



## Full length article

## Assessment methods and schedules for collecting daily process data on substance use related health behaviors: A randomized control study



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## ARTICLE INFO

## Keywords:

Daily process  
Interactive voice response  
Short message service  
Compliance  
Use patterns  
incentive

## ABSTRACT

**Background:** Interactive voice response (IVR) and short message service (SMS) systems have been used to collect daily process data on substance use. Yet, their relative compliance, use patterns, and user experiences are unknown. Furthermore, recent studies presented the potential of a hybrid weekly protocol requiring recall of behaviors in past week right after the weekend, in order to reduce the concerns about low compliance and measurement reactivity associated with daily data collection and also provide high quality data on the peak of use.

**Methods:** This study randomized substance users to four (2 × 2) assessment groups with different combinations of assessment methods (IVR or SMS) and schedules (daily or weekly). The compliance rates and use patterns during the experimental period of 90 days and user experiences reported after the period were compared across the groups.

**Results:** When IVR was assigned, the weekly schedule generated a higher compliance rate than the daily schedule. When SMS was used, however, the assessment schedule did not have an effect on compliance. While both the daily and weekly surveys via IVR can be completed within a short time, the weekly survey administered via SMS took much longer than its daily counterpart. Such an increased time consumption may offset the benefit of a less frequent assessment schedule.

**Conclusions:** IVR is a better choice for delivering the hybrid protocol of weekly collection of daily process data because of its higher compliance rate, shorter duration, and lower likelihood of interruption during data collection.

## 1. Introduction

Research studies with daily process designs involving data collection from participants once per day over a defined period have increased dramatically in the last decade (Guntherth and Wenzel, 2012). These designs have the advantage of eliminating retrospection bias and minimizing selectivity in describing experiences. More importantly, they have greater ecological validity because behavioral processes are assessed in real time and in their natural contexts (Reis, 2012). For example, alcohol consumption usually takes place in social settings with important antecedents and consequences such as moods and marital interactions, which can be effectively captured by daily process data (Cranford et al., 2010). Because of these advantages, such designs

have been adopted more frequently in substance use research.

In spite of these advantages, daily process designs require a higher cost and heavier participant burden than retrospective interviews or surveys. Yet, such costs and burdens could be reduced by collecting data using participants' own mobile phones through interactive voice response (IVR) or short message service (SMS) systems (Conner and Mehl, 2012). IVR systems administering surveys with prerecorded audio and recording participants' responses into databases automatically have been commonly adopted to collect daily process data in the substance abuse field (Yang et al., 2015). Recently, SMS has also become a popular research tool because of its popularity (Suffoletto et al., 2012). Researchers, however, have not conducted a randomized control study comparing these two assessment methods in terms of

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<http://dx.doi.org/10.1016/j.drugalcddep.2017.05.003>

Received 3 February 2017; Received in revised form 1 May 2017; Accepted 3 May 2017

Available online 13 June 2017

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compliance, use patterns, and user experiences. This is a critical gap in the literature because such comparison can inform future applications of these methods in various settings.

Daily process designs unavoidably involve self-monitoring of the target behavior which is an active component of some cognitive-behavioral interventions for substance use disorders (Simpson et al., 2005). The potential measurement reactivity (i.e., reducing the target behavior due to self-awareness) is undesirable for studies that aim to investigate the association between the target behavior and its antecedent or consequence (Yang et al., 2015). Another major drawback of daily process designs is low compliance that tends to result in non-random missing data and biased samples (Leigh, 2000). A possible way to address both the issues of measurement reactivity and low compliance is to implement a less intensive assessment schedule. Simpson et al. (2005) randomized a treatment sample into daily or weekly IVR monitoring and found no significant difference in the percent of calls made. Yet, such findings were limited by the short study duration (28 days) and an ongoing addiction treatment that may have promoted compliance in both groups. Another study with a small community sample completing both daily and weekly IVR for 128 days found a high correlation between the two reports of drinking (Tucker et al., 2007). The correlation, however, was likely to be inflated because the daily protocol may have facilitated the recall in the weekly protocol. Moreover, a feasibility study using SMS to collect data from young adults (Kuntsche and Robert, 2009) only on Saturday and Sunday afternoons (to minimize participant burden but still enable the maximum capture of high-risk drinking that usually occurs on Friday and Saturday nights) was able to reach a retention rate of 75% over 4 weekends. Taken together, previous studies presented the potential of a *hybrid protocol* that requires recall of behaviors in past 7 days right after the weekend, to reduce concerns about low compliance and measurement reactivity associated with daily data collection and also provide high quality data on the peak of use (weekend). Furthermore, it is unknown whether the differences in compliance, use patterns, and user experiences between daily and weekly assessment schedules vary across assessment methods (IVR vs. SMS).

This study aims to address the current knowledge gaps by randomizing substance users to four ( $2 \times 2$ ) assessments groups with different combinations of assessment methods (IVR or SMS) and schedules (daily or weekly). The compliance rates and use patterns during the experimental period of 90 days and user experiences reported after the period are compared across the groups. The results have important implications for designing future studies that collect daily process data on substance use related health behaviors.

## 2. Material and methods

### 2.1. Study sample and procedures

This study is a randomized control study that re-contacted participants who previously enrolled in a natural history study, the Flint Youth Injury (FYI) Study, of 14–24 year-olds with recent drug use who sought care in an Emergency Department in Flint, Michigan (see Bohner et al., 2015). Study procedures were approved and conducted in compliance with the Institutional Review Boards for the University of Michigan and Hurley Medical Center. A Certificate of Confidentiality was also obtained from the National Institutes of Health.

The recruitment period was from March 2014 to January 2016. Of the 600 subject pool, 103 were excluded because they did not agree to be re-contacted for future studies, were in jail, or had died. Remaining participants were sent a “welcome back postcard” and contacted (e.g., phone, home visit, social media) during the recruitment period. After providing consent for the daily process study, 331 participants self-administered a 30-min computerized assessment including demographic information and conventional measures of substance use related risk behaviors/problems in past six months, followed by a

20–30 min staff-administered timeline follow-back interview, which used a calendar and landmark events to facilitate participants’ recall of substance use related behaviors for each day in the past 90 days (see Buu et al., 2014). Participants received \$20 cash for completing the baseline assessment and also offered the options to participate in urine drug screening (\$5 cash) and HIV testing (\$5 cash). After the assessment, they were randomized into four experimental groups (IVR daily, IVR weekly, SMS daily, and SMS weekly) and received a 10-min training session for the assigned group.

Participants in the daily groups reported daily by IVR/SMS about behaviors on the previous day for 90 days. The weekly groups retrospectively reported about their behaviors in the previous 7 days on Sunday or Monday after the baseline; for those whose baseline was on a Sunday, Monday, or Tuesday, the duration was 13 weeks, whereas the others had the duration of 14 weeks. This protocol ensured that the IVR/SMS data collection fully covered the 90 days after baseline for both the daily and weekly groups. All participants were instructed to call or text the computer system to take a short survey between 8 am and 11:59 pm using their own mobile device, to ensure that they had sufficient time to complete the assessment before the data collection was closed at 1 am. The IVR/SMS system automatically sent a call or text reminder for those who had not completed their survey at 2 pm daily (or on Sunday for the weekly group). Participants had the option to take their survey from that call or text message. Research staff monitored compliance and contacted participants with incomplete Sunday surveys via phone call, text, email, and/or Facebook messaging on Monday to remind them to complete it before 11:59 pm on Mondays; the staff also verified there were no technical issues that needed to be addressed. For participants in the daily groups, the staff contacted them after missing two consecutive surveys. Non-compliant participants were contacted 2–3 times per week using the same methods described above. After the experimental period ended, a post assessment was conducted with a brief conventional measure of substance use related risk behaviors in past 90 days and a satisfaction questionnaire about participants’ experiences with IVR/SMS (both were self-administered), followed by a staff-administered 90-day timeline follow-back interview. Participation in the post assessment received \$25 cash and were offered the option to participate in urine drug screening (\$5 cash).

The original subject payment for daily IVR/SMS was \$1 per survey with an extra \$10 per month for completing 75% of their daily surveys; the one for weekly IVR/SMS was \$7 per survey with an extra \$10 per month for completing 75% of their weekly surveys. This payment structure applied to the 87 participants recruited during March 2014 to September 2014 (Cohort 1). Due to concerns about low compliance, our research team later implemented a higher payment structure for the 244 participants recruited during January 2015 to January 2016 (Cohort 2). The new subject payment was \$4 per daily survey and \$27 per weekly survey (the extra payment for 75% compliance was dropped). We increased to this amount based on feedback from participants in Cohort 1, given the length of time required to complete assessments. In order to investigate the effect of this change, we conducted an additional set of analysis to compare these two cohorts in terms of their compliance rates, use patterns, and user experiences.

Among the 331 participants recruited to participate in IVR/SMS data collection, 24 people have never provided any data during the experimental period and thus were not included in the analysis. They were not significantly different ( $p > 0.05$ ) from the rest of the 307 participants on the average age, race (e.g., percentage of Black), percentage of smokers, percentage of drinkers, percentage of marijuana users, percentage of illicit drug users, and percentage of prescription drug misusers. They did have a higher percentage of males (79% vs. 50%;  $p < 0.01$ ) and a lower percentage receiving public assistance (39% vs. 66%;  $p < 0.05$ ). Among the 307 participants included in statistical analysis, 81 were assigned to the IVR daily group, 76 to the IVR weekly, 81 to the SMS daily, and 69 to the SMS weekly.

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