

# Telephone-Based Self-Change Modules Help Stabilize Early Natural Recovery in Problem Drinkers

KERSTIN E. E. SCHRODER, PH.D.,<sup>a,\*</sup> JALIE A. TUCKER, PH.D., M.P.H.,<sup>a</sup> AND CATHY A. SIMPSON, PH.D.<sup>a</sup>

<sup>a</sup>Department of Health Behavior, School of Public Health, University of Alabama at Birmingham, Birmingham, Alabama

**ABSTRACT. Objective:** Self-guided attempts to resolve drinking problems are common, but little is known about the processes by which supportive interventions of lower intensity might promote resolution. This study investigated how brief supportive educational modules delivered as part of an interactive voice response self-monitoring (IVR SM) system helped stabilize initial resolution among otherwise untreated problem drinkers. **Method:** Recently resolved problem drinkers allocated to the intervention group of a randomized controlled trial were offered IVR access for 24 weeks to report daily drinking and hear weekly educational modules designed to support resolution. Using data from the 70 active IVR callers, hierarchical linear models evaluated whether module retrieval reduced subsequent alcohol consumption, including high-risk drinking, and whether module retrieval attenuated the effects on drinking of established proximal risk factors for relapse (e.g., urges,

drug use, and weekends). The analyses controlled for initial resolution status (abstinence or low-risk drinking). **Results:** Urges, drug use, and weekends were associated with increased drinking reports on the next IVR call (all  $ps < .01$ ), whereas retrieving a module was associated with decreases in next-call drinking reports, including high-risk drinking episodes ( $p < .05$ ). Module retrieval, however, did not reduce or buffer the effects of urges on drinking. Findings were similar across initially abstinent and low-risk drinkers. **Conclusions:** IVR-delivered supportive educational modules may help stabilize initial problem-drinking resolutions, but mechanisms of change deserve more study. The study adds to evidence of the co-occurring negative effects of multiple behavioral and environmental risk factors on the temporal patterning of post-recovery alcohol use. (*J. Stud. Alcohol Drugs*, 74, 902–908, 2013)

**M**OST PROBLEM DRINKERS DO NOT SEEK professional treatment, and accessible community-based interventions are needed to increase service options for untreated drinkers, who comprise the majority of the population with problems and contribute the bulk of harm and cost (Tucker and Simpson, 2011). Computer-automated telephone applications using interactive voice response (IVR) systems can extend the reach of services to drinkers with mild to moderate problems who find clinic-based treatments and mutual help groups such as Alcoholics Anonymous unappealing. IVR-based programs offer privacy and anonymity and can be made available over long periods for cost-effective risk monitoring, relapse prevention, and rapid treatment entry when needed (Tucker and Grimley, 2011). IVR systems have been well received by users engaging in substance misuse, risky sex, and other sensitive problem behaviors, and they hold promise for collecting high-quality data due to automation and near-contemporaneous reports that may reduce recall errors and reporting biases (Schroder and Johnson, 2009).

IVR systems are well suited to provide ongoing support to recovering problem drinkers. For example, daily self-monitoring (SM) often results in beneficial reductions in recorded behaviors, including drinking (Miller and Wilbourne, 2002). In addition, guided self-change materials (Sobell and Sobell, 1993), such as brief feedback and recovery-focused messages, can be offered via IVR during the often lengthy behavior-change process. However, most studies have offered IVR SM in conjunction with professional care and not as a support for self-change among otherwise untreated problem drinkers, which is the dominant pathway to recovery among the population with alcohol-related problems (Sobell et al., 1996).

This study investigated whether recovery-focused educational modules offered weekly as one component of a 24-week IVR-delivered guided self-change intervention (Sobell and Sobell, 1993) contributed to resolution stability (abstinence or low-risk drinking) among recently resolved untreated problem drinkers during early recovery when relapse risk is high. The data analyzed were from a larger randomized controlled trial (RCT) concerned with the efficacy of the multicomponent guided self-change intervention, which included the educational modules, daily SM of drinking and related variables (e.g., urges to drink, other drug use, drinking contexts), and weekly/monthly feedback on drinking goals (Tucker et al., 2012). In the parent study, IVR SM was found to have beneficial effects on 6-month drinking outcomes, corresponding to the end of the IVR SM interval. Specifically, the intervention selectively supported low-risk drinking resolutions among more impulsive drinkers

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\*Correspondence may be sent to Kerstin E. E. Schroder at the Department of Health Behavior, School of Public Health, University of Alabama at Birmingham, 1665 University Boulevard, Birmingham, AL 35294, or via email at: [kschroder@uab.edu](mailto:kschroder@uab.edu).

at baseline (expressed by greater pre-resolution spending on alcohol than future savings) if it was used on at least 70% of IVR call days.

In the context of intervention efficacy established in the RCT (Tucker et al., 2012), the present analyses investigated processes by which brief supportive educational modules delivered by the IVR SM system helped stabilize initial resolution. Specifically, we evaluated whether module retrieval reduced subsequent alcohol consumption, including high-risk drinking, and whether retrieval attenuated the effects on drinking of established proximal risk factors for relapse (e.g., drinking urges, drug use, and weekends; Marlatt and Witkiewitz, 2005).

New modules introduced most weeks of the 24-week IVR interval followed a typical course of recovery (e.g., relapse prevention, building sobriety-supportive networks) and presented evidence-based cognitive-behavioral and guided self-change materials (Sobell and Sobell, 1993; Sobell et al., 2002). Daily drinking and proximal risk factors for drinking were assessed during each IVR call.

The main hypotheses were as follows: (a) Urges to drink, concurrent drug use other than alcohol, and opportunity (weekend days) would be associated with increased alcohol consumption during the IVR interval; (b) retrieving a module would reduce next-call reports of drinking (main effect hypothesis); and (c) exposure to modules would reduce the impact of urges to drink on alcohol consumption, consistent with a buffer effect (moderator hypothesis). Initial resolution status (resolved abstinent [RA] or resolved nonabstinent [RNA]) was included as a potential moderator of the hypothesized effects of module retrieval and proximal risk factors on drinking.

## Method

### *Sample characteristics*

Participants randomized to the IVR SM intervention condition in the larger trial comprised the analysis sample. Of 187 eligible participants, 87 subjects were randomly allocated to IVR SM and remained eligible over the course of the intervention period. Participants in the assessment-only control group did not provide IVR data and thus were excluded. The study received institutional review board approval and a federal Certificate of Confidentiality.

As described in Tucker et al. (2012), adult research volunteers were recruited using media advertisements in Alabama, Georgia, and Mississippi and were screened using the Michigan Alcoholism Screening Test (Selzer, 1971), the Alcohol Dependence Scale (Skinner and Horn, 1984), and the Drinking Problems Scale (Cahalan, 1970). Eligibility criteria were (a) legal drinking age ( $\geq 21$  years), (b) high-risk drinking practices and alcohol-related problems for 2 or more years, (c) no current other drug misuse (except nicotine) reported at

enrollment, and (d) successful cessation of problem drinking during the past 3–16 weeks without alcohol-focused interventions ( $M = 2.33$  months resolved,  $SD = 1.00$ ).

Resolution onset was the most recent date that participants began abstaining (RA) or drinking in a non-problem manner (RNA; Sobell et al., 1996). *RNA status* was defined as (a) no dependence symptoms on the Alcohol Dependence Scale, (b) no alcohol-related negative consequences on the Drinking Problems Scale, and (c) no risky drinking days (five or more standard drinks/day for men, four or more drinks/day for women; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2005). *Problem drinking* was defined as exceeding these limits on any criterion. Limited earlier help seeking was not an exclusion criterion if it had occurred more than 2 years before the current resolution.

Sample characteristics are presented in Table 1. Of eligible participants randomized to the IVR intervention ( $n = 87$ , excluding 1 person who was eliminated because of inconsistencies in reporting; see Tucker et al., 2012), 70 provided IVR call data suitable for analysis (80.5%). Gender distribution among callers (41 men, 29 women) was similar to the U.S. problem drinker population; racial distribution reflected regional characteristics, with a higher-than-national percentage of African Americans ( $n = 31$ , 44.3%); and drinking problem histories were consistent with moderate alcohol dependence typical of outpatient treatment samples (Miller and Munoz, 2005). Although not required, participants met diagnostic criteria for alcohol dependence (American Psychiatric Association, 1994). Callers and noncallers did not differ significantly on demographic or drinking history measures, except that callers tended to be less likely to be employed,  $\chi^2(1) = 4.02$ ,  $p < .05$ , and reported longer problem-drinking histories,  $t(85) = 2.04$ ,  $p < .05$  (Table 1).

### *Procedures*

Procedures described here are specific to the current report. Additional procedures in the parent study are described elsewhere (e.g., Tucker et al., 2012).

*Baseline assessment.* In individual interviews that lasted 1.5–2.5 hours, participants were consented, and sobriety was verified by breath test (FC20, Lifeloc Technologies, Wheat Ridge, CO). An expanded Timeline Followback (TLFB) interview (Sobell and Sobell, 1992; Vuchinich and Tucker, 1996) assessed daily drinking practices and monetary allocation, including spending on alcoholic beverages from the pre-resolution year to the present. Participants received IVR training and a workbook with the IVR questions, reporting schedules, and brief readings that followed the IVR-delivered educational modules (see next section). Compensation was provided in the form of Visa gift cards or checks (\$50 per interview).

*IVR intervention.* After training, participants received access for 24 weeks to the toll-free IVR system, programmed

TABLE 1. Sample characteristics at initial assessment and during the post-resolution interactive voice response (IVR) interval

Variable	Callers ( <i>n</i> = 70)		Noncallers ( <i>n</i> = 17)		Test statistic		Whole sample ( <i>N</i> = 87)	
	<i>n</i>	%	<i>n</i>	%	$\chi^2$	<i>p</i>	<i>n</i>	%
Demographic characteristics								
Male gender	41	58.6	14	82.4	3.33	n.s.	55	63.2
Ethnic minority	34	48.6	10	58.8	1.12	n.s.	44	50.6
Married	26	37.7	8	47.1	0.50	n.s.	34	39.5
Employed full/part time	45	66.2	11	73.3	4.02	.045	56	67.5
Abstinent at enrollment	59	84.3	11	64.7	3.34	n.s.	70	80.5
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>
Age, in years	47.91	10.56	40.82	15.21	1.82	n.s.	46.53	11.86
Years of education	14.20	3.11	13.35	1.84	1.08	n.s.	14.03	2.91
Annual income, in U.S. \$	50,626	60,548	41,971	27,651	0.57	n.s.	48,935	55,637
History of drinking problems								
Problem-drinking duration, in years	16.30	11.69	11.06	8.50	2.04	.049	15.11	11.21
Alcohol Dependence Scale (47) <sup>a</sup>	18.13	9.49	18.81	9.23	-0.27	n.s.	18.26	9.39
Michigan Alcoholism Screening Test (25) <sup>a</sup>	12.59	3.76	13.41	3.97	-0.80	n.s.	12.76	3.79
Drinking Problems Scale (40) <sup>a</sup>	17.38	9.10	20.06	9.74	-1.07	n.s.	17.91	9.24
Pre-resolution-year drinking practices (Timeline Followback interview)								
% high-risk drinking days <sup>b</sup>	60.88	37.30	75.86	30.33	-1.54	n.s.	63.81	36.37
<i>M</i> standard drinks/drinking day	10.04	6.41	13.52	8.65	-1.87	n.s.	10.71	7.00
Post-resolution IVR substance-related reports								
% high-risk drinking days <sup>b</sup>	3.84	11.43						
<i>M</i> standard drinks per drinking day	3.41	3.49						
<i>M</i> urge to drink ratings <sup>c</sup>	1.84	1.90						
% drug use days	2.80	12.67						

Notes: Demographic and pre-resolution drinking variables are based on enrolled sample of 87. Post-resolution variables are based on IVR callers (*n* = 70) except for *M* drinks per drinking day, which are based on 42 callers who reported drinking. n.s. = not significant. <sup>a</sup>Maximum possible questionnaire scores are given in parentheses; higher scores indicate higher dependence levels (Alcohol Dependence Scale) or greater alcohol-related problems (Michigan Alcoholism Screening Test, Drinking Problems Scale). <sup>b</sup>High-risk drinking days are based on National Institute on Alcohol Abuse and Alcoholism (2005) gender-adjusted cut points (five or more standard drinks for men, four or more drinks for women). <sup>c</sup>Urge to drink were rated on a 10-point scale (0 = no urge to drink and 9 = strongest urge ever to drink).

using commercial software (SmartQ-Version 5 [5.0.141], TeleSage, Inc., Chapel Hill, NC). Daily questions assessed ounces of beer, wine, and distilled spirits consumed (converted to standard drinks for analysis, i.e., 12 oz. of beer, 5 oz. of wine, 1.5 oz. of distilled spirits); other drug use to “get high” (marijuana, cocaine, opiates, other); urges to drink rated on a 10-point scale (0 = no urge to drink and 9 = strongest urge ever to drink); and dollars spent on alcohol and other drugs during the 24-hour period of midnight to midnight yesterday. Questions about nondrinking activities balanced call duration when no substance use was reported.

Additional IVR questions asked once a week varied day to day on Monday through Thursday (e.g., strategies used to avoid/limit drinking, spending on commodities other than alcohol). On Mondays, participants received verbal feedback concerning last week’s drinking goals and set goals for the coming week. On Fridays, except during weeks participants were mailed monthly feedback letters (Weeks 5, 9, 13, 17, and 21), they could listen to a new 1- to 2-minute IVR-delivered education module patterned after guided self-change materials (Sobell and Sobell, 1993). Early modules focused on setting drinking goals, refusing drinks, and coping skills useful for relapse prevention in early recovery.

Later modules focused on making positive changes in other life-health areas important for maintaining long-term sobriety (e.g., developing nondrinking social networks, effective money management). Once a module had been introduced, it could be accessed later.

Daily and weekly IVR surveys averaged 4.6 and 2.3 minutes, respectively. Points for daily calls were awarded and modestly reimbursed (\$0.50–1.00/call) via an “electronic bank” (Searles et al., 1995), a commonly used procedure to encourage calls. Among those who called the IVR system at least once, mean earnings were \$33.79 (*SD* = 52.56).

*Post-intervention telephone interview and data quality checks.* At the end of the 24-week IVR SM intervention period, telephone interviews were conducted, including a TLFB assessing drinking practices over the preceding 6 months. Participants in phone interviews were compensated with \$15. As described in Tucker et al. (2012), to check the reliability of participant reports of key variables, time-matched reports of drinking derived from IVR and the post-intervention TLFB interviews were compared for participants with 10 or more days of IVR reports, showing generally good agreement. No significant differences were found between IVR and TLFB in terms of the percentage of drinking days and

average alcohol consumption per day. In addition, participant reports of eligibility criteria and drinking practices were verified using collateral informants when available. These findings support the reliability and accuracy of participants' verbal reports.

*Statistical analyses.* IVR time-stamped call-level data on module retrieval; day of week (coded as weekend/weekday); and reports of alcohol consumption (in standard drinks), urges to drink, and other drug use were combined for analysis with initial resolution status (RA or RNA) and select baseline measures. Hypothesis-relevant analyses were conducted using HLM 6.08 (Raudenbush et al., 2004).

Two sets of hierarchical linear model (HLM) analyses were conducted, with IVR reports nested within participants, to evaluate the hypotheses concerning predictors of standard drinks per IVR call day (continuous dependent variable) and high-risk drinking days based on NIAAA (2005) gender-adjusted cut points (dichotomous dependent variable). For standard drinks, a negative binomial model was specified to account for overdispersion in the data, and significance tests were conducted using robust standard errors to adjust significance levels to account for potential violations of model assumptions. For high-risk drinking, logistic mixed model analyses were performed using robust standard errors. Dichotomous predictors, including weekend/weekday drinking, same-day drug use/no drug use, and module/no module retrieval on the previous reporting occasion, were contrast coded (.5 = predictor present, -.5 = predictor absent). Event-rate ratios (ERRs) reflecting the relative increase in drinks consumed per one-unit change in a predictor were calculated, as were odds ratios (ORs) and the associated 95% confidence intervals (CI). Urge ratings were *z*-transformed; ORs thus reflected the effects of a 1-*SD* increase in this predictor.

For each set of HLM analyses, initial models included only time-varying predictors, including IVR day number ( $t = 1-168$ ), urge ratings, weekend/weekday, drug use, and module retrieval on the previous reporting occasion ( $t - 1$ ). Following recommendations of Raudenbush and Bryk (2002), group (person-specific) centering was applied to the predictors on Level 1. The buffer hypothesis was evaluated by including a Module  $\times$  Urge interaction as a time-varying predictor along with the other predictors. Subsequent models added initial resolution status (RA or RNA) as a time-invariant predictor and evaluated initial status as a moderator of the effects of time-varying predictors. The directional module retrieval hypotheses were evaluated with one-tailed significance tests with  $p < .05$ ; all other tests were two tailed.

## Results

### *Module retrieval*

The 70 callers collectively made a total of 5,546 daily IVR calls, with a mean of 79.23 calls per person ( $SD =$

63.97). Callers retrieved a mean of 6.9 of the 19 different modules ( $SD = 5.84$ , range: 0–19) and heard 7.8 total modules ( $SD = 7.00$ , range: 0–21) with repetitions included. Across the 5,546 daily observations, module retrieval was reported on 9.95% of call days (547 / 5,546). Retrieval decreased over time (OR = 0.995, 95% CI [0.993, 0.997],  $p < .001$ ) and, as expected, was positively correlated with number of IVR call days ( $r = .889$ ,  $p < .001$ ), which varied across callers ( $M$  percentage of call days = 46.95%,  $SD = 38.17$ ;  $Mdn = 34%$ ; see Simpson et al., 2012).

### *Post-resolution substance use*

Initial resolution status was 84.3% RA (59 / 70) and 15.7% RNA (11 / 70). Summed over all IVR calls with useable data, the percentages of calls with reports of any drinking, high-risk drinking, and other drug use were 20.3% (1,122 / 5,526), 6.13% (339 / 5,526), and 3.69% (203 / 5,495), respectively. As shown in Table 1, relative to heavy pre-resolution drinking practices, IVR-reported drinking among the 70 callers was much reduced. Drinking was reported by 60% of callers (42 / 70); 30% reported high-risk drinking (21 / 70), indicating at least one relapse. As expected, RNA participants reported a greater percentage of drinking days than RA participants ( $M = 32.27%$ ,  $SD = 29.76$  vs.  $M = 12.23%$ ,  $SD = 23.92$ ),  $t(68) = 2.46$ ,  $p < .017$ . Reports of high-risk drinking did not differ significantly as a function of initial resolution status. Drinking also did not differ significantly by gender; therefore, gender differences were not further explored.

### *Predictors of alcohol consumption*

*Daily drinking.* Table 2 summarizes the results for the hierarchical negative binomial model predicting the number of drinks reported during each call, based on the 5,489 daily observations available for analysis. The initial model included the time-varying proximal predictors of drinking. All were significant in the hypothesized direction. Alcohol consumption was more prevalent on weekends than weekdays, and both urges to drink and other drug use were associated with increased same-day drinking ( $ps < .01$ ). Urges were the strongest predictor of same-day drinking ( $p < .001$ ), and drinking increased over the IVR interval ( $p < .05$ ). In contrast, having heard an educational module during the previous IVR reporting episode was associated with reports of decreased drinking on the next call ( $p = .05$ , one tailed), consistent with predictions.

The second model added the interaction term between module retrieval at  $t - 1$  and urges to drink to the initial model. This did not change the results, indicating that the predicted buffer effect of module retrieval was not significant.

A series of additional models evaluated moderator effects of initial resolution status on the time-varying predictors



TABLE 2. Hierarchical linear modeling of alcohol consumption per interactive voice response (IVR) call day

Predictors	Estimate	SE	<i>t</i>	<i>df</i>	<i>p</i> <sub>robust</sub>	Event rate ratio	[95% CI]
<b>Model 1</b>							
Intercept	-2.793	0.337	-8.30	69	.001		
IVR day number ( <i>t</i> )	0.003	0.001	2.46	5483	.014	1.003	[1.001, 1.006]
Module retrieval ( <i>t</i> - 1)	-0.161	0.098	-1.64	5483	.050 <sup>a</sup>	0.852	[0.725, 1.000] <sup>a</sup>
Urge to drink	1.178	0.133	8.83	69	.001	3.248	[2.490, 4.237]
Weekend opportunity	0.138	0.047	2.91	5483	.004	1.148	[1.046, 1.260]
Drug use other than alcohol	0.539	0.133	4.06	5483	.001	1.714	[1.321, 2.223]
<b>Model 2</b>							
Intercept	-2.790	0.336	-8.31	69	.001		
IVR day number ( <i>t</i> )	0.003	0.001	2.42	5482	.016	1.003	[1.001, 1.006]
Module retrieval ( <i>t</i> - 1)	-0.491	0.268	-1.83	5482	.034 <sup>a</sup>	0.612	[0.393, 0.951] <sup>a</sup>
Urge to drink	1.278	0.145	8.80	69	.001	3.591	[2.689, 4.795]
Weekend opportunity	0.142	0.046	3.07	5482	.003	1.153	[1.053, 1.262]
Drug use other than alcohol	0.512	0.146	3.50	5482	.001	1.669	[1.253, 2.224]
Module Retrieval × Urge	0.249	0.142	1.75	5482	n.s.		
<b>Model 3</b>							
Intercept	-4.253	0.544	-7.82	68	.001		
Initial resolution status	1.100	0.247	4.45	68	.001	3.003	[1.835, 4.914]
IVR day number ( <i>t</i> )	0.003	0.001	2.34	5480	.019	1.003	[1.001, 1.006]
Module retrieval ( <i>t</i> - 1)	-0.493	0.267	-1.85	5480	.032 <sup>a</sup>	0.611	[0.394, 0.948] <sup>a</sup>
Urge to drink	1.284	0.149	8.64	69	.001	3.611	[2.686, 4.854]
Weekend opportunity	0.137	0.046	2.97	5480	.003	1.147	[1.048, 1.256]
Drug use other than alcohol	-0.246	0.392	-0.63	5480	n.s.		
Module Retrieval × Urge	0.254	0.141	1.80	5480	n.s.		
Resolution Status × Drug Use	0.301	0.129	2.33	5480	.020	1.352	[1.049, 1.742]

Notes: IVR day number (1–168) = time effect; *p*<sub>robust</sub> = significance based on robust standard errors (*SE*; see text); CI = confidence interval based on analyses with robust *SE*s; n.s. = not significant. <sup>a</sup>Effects for module retrieval were tested one tailed at *p* ≤ .05.

by including in separate HLM analyses a Resolution Status × Time-Varying Predictor interaction term for module retrieval, IVR day number, urges, weekend drinking, and other drug use. As shown in Model 3, the only significant moderator effect involved drug use (ERR = 1.352, CI [1.049, 1.742], *p* = .02). Drug use had stronger effects on IVR-reported drinking among initial RNA than RA status participants, adding to their risk of relapse ( $\beta$  = 0.301, *SE* = 0.129; *t* = 2.33, *p* = .02).

**High-risk drinking.** The hierarchical (logistic) regression results with high-risk drinking coded as a binary gender-adjusted outcome (NIAAA, 2005) yielded very similar findings. The likelihood of high-risk drinking increased on weekends (OR = 1.563, CI [1.084, 2.253], *p* = .017), with same-day use of other drugs (OR = 3.707, CI [1.785, 7.701], *p* < .001), and in the presence of urges to drink (OR = 3.576, CI [2.486, 5.143], *p* < .001). As predicted, module retrieval during the previous IVR reporting occasion was associated with decreased likelihood of reporting high-risk drinking on the next call (OR = 0.510, CI [0.305, 0.853], *p* = .017). The only discrepant result was that high-risk drinking did not change over time (OR = 1.007, CI [0.999, 1.015], n.s.).

No interaction was found between prior module retrieval and urges to drink that would support the buffer hypothesis for high-risk drinking. In contrast to the results with the number of standard drinks consumed, no RA/RNA differences were found for high-risk drinking. Initial resolution

status also did not display any moderator effects except for the interaction with drug use that was also observed in analyses with standard drinks (OR = 2.093, CI [1.040, 4.231]). Drug use had stronger effects on high-risk drinking among initial RNA participants, adding to their risk of relapse ( $\beta$  = 0.739, *SE* = 0.357; *t* = 2.07, *p* = .038).

## Discussion

Some support was found for beneficial effects of retrieving IVR-delivered educational modules that were sequenced to follow a typical course of recovery to aid relapse prevention and help stabilize new sober behavior patterns. Hearing a module on the previous IVR call was associated with decreased reports of alcohol consumption, including high-risk drinking, on the next call. These positive effects were similar across initial resolution status groups. No support was found, however, for the buffer hypothesis that module retrieval would be associated with diminished effects of urges on drinking reported on the next call. Because urges predicted drinking over weeks to months after initial resolution, the mechanisms of action for the observed beneficial association of module retrieval with reduced drinking remain unclear and warrant further study.

Consistent with past research (Marlatt and Witkiewitz, 2005), the present study replicated and extended the role of established relapse risk factors using prospective call-level

data. In addition to the associations between urges and drinking, same-day other drug use (primarily marijuana) was associated with increased reports of drinking, including high-risk drinking. This association occurred even though participants reported no drug misuse at enrollment and infrequent drug use during the IVR interval. Greater drinking also was associated with weekends compared with weekdays, as found in prior IVR studies (e.g., Schroder and Perrine, 2007). These results provide further evidence of the co-occurring negative effects of multiple behavioral and environmental risk factors on the temporal patterning of substance use.

As expected, RNA participants reported more post-resolution drinking days than RA participants, but high-risk drinking was similar across groups and increased over time. Thus, initial pursuit of a low-risk drinking resolution did not confer higher relapse risk. Other drug use was the only time-varying predictor that had differential effects on drinking as a function of initial resolution status, and it was associated with increased likelihood of drinking among RNA participants only. Although interesting and deserving of further study, the results are very preliminary, given that most participants were initially RA and drug use was reported in less than 4% of IVR calls.

Other study limitations relate to the modest sample size and the correlational nature of the research design, which argue for caution in making causal inferences. Although the results suggested benefits of module retrieval on drinking, the associations observed deserve further study by experimental manipulation of IVR access (e.g., using within-subjects ABAB reversal designs). Absent such research, it cannot be determined unequivocally if module retrieval reduced drinking, or whether there were other causal factors at play. Nevertheless, the large number of daily IVR reports collected led to an impressive data set of prospective daily observations that supported call-level examination of relationships among key variables.

Questions also remain about the specific contribution of the educational modules apart from the comprehensive IVR-based intervention that included daily SM and regular feedback on drinking practices. The RCT findings (Tucker et al., 2012) suggested that IVR SM selectively supported moderation resolutions if it was used by recently resolved problem drinkers with higher baseline impulsivity (i.e., stronger preferences for drinking relative to delayed rewards made possible by savings). Understanding the relative contributions to drinking behavior change of components such as IVR SM, educational modules, and drinking-related feedback is an important question for future research.

With these qualifications, the present findings suggest the potential of educational materials delivered using an IVR platform to help stabilize drinking resolutions after initial change. Our study showed beneficial effects of the modules in reducing subsequent drinking and the likeli-

hood of high-risk drinking. Self-change is the dominant pathway to resolution (Sobell et al., 1996), and IVR-based interventions can extend the reach of supportive services for the majority of problem drinkers who attempt to quit on their own.

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