," whereby TES modules are used as an adjunct to treatment, freeing face-to-face time for clinicians and increasing the overall capacity for treatment delivery. Ultimately, these studies suggest a variety of ways in which computerized interventions such as TES can be integrated within an existing clinical approach to improve access to quality treatment. These studies do not suggest that computerized interventions should be routinely substituted for counselor-delivered therapy.

Because computerized interventions cannot offer the benefits of a strong therapeutic alliance, findings citing their effectiveness, compared to more traditional counselor-delivered therapies, have been met with skepticism. Nonetheless, computerized interventions offer distinct advantages that contribute to their effectiveness. First, computerized interventions can be administered with fidelity to the treatment model, ensuring that all participants receive the same treatment, delivered exactly as intended. In contrast, it is difficult to ensure treatment fidelity when a clinician delivers an intervention, as the delivery will often vary, not only from one clinician to another but also for each clinician from one case to the next. Second, computerized interventions can be administered with much greater flexibility, especially when the intervention is web-based, which allows access from home or on a mobile device, and simplifies scheduling, which should have a positive impact on engagement and compliance. Third, computerized interventions offer privacy and confidentiality that is not possible for those participating in clinician-delivered interventions, particularly in group therapies. This could encourage individuals who have typically resisted more traditional models to participate in treatment, which could subsequently lead to improved outcomes. Finally, computerized interventions increase treatment capacity, which means that more individuals will receive treatment and those who are treated will receive a greater dose.

Study limitations

A number of limitations affect the interpretation of results presented in this paper. First, although a Certified Addictions Counselor (CAC minimum) administered substance abuse treatment with a psycho-educational format at each site to all offenders in the C condition over 12 weeks (2 h per week), each of the four DOCs (CO, KY, PA, and WA) delivered their own standard treatment curricula (e.g., SAMHSA 2006). A standardized approach could not be implemented for the C condition, which made it difficult to determine whether a confound to the analysis had been introduced.

Second, inferences regarding service utilization were limited as session attendance data were not available for C-*Standard Care* subjects in KY, PA, and WA, thereby precluding cross-site comparisons; however, attendance data were available for subjects in Colorado, which supplied 7 of the 10 prisons and nearly two-thirds of

the study sample. Within Colorado, results showed no significant group differences for session attendance.

Third, some participants did not complete the treatment satisfaction questionnaire, as these items were added to the follow-up protocol during the course of data collection. Nonetheless, data were obtained for 376 (87 %) of the 430 participants who completed either a 3- or 6-month follow-up interview. Retrieval bias was not evident for these subjects; instead, completion of items had more to do with when the interview was conducted.

Finally, in developing the paper, generalized linear modeling was used to explore "prison site" as a stratifying measure. As expected, much heterogeneity was observed across prison inmates and settings, but the inclusion of prison site into the models did not affect the findings regarding the effect of treatment condition on the selected outcomes, and was not included in the analyses reported here.

Conclusion

The initial evidence from this study suggests that: (1) it is feasible to implement TES in prison as the relatively positive findings for service utilization demonstrated; specifically, comparable rates of session attendance between treatment conditions, and high rates of TES module completion for E-TES subjects; (2) TES was equally effective as *Standard Care* in improving coping strategies; and (3) TES was viewed more favorably than *Standard Care* on a few measures capturing utility and treatment satisfaction. Collectively, these results show that not only can a computerized intervention like TES be implemented successfully in prison but also that these types of interventions are particularly well suited to correctional settings for inmates with mild to moderate substance use disorders, given the typical barriers to the delivery of substance abuse treatment. If TES is proven to be as effective as *Standard Care* when compared on longer-term key outcomes, such as substance use, recidivism, and HIV risk behavior, it could present a unique opportunity to expand access to treatment for many substance-using offenders who have traditionally been neglected.

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Excellence), a national initiative that provided 40 states with technical assistance in system integration, using learning communities of state stakeholders to facilitate this integration. At present, he is Principal Investigator on several NIDA-funded studies and Director of the New York State Health Foundation's CEIC (*Center for Excellence in Integrated Care*), charged with delivering technical assistance to promote the integration of substance use and mental health services in an estimated 1,200 outpatient mental health and addiction clinics statewide. Since 2012, Dr. Sacks and his team have led the Northeast and Caribbean Addiction Technology Transfer Center (NeC-ATTC) that serves New Jersey, New York, Puerto Rico, and the U.S. Virgin Islands.

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