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Correspondence of interactive voice response (IVR) reports of nicotine withdrawal, craving, and negative mood with questionnaire ratings

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Abstract

This study focuses on comparing reports of nicotine withdrawal, craving, and depressive symptoms obtained using an Interactive Voice Response (IVR) system and several questionnaires. As part of a smoking cessation trial, daily reports of withdrawal, craving, and negative mood were collected using an IVR system for 7 days after participants attempted to quit smoking, and several pencil and paper questionnaires (i.e., the Minnesota Nicotine Withdrawal Scale, the Questionnaire on Smoking Urges, and the Center for Epidemiological Studies-Depression) were completed a week after the target quit date. The sample was composed of 378 daily smokers. Moderate to high correlations were found between the research questionnaires obtained at the end of the week and the corresponding daily IVR reports of nicotine withdrawal, craving, and depressive symptoms. However, the sample size decreased on each day of IVR reporting due to attrition. Thus, an appealing aspect of daily assessment using an IVR system is that it can provide additional data that are not obtained with paper and pencil assessments given once per week, but it will be important for future studies to concentrate on improving adherence with the IVR system in this population.

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GlaxoSmithKline donated patches in the original investigation upon which this study is based. In the past year, Dr. O'Malley has been a consultant to GlaxoSmithKline, Eli Lilly, and OrthoMcNeill Pharmaceuticals, and she has received medication supplies for research from Mallinckrodt Pharmaceuticals and Sanofi Aventis. Dr. O'Malley is an inventor on patents held by Yale University for naltrexone for smoking cessation.

Introduction

Most assessments of smoking related syndromes (e.g., withdrawal) rely on retrospective recall. Unfortunately, recall is prone to biases. For instance, when recalling memories of events, people generally rely on heuristic strategies and make inferences that may or may not be correct (e.g., those who can recall three dental visits in the past month may infer that they go to the dentist monthly and infer that in the past year they went to the dentist 12 times) (Bradburn, Rips, & Shevell, 1987). In addition, the accuracy of memory over longer time periods is worse (Brown, Rips, & Shevell, 1985). With regard to addictive behaviors, participants' recollection of relapse episodes is subject to these biases. For example, when recalling a specific relapse episode, participants may blend several recent relapse episodes to construct a template of a lapse in place of the specific lapse memory (Hammersley, 1994).

Several methods have been created in an attempt to lessen recall biases and obtain more accurate assessments of antecedents of smoking relapse episodes and smoking-related syndromes. For example, electronic diaries obtain multiple assessments throughout the day using palmtop computers. Such studies have been used to determine factors predicting smoking lapses. Shiffman, Paty, Gnys, Kassel, and Hickcox (1996) showed that lapse episodes were more likely to occur when smoking was permissible, in the presence of smokers, and when cigarettes were accessible. This type of study also allows for a head-to-head comparison of daily assessments with retrospective reports across longer periods of time. Shiffman et al. (1997) assessed cigarette consumption and subjective states (e.g., mood ratings) with real-time reports on handheld computers and retrospective accounts provided after 12 weeks. In this study participants' recall of antecedents to lapses was poor, and negative affect was overestimated. Based on these data, Shiffman et al. (1997) advised caution when using retrospective recall in research.

A variety of measures are available for the assessment of smoking abstinence syndromes such as withdrawal symptoms (Minnesota Nicotine Withdrawal Scale [MNWS]; Hughes & Hatsukami, 1986), craving (Questionnaire on Smoking Urges [QSU]; Tiffany & Drobes, 1991), and depressive mood (Center for Epidemiological Studies –Depression [CES-D]; Radloff, 1977), but the optimal time frame for the assessment of these abstinence syndromes among cigarette smokers is unclear. Once-daily reporting of withdrawal, craving, and depressive mood may provide a more valid assessment than longer retrospective reports because it involves reporting over a shorter time period with less need for retrospective recall.

Interactive Voice Response (IVR) technology has been shown to reliably assess a variety of daily behaviors (Piette, 2000). With regard to substance use, studies have shown that daily reports of drinking can be adequately assessed using IVR technology (Searles, Perrine, Mundt, & Helzer, 1995). Although IVR has been used in smoking cessation clinical trials (Killen et al., 2000; Shiffman et al., 2002), its reliability and validity have been formally evaluated with smokers in only one study (Toll, Cooney, McKee, & O'Malley, 2005). In addition, no studies to date have been conducted that measure the correspondence of daily IVR reports of smoking-related syndromes (e.g., withdrawal) to retrospective questionnaire ratings of such syndromes across a longer time period. This study focuses on assessing the correspondence of daily reports of nicotine withdrawal, cigarette craving, and depressive symptoms provided by an IVR system with ordinary questionnaire ratings of these syndromes obtained 1 week after a smoking quit attempt.

Method

Participants and procedure

The original investigation was a double-blind, placebo-controlled clinical trial for smoking cessation examining whether naltrexone augments the effects of the nicotine patch (O'Malley et al., 2006). Participants were eligible for inclusion in the clinical trial if they were at least 18 years of age, smoked 20 cigarettes per day for at least 1 year, and had a baseline expired carbon-monoxide (CO) level of at least 10 ppm. Participants were excluded if they were medically unstable, suffering from a major psychiatric disorder, or alcohol dependent. As a component of their participation in the clinical trial, all participants agreed to take part in a project involving daily reporting of their cigarette and alcohol use, urge to smoke, nicotine withdrawal, and depressive symptoms. Four hundred individuals enrolled in the clinical trial, and the present analyses are based on the 378 individuals that provided one or more data points via the IVR system or by questionnaire. The treatment-seeking sample ($N=378$, 51.6% male) reported a mean age of 46.07 ($SD=11.11$). Participants were primarily Caucasian (88.6%) and employed full time (70.1%). This research was conducted at the Connecticut Mental Health Center and the Veterans Affairs (VA) Connecticut Healthcare System, and this study was approved by the Institutional Review Boards of the Yale University School of Medicine, the University of Connecticut, and the VA Connecticut Healthcare System.

As part of a smoking cessation clinical trial, participants received a 21-mg nicotine patch daily and were randomized to placebo, or 25 mg, 50 mg, or 100 mg of naltrexone for a 6-week period. Questionnaires were administered, and brief counseling was provided at weekly appointments. The present study is based on data gathered by IVR and questionnaires pertaining to the first week after participants' quit date. Participants completed the QSU, CES-D, and the MNWS during their second treatment session of the clinical trial, which corresponded to the period 1 week post-targeted quit date, and at the end of the week of IVR reporting. Of note, the questionnaires were administered after the scheduled time of the 6th IVR call but before the 7th (i.e., final) IVR call.

Participants were instructed to call the IVR telephone line first thing in the morning for 7 days in a row, beginning the day after their quit date. Data was collected that confirmed the date and time of the IVR call. Participants called a toll-free number that was active throughout the United States, which was connected to a computerized system that collected daily reports for each of the 7 days. Participants responded to a brief series of questions about their smoking, alcohol consumption, nicotine withdrawal, craving, and mood symptoms by touching numbers on their telephone keypad that corresponded to their answers. Data from the present report include the first eight IVR script items that assessed craving, withdrawal, and depressive mood and are scored on a scale from 0 (none) to 4 (severe) (See Appendix for a list of these eight items). The eight questions analyzed in this report were preceded by a keyword, following which answers to questions were allowed to be immediately entered. This eliminated the need for participants to listen to each question in its entirety after they had experience using the system. To increase the adherence with daily dairies, for each day the telephone questionnaire was completed, participants earned \$2.

Materials

All participants completed the following questionnaires:

The Questionnaire on Smoking Urges (QSU)—The QSU is a 32-item self-report questionnaire designed to assess urges to smoke, with higher scores indicating stronger urges (Tiffany & Drobes, 1991). Respondents are asked to indicate how strongly they agree or disagree with each item using a scale from 1 (strongly disagree) to 7 (strongly agree), and they

are asked to report how they are thinking or feeling at the time of administration. The original two-factor model reported by Tiffany and Drobes (1991) contained 15 items in Factor 1 and 11 items in Factor 2, and studies using the QSU typically report the scores for these two factors (Bell, Taylor, Singleton, Henningfield, & Heishman, 1999). The QSU has demonstrated excellent reliability for each of these factors (Cronbach's $\alpha=.95$ for Factor 1 and $.93$ for Factor 2). Each QSU factor score was correlated with the following IVR item: "In the past 24 hours, how much did you notice or feel a craving for cigarettes?"

The Center for Epidemiological Studies – Depression (CES-D)—The CES-D scale (Radloff, 1977) is a self-report instrument composed of 20 items, and respondents are asked to rate how often they experienced symptoms of depression during the past week. Items range from 0 (rarely or none, <1 day) to 3 (most or all, 5–7 days), and all items are summed to report a total score. This scale has been shown to correlate with clinical ratings of depression severity, and it was found to have very good reliability in a sample of smokers presenting for smoking cessation treatment (Cronbach's $\alpha=.90$; Lerman et al., 1996). The CES-D total score was correlated with the following IVR item: "In the past 24 hours, how much did you notice or feel a depressed or sad mood?"

The Minnesota Nicotine Withdrawal Scale (MNWS)—The MNWS (Hughes, 1992), which is adapted from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* (American Psychiatric Association, 1994) assesses symptoms associated with nicotine withdrawal for the past week. The severity of eight withdrawal symptoms are rated on a scale from 0 (not present) to 4 (severe) for the past week (see Table 1 for a listing of items used in the scale) (Patten & Martin, 1996). The score of this questionnaire is reported as a single total score (Etter & Hughes, 2006), and reliability ranges from fair to good (Cronbach's α range=.77–.84) (Toll, O'Malley, McKee, Salovey, & Krishnan-Sarin, 2007). Each MNWS item score (i.e., craving, irritability, anxiety, difficulty concentrating, restlessness, increased appetite/weight gain, depression, and insomnia) was correlated with a corresponding IVR item score (i.e., In the past 24 hours, how much did you notice or feel a craving for cigarettes? In the past 24 hours, how much did you notice or feel irritability, frustration, or anger? How much did you notice or feel anxiety in the past 24 hours? In the past 24 hours, how much did you notice or feel difficulty in concentrating? How much did you notice or feel restlessness in the past 24 hours? How much did you notice or feel increased appetite or weight gain in the past 24 hours? In the past 24 hours, how much did you notice or feel a depressed or sad mood? How much did you notice or feel insomnia or sleep problems in the past 24 hours?).

Results

IVR response rate

Data were collected on eight IVR items over the span of 7 days. The percentage of complete data for each of the 7 days for all items, beginning with day 1, was: 95.0%, 91.0%, 91.0%, 87.6%, 84.9%, 80.7%, and 62.4%. The larger decline on the seventh day may have been related to the structure of the data collection protocol. Specifically, participants were seen for their second treatment session on their sixth day of calling the IVR system, and many of them may have forgotten that they were supposed to call on the day after this session.

Correlations between IVR and questionnaire ratings

Correlations between the IVR system ratings and MNWS scores for each of the 7 assessment days and the aggregate total (i.e., the sum of the IVR values reported across days 1 through 7) are displayed in Table 1 using all available data and for the subsample who provided data on all 7 days. Means and standard deviations for each IVR item and the aggregate total are also

listed in this table. For these analyses the values for IVR questions (e.g., In the past 24 hours, how much did you notice or feel irritability, frustration, or anger?) were correlated with corresponding MNWS items for each *DSM-IV* withdrawal symptom. As shown in Table 1, all correlations for withdrawal symptoms were significant and fell within the moderate to high range. The sample size decreased on every day that behavior was reported. In general, correlations increased toward the end of the week as the daily IVR reporting period drew nearer to the time when the retrospective questionnaires were obtained.

Correlations between IVR items, QSU factor scores, and CES-D scores for each of the 7 assessment days and an aggregate total (i.e., the sum of the values reported for days 1 through 7), for both the entire sample and the subsample that provided data on every day, are presented in Table 2. For the correlations between IVR and the QSU, each of the IVR reporting days and an aggregate total for the IVR craving item (i.e., In the past 24 hours how much did you notice or feel a craving for cigarettes?) was correlated with factors 1 and 2 of the QSU. The correlations between IVR and the CES-D compared each of the reporting days and the aggregate total for the IVR depressed mood item (i.e., In the past 24 hours, how much did you notice or feel a depressed or sad mood?) to the total score of the CES-D. All correlations for urge and depression were significant and fell within the moderate range. Many of these correlations were slightly lower than those for the MNWS. However, this was most likely due to the fact that QSU and CES-D total scores were correlated with a single IVR item, whereas analyses on the MNWS used direct item-to-item correlations. The sample size decreased every day that behavior was reported. Like the correlations for withdrawal symptoms, overall these correlations increased as the reporting period drew nearer to the time when the weekly retrospective report was obtained.

Differences between IVR completers and non-completers

In an effort to better characterize the subsample of participants who provided complete IVR data we compared IVR completers (those who provided data for all 7 IVR reporting days) to non-completers (those who provided less than 7 days of IVR data) on demographic variables and smoking cessation outcomes. Completers were an older group of participants with a mean age of 47.88 ($SD=10.65$) as compared with non-completers, who had an average age of 44.24 [$SD=11.28$; $t(376)=-3.22$, $p=.001$]. There were no other differences on demographic variables (gender, percent white, employment status). With regard to smoking cessation outcomes assessed 5 weeks after the IVR assessment period, we analyzed point prevalence abstinence (not smoking during the last week of the study treatment paired with a CO value of 10 ppm or less) and found a significant relationship, $\chi^2(1, 378)=17.23$, $p=.000$. Specifically, the proportion of abstinent participants was higher (68.4%; 130/190) for the completers as compared to the non-completers (47.3%; 89/188), revealing that completers were more likely to have greater success at smoking cessation.

Discussion

Correlations between daily self-reports provided via the IVR system and ordinary questionnaire assessments that were given in a single administration (MNWS, QSU, and CES-D) were found to be moderate to high, and these correlations increased as the time drew nearer to the date of questionnaire administration. The best correlations between IVR and questionnaire assessments were found when the IVR score was based on an aggregate mean across multiple daily IVR reports. To test whether the subsample of participants who provided data on every day were the most conscientious participants in general and to control for attrition, we correlated each IVR assessment day with questionnaire ratings for only these participants. These data showed that correlations for this subsample were not higher on all days; indeed, there were many days on which the correlations were lower. In fact, the means and standard

deviations for each IVR day and the aggregate total reveal that the higher correlations for the aggregate total may reflect greater variability in aggregate total scores. Additionally, weekly averages are inherently more reliable because they average across multiple assessments. Of note, although the weekly correlations were high overall, for many of the symptoms assessed by IVR the weekly correlation only accounted for a portion of the variance between IVR and retrospective recall (e.g., the anxiety correlation of 0.71 accounted for approximately half the variance).

As described in our previous reports (Toll, Cooney, McKee, & O'Malley, 2005; 2006), the sample size and percentage of complete data decreased with each additional reporting day. There were significant differences between participants who provided complete data on all 7 IVR reporting days and those who did not. Completers were a slightly older group of individuals, and they had more successful smoking cessation outcomes. These differences may have translated to greater willingness to be adherent with the IVR system. For instance, perhaps not providing complete data was related to those smokers not wanting to report lack of success or severe withdrawal symptoms.

The fact that the correlations increased on almost every reporting day suggests that the QSU, CES-D, and MNWS scores may be best measuring withdrawal, craving, and depressive symptoms on the date they are administered. This lends some support to the position taken by Shiffman et al. (1997), and it may be the case that retrospective recall of smoking quit behavior (e.g., withdrawal) is generally not as good as ratings provided daily or several times per day. However, for the present study it should be noted that although the data on days 1–6 are clearly better than no data at all, the fully scaled questionnaires (CES-D and QSU) given on day 7 likely provided a broader and potentially more accurate assessment than the briefer IVR questions. Also, it should be noted that IVR data are not free from recall biases, which can occur within a day (Redelmeier & Kahneman, 1996), particularly since IVR assessments were collected in the morning and were pertinent to the previous 24-hour period. Indeed, even if IVR data were collected several times per day, like all other assessments, the data also would be subject to recall biases. It would be interesting for future studies to assess whether participants whose symptom experience is more variable show more distortion in recall and whether this predicts outcome.

Nevertheless, due to the fact that recall bias may be lessened, for researchers daily monitoring may be appealing for the assessment of multiple smoking-related syndromes. Daily reporting allows more fine-grained analyses such as determining the time course of symptoms, the variability in symptoms across time, and the ability to assess changes in measures proximal to important events such as a smoking lapse. This method of data collection may also be appealing as a way to more closely monitor adverse events, which is important, especially when interventions are being tested with high-risk smokers (e.g., individuals with a history of depressive disorders).

One problem with the data in the present study is that the sample size and percentage of complete data decreased every day that IVR data was reported. Previous IVR studies with other disorders (alcohol, binge eating) reported higher rates of adherence. Searles, Helzer, & Walter (2000) reported an overall adherence rate of approximately 94%; Bardone, Krahn, Goodman, & Searles (2000) reported an overall adherence rate of approximately 82%. However, these studies were generally conducted with small sample sizes and larger monetary incentives (e.g., a lottery in which participants could win \$3,000) (Searles, Helzer, & Walter, 2000). Thus, if greater or escalating incentives were provided, even though some participants might only use the system to get the incentive, perhaps more data could be gathered. Another method to increase adherence would be to provide automated reminder telephone calls to prompt

participants to call the IVR system. Future studies should address this issue, as daily assessments of smoking-related syndromes might be a strength of the IVR system.

There are several limitations to this study. First, with larger monetary incentives and reminder calls, adherence with the IVR system might have been better. Second, adherence may have also been different if participants were required to report to the IVR system throughout the study treatment instead of only 1 week. Third, the questionnaires used in this study asked participants to rate their symptoms over a maximum of 1 week, and longer periods of retrospection might yield different results. Fourth, an important limitation of the study is that all IVR reports were collected in the morning, which may have maximized the demand on memory to recall the prior days' symptoms. Fifth, autocorrelations (e.g., when making ratings on day 7, one can remember day 7's symptom severity, which will create a correlation with days 6, 5, etc, because the days are autocorrelated) could represent a recall bias, or could represent stability in the measure across days, and there is no way of knowing which is true. Sixth, the time period of assessment for the QSU (time of administration) differed from the time period for the IVR questions (past day), so these data should be interpreted with caution. Finally, caution is warranted regarding the generalization of these findings given that these participants were paid for completing IVR ratings as part of a clinical trial involving medications.

Quite a bit of IVR data was missing due to problems of adherence. However, the IVR system is appealing as it provides a day-to-day assessment of withdrawal, craving, and negative mood, capturing additional data that is not obtained in a questionnaire given once per week. Clearly, further research is needed that tests IVR assessment of smoking related syndromes, and it will be important for future studies to incorporate methods to increase adherence with the IVR system.

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Appendix

Interactive Voice Response (IVR) Script:

1. In the past 24 hours, how much did you notice or feel a craving for cigarettes? If none, press 0, if slight, press 1, if mild, press 2, if moderate press 3, if severe, press 4.

Key words: *Craving for cigarettes*

2. In the past 24 hours, how much did you notice or feel irritability, frustration, or anger? If none, press 0, if slight, press 1, if mild, press 2, if moderate press 3, if severe, press 4.

Key words: *Irritability, frustration or anger*

3. How much did you notice or feel anxiety in the past 24 hours? If none, press 0, if slight, press 1, if mild, press 2, if moderate press 3, if severe, press 4.

Key word: *Anxiety*

4. In the past 24 hours, how much did you notice or feel difficulty in concentrating? If none, press 0, if slight, press 1, if mild, press 2, if moderate press 3, if severe, press 4.

Key words: *Difficulty concentrating*

5. How much did you notice or feel restlessness in the past 24 hours? If none, press 0, if slight, press 1, if mild, press 2, if moderate press 3, if severe, press 4.

Key word: *Restlessness*

6. How much did you notice or feel increased appetite or weight gain in the past 24 hours? If none, press 0, if slight, press 1, if mild, press 2, if moderate press 3, if severe, press 4.

Key words: *Increased appetite or weight gain*

7. In the past 24 hours, how much did you notice or feel a depressed or sad mood? If none, press 0, if slight, press 1, if mild, press 2, if moderate press 3, if severe, press 4.

Key words: *Depressed or sad mood*

8. How much did you notice or feel insomnia or sleep problems in the past 24 hours? If none, press 0, if slight, press 1, if mild, press 2, if moderate press 3, if severe, press 4.

Key word: *Insomnia*

Table 1

Correlations between IVR and MNWS for each assessment day and the aggregate total and means for each IVR item and the aggregate total.

	All available data			Complete data			IVR items		
	N	r	n	r	N	M	SD		
Craving									
Day 1	336	.52	183	.49	359	2.75	.89		
Day 2	328	.62	183	.58	344	2.53	.99		
Day 3	325	.62	183	.66	344	2.33	1.04		
Day 4	320	.66	183	.71	331	2.13	1.05		
Day 5	309	.72	183	.70	321	2.05	1.00		
Day 6	293	.70	183	.72	305	1.90	1.01		
Day 7	228	.64	183	.67	236	1.75	1.02		
Total	183	.81	183	.81	190	14.93	5.60		
Irritability, frustration, or anger									
Day 1	337	.32	184	.28	359	1.64	1.15		
Day 2	330	.49	184	.53	344	1.69	1.17		
Day 3	327	.53	184	.60	344	1.48	1.22		
Day 4	321	.64	184	.67	331	1.40	1.20		
Day 5	310	.64	184	.69	321	1.22	1.09		
Day 6	295	.59	184	.58	305	1.17	1.08		
Day 7	229	.62	184	.69	236	1.08	1.08		
Total	184	.76	184	.76	190	9.31	5.92		
Anxiety									
Day 1	336	.36	183	.34	359	1.67	1.17		
Day 2	329	.44	183	.42	344	1.51	1.16		
Day 3	326	.58	183	.58	344	1.36	1.21		
Day 4	320	.62	183	.64	331	1.20	1.16		
Day 5	310	.64	183	.65	321	1.09	1.11		
Day 6	294	.60	183	.60	305	.99	1.06		
Day 7	229	.64	183	.65	236	.85	1.01		
Total	183	.71	183	.71	190	8.20	5.90		
Difficulty concentrating									
Day 1	336	.56	183	.65	359	1.19	1.17		
Day 2	329	.57	183	.63	344	1.14	1.12		
Day 3	326	.68	183	.71	344	1.07	1.10		
Day 4	320	.65	183	.70	331	.94	1.12		
Day 5	310	.67	183	.75	321	.88	1.03		
Day 6	294	.59	183	.69	305	.75	.97		
Day 7	229	.67	183	.74	236	.66	.91		
Total	183	.83	183	.83	190	6.26	6.17		
Restlessness									
Day 1	332	.41	183	.46	359	1.86	1.21		
Day 2	326	.56	183	.56	344	1.60	1.22		
Day 3	322	.54	183	.57	344	1.51	1.21		
Day 4	317	.58	183	.58	331	1.26	1.19		
Day 5	308	.60	183	.57	321	1.22	1.17		
Day 6	292	.59	183	.60	305	1.03	1.07		
Day 7	229	.56	183	.59	236	.86	.96		
Total	183	.71	183	.71	190	9.02	6.27		
Appetite or weight gain									
Day 1	335	.41	183	.43	359	1.33	1.24		
Day 2	329	.52	183	.51	344	1.16	1.17		
Day 3	325	.57	183	.50	344	1.09	1.11		
Day 4	319	.56	183	.53	331	1.11	1.11		
Day 5	309	.67	183	.65	321	1.10	1.12		

	All available data			Complete data			IVR items		
	N	r	n	r	N	M	SD		
Day 6	293	.67	183	.65	305	1.05	1.04		
Day 7	229	.67	183	.66	236	.94	1.04		
Total	183	.69	183	.69	190	7.37	6.11		
Depressed or sad mood									
Day 1	335	.29	183	.51	359	.66	.98		
Day 2	328	.36	183	.36	344	.68	.90		
Day 3	325	.39	183	.49	344	.72	1.00		
Day 4	319	.56	183	.62	331	.69	.99		
Day 5	309	.56	183	.55	321	.63	.94		
Day 6	293	.59	183	.58	305	.58	.88		
Day 7	229	.54	183	.54	236	.44	.74		
Total	183	.66	183	.66	190	3.86	4.78		
Insomnia or sleep problems									
Day 1	336	.50	184	.49	359	1.29	1.41		
Day 2	329	.58	184	.56	344	1.26	1.37		
Day 3	326	.62	184	.66	344	1.21	1.30		
Day 4	320	.65	184	.70	331	1.10	1.26		
Day 5	310	.72	184	.74	321	1.09	1.25		
Day 6	295	.65	184	.66	305	1.07	1.25		
Day 7	230	.65	184	.65	236	.96	1.21		
Total	184	.81	184	.81	190	8.30	7.29		

Note. All correlations were significant ($p < .05$).

Table 2

Correlations between IVR, QSU, and CES-D for each assessment day and an aggregate total.

	All available data			Complete data			M	SD
	N	r	n	r	n	N		
QSU Factor 1								
Day 1	328	.31	178	.37		IVR Items 359	2.75	.89
Day 2	322	.28	178	.32		344	2.53	.99
Day 3	318	.34	178	.42		344	2.33	1.04
Day 4	312	.35	178	.43		331	2.13	1.05
Day 5	302	.34	178	.44		321	2.05	1.00
Day 6	287	.45	178	.51		305	1.90	1.01
Day 7	224	.54	178	.53		236	1.75	1.02
Total	178	.54	178	.54		190	14.93	5.60
						QSU Factor 1 346	36.16	16.08
QSU Factor 2						IVR Items 359	2.75	.89
Day 1	331	.26	181	.30		344	2.53	.99
Day 2	323	.22	181	.25		344	2.33	1.04
Day 3	321	.32	181	.35		331	2.13	1.05
Day 4	315	.31	181	.32		321	2.05	1.00
Day 5	306	.36	181	.38		305	1.90	1.01
Day 6	289	.39	181	.42		236	1.75	1.02
Day 7	226	.46	181	.46		190	14.93	5.60
Total	181	.44	181	.44		348	18.52	9.70
						QSU Factor 2 348	18.52	9.70
CES-D						IVR Items 359	.66	.98
Day 1	329	.34	182	.41		344	.68	.90
Day 2	322	.42	182	.47		344	.72	1.00
Day 3	321	.40	182	.47		331	.69	.99
Day 4	315	.55	182	.58		321	.63	.94
Day 5	302	.54	182	.55		305	.58	.88
Day 6	289	.58	182	.59		236	.74	.44
Day 7	226	.56	182	.57		190	3.86	4.78
Total	182	.66	182	.66		CES-D Total Score 346	8.23	6.93

Note. All correlations were significant ($p < .05$).