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Interactive Voice Response for Relapse Prevention Following Cognitive-Behavioral Therapy for Alcohol Use Disorders: A Pilot Study

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Abstract

Relapse after alcoholism treatment is high. Alcohol Therapeutic Interactive Voice Response (ATIVR) is an automated telephone program for posttreatment self-monitoring, skills practice, and feedback. This pilot study examined feasibility ofATIVR. Participants ($n = 21$; 57% male) had access toATIVR for 90 days following outpatient group cognitive-behavioral therapy (CBT) to make daily reports of mood, confidence in sobriety, urges to use substances, and actual use. Reports of relapse or risk were followed with additional questions. Participants received personalized therapist feedback based on responses, and could access recorded CBT skill reviews. Pre–post assessments included: alcohol consumption (Timeline Follow-Back), self-efficacy (Situational Confidence Questionnaire), and perceived coping ability (Effectiveness of Coping Behaviors Inventory). Participants called on 59% of scheduled days and continued making calls for an average of 84 days. FollowingATIVR, participants gave feedback thatATIVR was easy to use and increased self-awareness. Participants particularly liked the therapist feedback component. Abstinence rate increased significantly duringATIVR ($p = .03$), and both self-efficacy and coping significantly improved from pre-CBT to post-ATIVR ($p < .01$). Results indicateATIVR is feasible and acceptable. Its efficacy should be evaluated in a randomized controlled trial.

Keywords

alcohol use disorders; cognitive-behavioral therapy; interactive voice response; relapse prevention; automated telephone

The efficacy of individual and group cognitive-behavioral therapy (CBT) for alcohol use disorders (AUDs) has been demonstrated multiple randomized clinical trials (Morgenstern & Longabaugh, 2000). CBT is grounded in Social Cognitive Theory (Bandura, 1977, 1986),

which posits that maladaptive alcohol in use (or other behavioral health problems) is a result of personal skills deficits. In CBT, therapists instruct and support their clients in the use of a variety of inter- and intrapersonal coping skills and encourage their application in real-life situations.

A number of studies have demonstrated that CBT for alcohol use disorders increases the development of coping skills (Chaney, O'Leary, & Marlatt, 1978; Monti et al., 1993; Oei & Jackson, 1980, 1982). Furthermore, skills use among clients in treatment for alcohol use disorders has a demonstrated impact on treatment outcome (Chung, Langenbucher, Labouvie, Pandina, & Moos, 2001; Connors, Maisto, & Zywiak, 1996; Litt, Kadden, Cooney, & Kabela, 2003; Miller, Westerberg, Harris, & Tonigan, 1996; Moser & Annis, 1996). Because relapse to drinking in the months following treatment is high (up to 80% at 12 months; Connors et al., 1996; Feeney, Young, Connor, Tucker, & McPherson, 2002; Hunt, Barnett, Branch, 1971; Litman, 1986; Lowman, Allen, Stout, & The Relapse Research Group, 1996; Miller et al., 1996; Moser & Annis, 1996), effort to support patients' retention and use coping skills in the posttreatment period seems justified as a potential relapse prevention tool. Extended treatment or aftercare often is available or affordable; thus, an accessible low-cost technology such as Interactive Voice Response (IVR) has promise as a means for maintaining patients' connections to their therapeutic experience after discharge.

IVR has been used to monitor alcohol use and related symptoms among individuals receiving alcohol brief intervention, with demonstrated therapeutic benefit when participant feedback was included (Aharonovich et al., 2006; Helzer et al., 2008). Feasibility studies of IVR symptom monitoring with untreated alcoholics and their spouses (Cranford, Tennen, & Zucker, 2010) and among individuals recently completing specialty treatment for alcohol use disorders (Mundt, Moore, & Bean, 2006; Simpson, Kivlahan, Bush, & McFall, 2005), have demonstrated good compliance and minimal measurement reactivity. The posttreatment IVR program described by Mundt et al. (2006) is the most sophisticated to date. The participant interface of their IVR program included a daily survey with branching logic based on whether or not the patient drank. Each branch lead to further assessment questions, then both branches concluded with a relapse risk questionnaire. The IVR system also provided feedback, encouragement, and support based on participants' responses. Patients could leave a message and/or request a call-back from the therapist.

The goal of the current study was to pilot test an IVR-based program, the Alcohol Therapeutic Interactive Voice Response (ATIVR), which was designed to facilitate the transition from outpatient Group CBT to the personal application of skills after Group CBT was completed. Using an uncontrolled, single-arm, pre-post design we examined the feasibility of incorporating ATIVR as a posttreatment addition to CBT at an outpatient clinic. A feasibility test is critical because client preferences for and engagement with automated treatments are largely unknown but they clearly will affect the utility, applicability, and efficacy of the treatment. In addition, we assessed the drinking outcomes of participants before and after 3 months of ATIVR, and their utilization of coping behaviors during the ATIVR phase.

Method

Participants and Recruitment

Participants were recruited from a treatment center for substance use disorders located in a county of 150,000 in a rural U.S. state. This clinic provides assessment, outpatient group therapy, and intensive outpatient programs. The treatment goal is abstinence.

All participants completed the standard clinic intake assessment procedures, which included evaluation of clinical, social, and medical stability. On the basis of this assessment, a determination of appropriate level of care was made. Clients who were placed in outpatient group therapy were invited to participate in the research. Treatment consisted of 12 weekly 90-minute Group CBT sessions. After the intake assessment, informed consent for the research was obtained by a trained research assistant. There were two CBT groups, each with a single therapist. Attendance at eight or more sessions was required for enrollment to the study, which occurred at the completion of CBT.

Intervention and Apparatus

The intervention, Alcohol Therapeutic Interactive Voice Response (ATIVR), was delivered via an automated computer-driven telephone system. Participants called a toll-free number and responded with the telephone keypad to prerecorded prompts. Each participant had access to the ATIVR program for 90 days after their CBT ended. As illustrated in Figure 1, there are five components to the ATIVR:

1. Daily questionnaire—Ten items assessed callers' current feelings of confidence to cope with urges to drink or use drugs; commitment to staying sober; experience of urges to use and efforts to cope with urges; mood states; anticipation of encountering high-risk situations and plan for coping with them; anticipation of alcohol or drug use; drinking since last call; and use of drugs since the last call. Patients were encouraged to call this questionnaire every day; however, in the event that one or more daily calls were missed, the Daily Questionnaire was programmed to ask about alcohol consumption for each day since the previous call.

2. Therapeutic questionnaire—Patients who drank or used drugs since their last call were flagged for further assessment with the Therapeutic Questionnaire. Other triggers for the Therapeutic Questionnaire included: reported strong urges to use, anticipated drinking that day, low or no confidence for coping with urges today, low or no commitment to sobriety today, and anticipating a high-risk situation today without a plan for coping with it. Patients whose responses to the Daily Questionnaire raised no red flags were congratulated and given an encouraging message with feedback based on prior responses to the Daily Questionnaire (e.g., "You have now gone ___ days without anything to drink.")

In the Therapeutic Questionnaire, participants were asked which coping skills they had used to resist or minimize drinking, and their reasons for either drinking or not drinking. Participants who reported a strong urge to use were asked to rate a number of possible reasons for the urge (e.g., exposure to alcohol, various mood states, etc.). Depending upon a participant's responses to the Therapeutic Questionnaire, the system was programmed to recommend one or more relevant CBT skills for practice via the IVR system (described below). For example, a participant who reported a strong urge to drink would hear a suggestion to practice a recorded session of Managing Thoughts of Use and would be able to do so immediately through the ATIVR.

3. Didactic skills review—Components 3 and 4 were included to encourage and assist in the ongoing use of skills learned in CBT and were prerecorded for the IVR system by the therapist. Component 3 consisted of descriptive reviews of the rationale and essential elements of seven different coping skills that were covered in the CBT groups. The reviews were 2–4 minutes in length.

4. Coping skills practice—The skills practice feature guided the participant through actual exercises from CBT group; for example, body scan relaxation. Practice segments for nine CBT skills ranging from 2 to 10 minutes in length were available.

5. Therapist feedback messages—At the end of each month of calling, the IVR created a summary report for the therapist based on data the patient provided via ATIVR that month. For example, the report indicated the number of calls the client made and which features were used, plus graphical displays of Daily Questionnaire responses across the month. Based on the report, and informed by the therapist's knowledge of the patient from the group treatment, the therapist called the ATIVR to record a personalized message for each participant. In this monthly message, the therapist commented on the patient's progress as indicated in the IVR questionnaires, offered feedback and encouragement, called attention to CBT skills that were underutilized, and made suggestions about how to maintain progress and/or reengage in therapeutic behavior.

Design and Procedure

This was a prospective longitudinal 90-day pilot study. Prior to and following the 12 sessions of Group CBT, all participants underwent an assessment battery (see below) for which they were compensated \$25. At the conclusion of CBT treatment, participants attended a training session and demonstration of the use and features of ATIVR. Participants were asked to make daily calls to the ATIVR for 90 days and to utilize the other ATIVR components at will. If a participant missed two consecutive calls to the ATIVR, a research assistant called to inquire about any difficulties and encourage regular calling. Reminder calls were made a maximum of once per week and for the first month only. At the conclusions of the 90-day calling period, participants were then scheduled to return to the research office for a final assessment for which they were compensated \$25. All study procedures were approved by the University of Vermont Committee on Human Research in the Medical Sciences.

Instruments

The Assessment Battery Included the following:

Timeline Follow-Back. (TLFB; L. C. Sobell & Sobell, 1995)—The TLFB is a calendar-based interview method for retrospective recall of daily alcohol consumption, measured in standard drink units (12-oz beer, 5-oz wine, or 1.5-oz distilled spirits). Prior studies have demonstrated the concordance of self-reported drinking via TLFB against collateral reports of drinking, alcohol-related consequences, and biochemical assessments (Cooper, Sobell, Sobell, & Maisto, 1981; Maisto, Sobell, & Sobell, 1979; O'Farrell, Cutter, & Floyd, 1985; M. B. Sobell, Sobell, Klajner, Pavan, & Basian, 1986). Ninety-day TLFB interviews were conducted after CBT at both pre-ATIVR and post-ATIVR assessments.

Short Inventory of Problems. (SIP; Miller, Tonigan, & Longabaugh, 1995)—This 15-item short version of the Drinker Inventory of Consequences was designed to measure adverse consequences of alcohol abuse in the domains of physical health, social responsibility, interpersonal functioning, intrapersonal functioning, and impulse control. Feinn, Tennen, and Kranzler (2003) reported significant correlations between total score and both alcohol craving and the number of alcohol dependence criteria. The authors reported a test-retest correlation of .74 for the SIP total score at 3 months versus 6 months posttreatment. Thus, .74 should be considered a low estimate of the instrument's stability because genuine change in symptomatology may be reasonably expected during that interval. The SIP was administered to participants who reported any alcohol consumption since the previous assessment.

Situational Confidence Questionnaire. (SCQ; Annis & Graham, 1988)—This 39-item self-report questionnaire was designed to assess Bandura's (1986) concept of self-efficacy for alcohol-related situations. Respondents indicated on a 6-point scale their degree of confidence to resist heavy drinking in various high-risk situations. Higher scores reflect greater confidence. The instrument is scored on eight subscales plus a total score. Subscales include pleasant or unpleasant emotions, physical discomfort, testing control, urges and temptations, conflict with others, social pressure to drink, and pleasant times with others. SCQ scores during inpatient treatment are associated with post-treatment drinking outcomes such as continuous abstinence rate, time to relapse, and percent days abstinent (Burling, Reilly, Moltzen, & Ziff, 1989; Greenfield et al., 2000; Solomon & Annis, 1990).

Effectiveness of Coping Behaviors Inventory. (ECBI; Litman, Stapleton, Oppenheim, Peleg, & Jackson, 1984)—Participants rated their past experiences with 36 different coping strategies, and how effective each strategy was for keeping them from using alcohol. The instrument assesses four domains of coping strategies: positive thinking, negative thinking, avoidance/distraction, and seeking social support, as confirmed by factor analysis (Litman et al., 1984). Litman et al. reported that total scores on the ECBI discriminated relapsers and heavy drinkers approximately 9 months following discharge from inpatient treatment. Higher scores indicate greater efficacy of the related skill.

Post-ATIVR Feedback Interview—An interview developed specifically for this study was administered at the post-ATIVR assessment to solicit feedback on participants' experiences with the ATIVR. Through open-ended questions, participants reported likes and dislikes about the program, how easy it was to use, feedback about the content and length of the Daily Questionnaire, usefulness of the various ATIVR features (e.g., skills reviews, therapist messages), reasons for calling or not calling the system, opinion about the length of the calling period (i.e., 3 months), and overall impression of whether it was helpful to them and/or potentially valuable to others. The interview concluded with self-rating of two items on a 1–5 scale: “Now that you have completed the study, how logical does this type of treatment seem to you,” and “In general, how honest were you on the Daily Questionnaire?”

Statistical Methods

Kaplan-Meier estimates of survival distribution were derived to describe the length of participants' period of engagement in ATIVR calling. Paired *t* tests and McNemar's tests were used to compare measures of alcohol consumption obtained from TLFB assessments administered pre-ATIVR and post-ATIVR. SCQ scales and the ECBI assessed at pre-CBT, post-CBT (pre-ATIVR) and at the 3-month follow-up (post-ATIVR) were analyzed using repeated measure analyses of variance. Pairwise comparisons among means at the three time points were performed based on Fisher's LSD based on the pooled variance estimate from the ANOVA. Cohen's *d*, computed using the across-participant standard deviation at baseline, was used as the measure of effect size. Post-ATIVR subjective measures are reported using descriptive statistics.

All statistical analyses for this paper were performed using SAS software (Version 9.2; Cary, NC: SAS Institute Inc.).

Results

Characteristics of the Sample

Twenty-three participants consented to the research before starting CBT, but two withdrew immediately after treatment ended. They did not initiate the ATIVR component of the research and provided no assessment data. Analyses of data from the ATIVR calls

correspond to the remaining 21 participants, who all made at least one call to the ATIVR. Demographic and alcohol use characteristics for the 21 participants are displayed in Table 1. Three participants who made calls to the ATIVR did not return for the post-ATIVR interview, so the outcomes assessment analyses are based on the 18 participants who completed the post-ATIVR interview.

Call Data

Figure 2 shows the survival curve associated with participants' "days to last call" to the ATIVR, our measure of treatment engagement. All participants remained engaged with the ATIVR for the first 52 days, at which time one participant stopped calling. Two others stopped at 58 days and 71 days. Three additional participants made their last calls within a week of their 90-day mark. The mean duration of treatment engagement was 84 days ($SD = 12$) with 71% of participants remaining engaged with the ATIVR system for the full 90 days. Participants called on an average of 59% ($SD = 22$) of scheduled days.

Usage rates for the additional ATIVR components are outlined in Table 2. Therapeutic Feedback Messages was the only component accessed by every participant. Usage of CBT Skills Practice and Didactic Skills Review components was variable, but the most commonly selected were Managing Negative Moods or Anger, and Managing Thoughts of Use (data not shown).

Consumption

Alcohol consumption was measured just before starting and just after completing the ATIVR calling period using a TLFB that covered the prior 3 months. As shown in Table 3, significant improvements were noted in abstinence rate [McNemar's $S = 4.5$, $p = .03$, Cohen's $d = 0.75$], percent days drank [$t(12) = 4.34$, $p < .001$, Cohen's $d = 0.46$], and number of drinks per week [$t(12) = 4.36$, $p < .001$, Cohen's $d = 0.36$].

Self-Efficacy and Coping Ability

Assessments of self-efficacy to avoid relapse were obtained prior to CBT, after CBT (before ATIVR) and after ATIVR using the ECBI (Litman et al., 1984) and the SCQ (Annis & Graham, 1988). Mean scores on the ECBI improved from baseline (29.6, $SD = 18.8$) to post-CBT [41.4, $SD = 12.6$; $t(31) = 2.80$, $p = .01$, Cohen's $d = 0.63$], and to post-ATIVR [42.9, $SD = 12.7$; $t(31) = 3.39$, $p = .002$, Cohen's $d = 0.71$]. Higher scores on the ECBI indicate greater effectiveness of coping strategies; thus, rather than show any deterioration after CBT, overall perceived coping ability was maintained during the use of the ATIVR. On the SCQ, the mean overall score improved significantly from baseline (70.8, $SD = 17.5$) to post-CBT [80.42, $SD = 14.7$; $t(30) = 2.12$, $p = .04$, Cohen's $d = 0.55$], and to post-ATIVR [88.72, $SD = 9.01$, $t(30) = 4.02$, $p < .001$, Cohen's $d = 1.02$]. As displayed in Figure 3, all of the eight SCQ individual subscales significantly improved from baseline to post-ATIVR. There was no significant change in SCQ scores from post-CBT to post-ATIVR on the total score or any of the subscales.

Subjective Reports

Participants were interviewed about their perceptions of the ATIVR after the 3-month calling period. They were asked to rate on a 5-point scale (*not at all* to *very*) their impressions of how logical the ATIVR treatment seemed as an add-on to CBT and their honesty in responding to the Daily Questionnaire items. After the ATIVR, mean treatment logic was rated 3.9 ($SD = 1.1$), and reported honesty level was 4.6 ($SD = 0.6$).

In the post-ATIVR Feedback Interviews, participants indicated the system was easy to use and that the calls increased their awareness of their thoughts, feelings, and actions in

reference to alcohol. Participants particularly liked the Therapist Feedback Message, saying it was “refreshing,” made them feel good, and encouraged them to make calls. One participant commented, “it was nice to get a personalized message from someone who really knows me.” Over half of the participants indicated ATIVR was helpful to their sobriety and/or that ATIVR helped them to feel accountable to themselves. In particular, some reported that what made them accountable was the expectation that calls be made daily, instead of some less frequent time interval, and that calls be made on good as well as bad days.

Unexpectedly, in the Feedback Interview some participants offered spontaneous comparisons of ATIVR and features of other support options, primarily Alcoholics Anonymous (AA). For example, ATIVR was considered to be, “like an electronic sponsor,” but also, “good because it’s not judgmental, unlike an AA sponsor.” One person said, “I called when I couldn’t reach my sponsor.” Others made analogies to meetings. ATIVR was described as, “like an AA meeting on the phone: a way to reach out and grab some sobriety,” and, “like AA: some people are going to stay and some are going to go but the meetings [and the ATIVR] are always there.” Conversely, it was noted that, “I don’t feel as accountable to an automated system as I do face-to-face AA meeting,” and, “The ATIVR does not take the place of showing my face at AA each day.” Finally, one participant said he was not interested in AA but found the ATIVR study to be a more appealing option for him.

Participants who did not call typically said it was because they forgot, although some reported they did not need the ATIVR because they were doing well and/or had other supports in place.

Discussion

Summary of Major Findings

The feasibility of ATIVR was demonstrated by the high call rates, utilization of program features, and feedback from participants. While the goals of this pilot were to test feasibility in a small sample of patients, we also examined pre–post changes in certain clinical status parameters. These analyses were conducted using data from as few as 13 participants and without a control group so results are not to be generalized to other samples. However, among this select group of participants, substantial improvements in alcohol consumption-related variables from pre- to post-ATIVR were observed. Self-efficacy and effectiveness of coping behaviors improved during CBT and in all cases, significant improvements were sustained or augmented during the ATIVR period.

We suspect that the patient acceptance and benefit from this program can be attributed to its consistency with both behavior theory and Social Cognitive theory (Bandura, 1977, 1986). Specifically, this program incorporated self-monitoring of both drinking behaviors and urges to drink, a technique widely advocated for motivating and encouraging clients to reduce or stop drinking (Marlatt & Gordon, 1985; National Institute on Alcohol & Alcohol Abuse, 2009). It is important to note that this program incorporated therapist feedback as a way of providing both positive reinforcement for change as well as encouragement and motivation for reengagement with therapeutic behavior. Indeed, this feedback (via the Therapist Feedback Message) was the only program component besides the Daily Questionnaire that was accessed by all participants. Finally, this program provided patients access to the coping skills they learned in therapy, which they could either review or practice in real time.

An unanticipated finding was the number of spontaneous comparisons of ATIVR with Alcoholics Anonymous. One explanation for this analogy might be that the ATIVR, because it is confidential and automated, conveyed a sense of anonymity while at the same time

offering support and feedback both immediately following the Daily Questionnaire and monthly via the Therapist Feedback Message.

Limitations

This research is limited by the small size and relative homogeneity of our sample. Because this was a pilot program, we recruited from just one clinic in one geographic region. Another limitation was the pre–post design, which did not allow for the comparison of groups exposed to ATIVR versus usual care. Finally, this research relied on self-report of alcohol consumption to evaluate change in drinking. No objective alcohol use data were collected.

Implications

The results of this study demonstrate the feasibility of using IVR to extend outpatient treatment for alcohol use disorders and suggest that IVR technology holds promise as a means for facilitating ongoing use of CBT skills. While an automated telephone may seem impersonal and of limited therapeutic value, a number of patients commented that the impersonal interface was perceived to be less judgmental; indeed, prior research has shown that individuals often prefer and respond more honestly to computers than face-to-face or on paper (Kypri, Saunders, & Gallagher, 2003; Lucas, Mullin, Luna, & McInroy, 1977; Perlis, Des Jarlais, Friedman, Arasteh, & Turner, 2004). That some participants drew parallels between ATIVR and AA implies that perhaps an ATIVR system could be effectively designed using alternative theoretical underpinnings, such as 12-step facilitation. For example, the Daily Questionnaire could be modified to include monitoring of important daily practices such as AA meetings attended; the Therapeutic Questionnaire could focus on actions the participant took or might have taken that are consistent with the AA philosophy (e.g., call the sponsor), and the Coping Skills Practice and Didactic Skills Review components could be designed to remind or summarize readings from the “Big Book,” or review the elements of major topics like acceptance and surrender.

The results suggest the need for a larger trial to measure the efficacy of ATIVR against a usual care control group. While the labor costs for designing and programming an IVR system are not trivial, the per-capita cost shrinks incrementally with each client added to an existing system. The financial payback for this system would need to be calculated based on its relative efficacy. Our research group is currently conducting a randomized controlled trial of ATIVR in a larger, more diverse sample.

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Figure 1. Alcohol Therapeutic Interactive Voice Response (ATIVR) features and branching structure. The five primary components are capitalized.

Figure 2. Survival curve associated with participant engagement in the Alcohol Therapeutic Interactive Voice Response (ATIVR). Engagement defined as “days to last call.”

Figure 3. Situational Confidence Questionnaire subscale scores (mean $\pm$ standard error) for each assessment.

Table 1Demographics and Substance Use Characteristics ($N = 21$)

Characteristic	Percent of participants ^a
Age, years (mean $\pm$ <i>SD</i>)	45.6 $\pm$ 11.5
% Male	57
% White	95
% Married	38
% Education greater than high school ^b	59
% Unemployed ^c	28
% Alcohol abuse or dependence	90
% Other substance abuse or dependence	19
% DWI conviction ^d	44

Note. DWI = driving while intoxicated.

^a percent unless otherwise stated.

^b $n = 18$.

^c $n = 17$.

^d $n = 16$.

Table 2

ATIVR Components in Order of Usage Rate

Component	Percent of participants	Number of times used Mean
Therapist Feedback Message	100	3.4 (1–10)
Skills Practice	71	5.8 (1–21)
Skills Review	48	3.4 (1–14)

Note. Values indicate the percent of participants who used each component at least once.

^a Includes only participants who used the component.

Table 3Alcohol Use Outcomes ($N = 18$)

	Post-CBT/pre-ATIVR	Post-ATIVR	<i>p</i> -value
% with 90-day abstinence (%)	28	61	.03
% days drank in past 90 ^a	35.1 ± 21.5	5.7 ± 11.5	.001
drinks/week ^a	18.1 ± 12.9	1.5 ± 3.3	<.001

Note. “Post-Cognitive Behavior Therapy (CBT)/Pre-Alcohol Therapeutic Interactive Voice Response (ATIVR)” assessment was conducted at the conclusion of 12 weeks of CBT, before beginning the ATIVR program. Consumption data were obtained using the Timeline Follow-back. Tabled values are means ± *SD* unless otherwise noted.

^aAnalysis limited to participants who reported drinking at the pre-ATIVR assessment ($n = 13$).