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# Validation of a Substance Use Disorder Screening Instrument for Use in Vocational Rehabilitation Settings

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***Objective:*** The study objectives were to develop and validate a substance use disorder screening instrument for vocational rehabilitation customers. Beginning with the Substance Abuse Subtle Screening Inventory–3 (SASSI-3), the authors developed items pertaining to prescription medication misuse and modified other items. ***Research Method/Design:*** Data were collected for the cross-sectional cohort study through interviews with a random subsample reinterviewed 14 days later. Complete data sets were collected from 948 customers recruited in Ohio, Illinois, and West Virginia; 128 completed a second interview. Women composed 52% of the sample and 58% were African American; the mean age was 40 years (±12 years). Customers completed a preliminary version of the new instrument, called the Substance Abuse in Vocational Rehabilitation Screener (SAVR-S), and the Diagnostic Interview Schedule. The authors used Rasch analyses to reduce the instrument to 43 items then divided the sample into a development subsample (used to formulate a scoring routine) and a validation subsample. ***Results:*** Sensitivity in detecting substance use disorders was 82% and specificity was 85% in the validation subsample. ***Conclusions/Implications:*** The SAVR-S appears to be a valid instrument and minimizes respondent burden while maximizing sensitivity and specificity to substance use disorders. It can assist vocational rehabilitation staff in identifying customers who need professional assessment and help support efforts toward self-sufficiency.

*Keywords:* substance use disorders, vocational rehabilitation, alcohol and drug screening

Substance use disorders (SUDs) occur frequently among persons with disabilities. Moore and Li (1994) reported that the lifetime use of illicit drugs among vocational rehabilitation (VR) applicants was considerably higher than in the general population. Corrigan and colleagues (1995) noted that up to two thirds of persons admitted to traumatic brain injury (TBI) rehabilitation programs have a history of substance abuse. Among a sample of people interviewed 1 year after discharge from inpatient rehabilitation for TBI, at least half reported resumption of alcohol use (Schmidt, Garvin, Heinemann, & Kelly, 1995). Research findings

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suggest that persons with disabilities such as blindness (Koch, Nelipovich, & Sneed, 2002), deafness and being hard of hearing (Lipton & Goldstein, 1997), developmental disabilities (Degenhardt, 2000), multiple sclerosis (Bombardier et al., 2004), and traumatic spinal cord injury (Heinemann & Schmidt, 1994) and persons who are applying for VR services (Moore & Li, 1994) are at risk for SUD.

Estimates of SUD among VR customers range from 2% to 33% (DiNitto & Schwab, 1993). Glenn, Ford, Moore, and Hollar (2003) conducted a six-state epidemiological survey of substance use patterns among a random sample of 1,295 VR service recipients. Although the sampling methodology likely underrepresented persons with SUD because of self-selection, they reported that approximately 22% of the sample reported being in recovery from alcohol or drug addiction, although only 5.9% received a primary disability diagnosis of "chemical dependency." Of particular concern, approximately 18% of respondents reported a prior drunk driving arrest, indicating serious social and legal consequences from alcohol abuse. Similarly, although 23.8% of men and 18.5% of women reported recent illicit drug use, only 0.8% of customers reported that satisfactory completion of an alcohol or drug treatment program was included in their rehabilitation plan.

Given the high prevalence of SUD among persons applying for VR services, its accurate identification among VR customers is important (DiNitto & Schwab, 1993; Drebing et al., 2002; Rehabilitation Research and Training Center on Drugs and Disability, 2002; Rehabilitation Research and Training Center on Employment, Disability, and Substance Abuse, 2006). Unfortunately, many VR customers with alcohol and drug problems are not identified and consequently do not receive services that could help them achieve self-sufficiency. Figure 1 plots the rates at which state VR agencies identified alcohol and other drug problems on the case service record (Form RSA-911) in 1997 and 2005. The differences are striking. Fewer than 10 states identify 20% of their total customers as having an SUD, which is a broad departure from the expected prevalence rate among VR customers (Drebing et al., 2002; Rehabilitation Research and Training Center on Drugs and Disability, 2002; Rehabilitation Research and Training Center on Employment, Disability, and Substance Abuse, 2006). Variability in SUD identification may represent true differences in prevalence. However, it could also reflect systematic error resulting from VR policies, attitudes toward SUD as a disability, and the lack of a screening instrument and staff training. As a consequence of such errors, many customers with alcohol and drug problems are not identified and consequently may not be receiving appropriate services (Brown & Saura, 1996; Christensen, Boisse, Sanchez, & Friedmann, 2005; Davis, 2005; Hergenrather & Rhodes, 2006; Toriello & Leierer, 2005).

Even though substance abuse has a major negative impact on the health and well-being of persons with disabilities (Chapman, 1998;

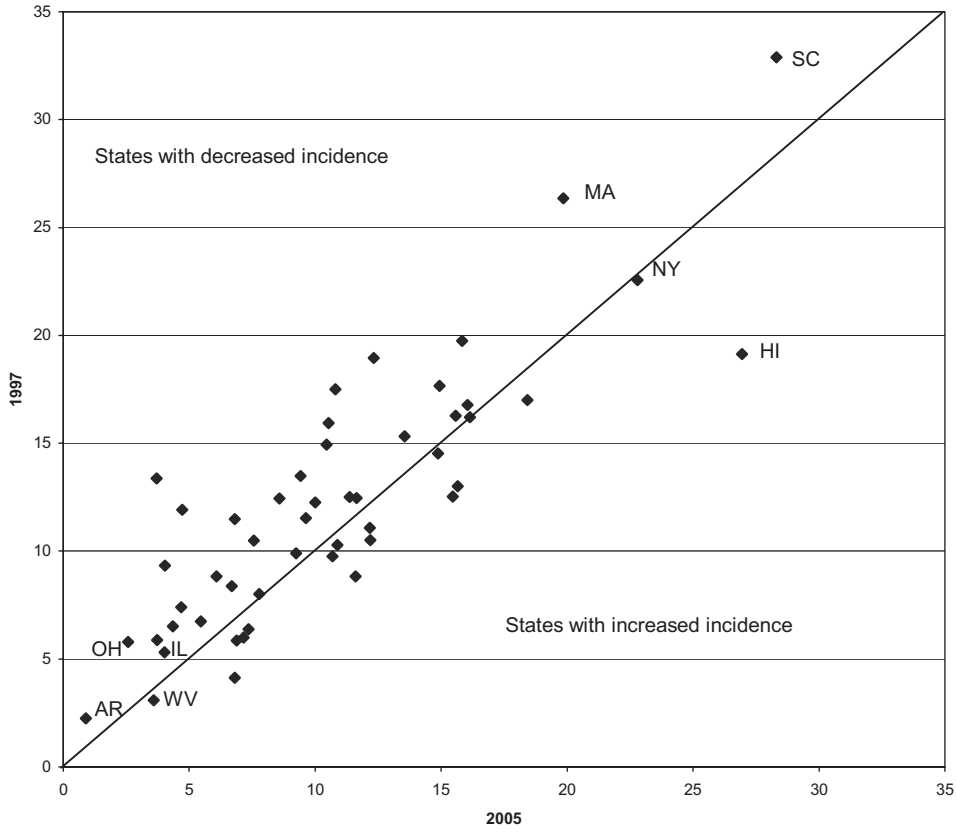


*Figure 1.* 1997 versus 2005 substance use disorder incidence by state. Data are drawn from Rehabilitation Services Administration, 2005.

Moore & Li, 1994; Schwab & DiNitto, 1993) and routine screening of SUD in rehabilitation populations has been encouraged for more than a decade (Corthell & Brown, 1991; DiNitto & Schwab, 1993; Greer, 1989; Shamblin, 1990), work completed by the Rehabilitation Research and Training Center on Substance Abuse, Disability, and Employment reveals no practical, accessible, and valid screening instrument for use by VR counselors and other rehabilitation personnel (e.g., McAweeney, Keferl, Moore, & Wagner, in press). Although a number of instruments have been used to help practitioners diagnose SUD in the general population, their use in rehabilitation research and practice has been limited (cf. AUDIT [Kelly, Donovan, Chung, Cook, & Delbridge, 2004], MAST [Selzer, 1971], DAST [Skinner, 1982], ME [Manson & Huba, 1987], SCID [Spitzer, Williams, Gibbon, & First, 1992]).

Although routine assessment of SUD is important to ensure that customers who are in need of substance use services are identified and referred so they may receive such services, major barriers prevent widespread screening of SUD in rehabilitation populations. These barriers include (a) the lack of a screening instrument specifically validated for persons with disabilities; (b) the lack of an instrument that includes items to assess the abuse of prescription medications (Moore & Polsgrove, 1991; Olkin, 1999); and (c) administration barriers for persons who have sensory (Guthman & Sandberg, 1998), physical (Heinemann, 1993), or cognitive impairments (Degenhardt, 2000). VR and other employment service professionals are pressed for time that is needed for in-depth clinical interviews regarding substance use history. As a result, customers with potential substance problems often are not identified and do not receive appropriate services.

We selected the Substance Abuse Subtle Screening Inventory–3 (SASSI-3) as the basis for instrument development for several reasons. Although shorter screening instruments are available, these instruments have not been validated for persons with disabilities, and their psychometric and screening properties are not as promising as are those of the SASSI-3. The availability of resources to customize the instrument specifically for VR settings and to support the instrument's use through development of automated scoring, reporting systems, user training, and a toll-free user support line were other considerations in selecting a proprietary instrument. The SASSI-3 is effective for SUD screening in the general population (Lazowski, Miller, Boye, & Miller, 1998) and shows promise as a tool for screening VR customers. It reflects more than 2 decades of instrument development and refinement. The original version (G. A. Miller, 1985) and its revisions (F. G. Miller & Lazowski, 1999; G. A. Miller, 1994) were developed for use in a wide variety of settings to identify persons with a high probability of SUD for further assessment. DiNitto and Schwab (1993) highlighted the effectiveness of using an appropriate SUD assessment instrument in vocational rehabilitation. They recruited Texas Rehabilitation Commission applicants who completed either the Addiction Severity Index or the SASSI. Both instruments identified more cases as likely SUD than did the standard intake interview. The Addiction Severity Index identified 38.4% of the cases as likely SUD, whereas the SASSI identified 32.7%. None of these customers had received a diagnosis of primary or secondary SUD using standard intake procedures.

The SASSI-3 includes face-valid frequency items as well as true–false items, some of which appearing to have no relation to substance misuse. Analyses of the correspondence between SASSI-3 classifications and clinical diagnoses of either substance abuse or dependence in a sample of 839 adults in five different types of clinical treatment settings demonstrated 94% accuracy, 94% sensitivity, 94% specificity, 98% positive predictive power, and 80% negative predictive power (Lazowski et al., 1998). Research on the SASSI-3 with college students and patients with TBI showed lower screening accuracy (Feldstein & Miller, 2007). Several advantages in using an instrument derived from the SASSI-3 as a screening instrument for VR and related settings include an extensive database of previous SASSI administrations; a history of use with persons with disabilities or in VR settings; inclusion of items with no apparent relationship to substance misuse; availability of multiple test application modalities with immediate individualized printouts of screening findings; and an established infrastructure for the distribution of instruments, training, automated scoring and reporting of results, and data archiving.

## Study Objectives and Hypothesis

Our objectives in this study were to customize and validate a SUD screening instrument specifically for VR customers and evaluate its psychometric properties using a sample of persons who were seeking VR services. We hypothesized that the screening instrument would demonstrate adequate psychometric properties with a heterogeneous sample of persons with disabilities.

## Method

### *Sample*

We recruited VR customers from six VR offices in southern Ohio and metropolitan Chicago, two community rehabilitation agencies (one in Dayton, Ohio, and one in Chicago), and one residential program managed by West Virginia's VR agency. Inclusion criteria were (a) applicants were 18 years of age and older, (2) applicants spoke English, and (3) applicants had applied for state-funded VR services or community-based employment programs within the past year. We excluded persons who were profoundly deaf and communicated exclusively via American Sign Language. We assessed reading level and read the Substance Abuse in Vocational Rehabilitation Screener (SAVR-S) aloud to participants who were below a fifth-grade level.

Project staff visited field offices on high-volume days (such as group orientation for new applicants), recruited individuals who signed their own consent form, and offered a $15 honorarium in the form of public transit passes or grocery store gift certificates in exchange for participation. The screening session took 30 to 60 min on average, with longer times for persons with more active polyabuse histories or cognitive–communicative impairments.

Of 1,011 customers we approached, 958 consented to participation, 948 completed the SAVR-S, but 3 of these persons did not complete the Diagnostic Interview Schedule (DIS). The 948 SAVR-Ss we administered represent a 94% recruitment rate. Forty-nine percent of the sample was recruited from Illinois sites, 46% from Ohio, and 4% from West Virginia. The sample included

persons who were African American (58%), Caucasian (38%), and other races (4%). Five percent of the sample was of Hispanic origin. Women composed 52% of the sample. Marital status included 56% never married, 15% divorced, 14% married, 7% separated, 5% unmarried but part of a couple, and 3% widowed. Education level included 26% with less than a high school degree, 45% with a high school degree or equivalent, and 29% with postsecondary education. The mean age was 40.0 years ($SD$ = 12.0 years). We asked participants to identify up to three disabilities that were reasons for seeking VR services: 42.0% reported one, 32.8% reported two, and 25.3% reported three or more disabilities. The most frequently reported disabilities were psychiatric disabilities (51.7%), mobility problems (42.4%), chronic diseases (33.3%), developmental disabilities (28.2%), acquired brain injury (11.5%), SUD (9.5%), vision impairment (4.3%), and hearing impairment (4.1%). In all cases, participants with hearing loss were able to communicate well enough to consent to and complete the study protocol.

### Instruments

Two instruments were administered, the DIS and a preliminary, 69-item version of the SAVR-S. Demographic characteristics were collected by self-report.

*SUD diagnosis.* The DIS was used as the criterion against which to validate the screening instrument. The DIS (Helzer, 1992; Roberts & Rhoades, 1990) has been widely used as a method of obtaining *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*) diagnoses in multiple drug or alcohol studies for more than 15 years. It is efficient to administer, can make use of trained but nonclinical interviewers, and has norms for both alcohol and drug-related *DSM* diagnoses. It has been used to develop cutoff scores for instruments assessing SUD (Chantarujikapong, Smith, & Fox, 1997; Helzer, 1992; Svanum & McGrew, 1995).

*Initial substance abuse in vocational rehabilitation screener item pool.* The screening instrument was derived from the SASSI-3. The SASSI-3 consists of 67 true–false items, of which 12 ask clients to report the frequency of specific manifestations of alcohol abuse and 14 are frequency items pertaining to the abuse of illicit drugs. It requires approximately 15 min to complete. Focus groups of VR counselors recommended that we assess misuse of prescription medication, as this class of drugs is often abused. The first version of the SAVR-S contained 69 items. This version included 12 items that assessed the frequency of alcohol misuse, 17 that assessed the frequency of illicit and prescription drug misuse, and 40 true–false items that are used in the SASSI-3 test classification. We excluded SASSI-3 items from auxiliary scales that are not used in the dichotomous test classification regarding the likelihood of SUD. On the basis of initial results of field testing with the SAVR-S, some items were rephrased to increase comprehension and decrease reading level. Questions also were modified after field testing to ensure that respondents were answering questions on the basis of their last 12 months of substance use only, consistent with *DSM* criteria for active SUD. The Flesch–Kincaid Grade Level readability test score for this 69-item SAVR-S is 4.2, with a Flesch Reading Ease score of 78.9 (possible range 0–100, with 100 being the easiest).

VR applicants were prescreened during the consenting process to determine their ability to read. They were asked to read four consent-related statements that increased in grade level readability score. If they had difficulty reading a sentence at the fifth-grade level or had other functional impairments that precluded self-administration, a trained interviewer verbally administered the DIS and the initial 69-item version of the screening instrument. The only disability groups for which the screening instrument specifically is not designed are persons who are profoundly deaf and those who have severely limited English reading comprehension. Level of assistance provided was recorded as *none*, *minor*, *moderate*, or *severe*. Some circumstances required completion of the instruments by telephone interviews. Institutional review boards for human subject protection at participating agencies approved all procedures.

### Rating Scale Analyses

We used the Rasch rating scale model to evaluate the characteristics of the 69 substance use screening items and to estimate the level of people on the underlying dimension being measured (Rasch, 1980; Wright & Masters, 1982). The Rasch model assumes that an underlying, unobserved trait exists on which items are arrayed hierarchically from the most likely to the least likely to endorse. People can be located similarly on the measurement continuum, in this case, from most likely to least likely to have an SUD. The Rasch model is sometimes referred to as a one-parameter logistic within the family of item response theory models, so named because of the number of item parameters each incorporates (Hambleton, Swaminathan, & Rogers, 1991). The item parameter modeled is its "difficulty" or location on the presumed underlying trait being measured (in this context, SUD). Unlike the two- and three-parameter models, item discrimination (slope) is modeled as invariant across items. The Rasch model is well-suited to the development of screening instruments because of its relative simplicity, flexibility in handling rating scale data, smaller sample requirements than two- and three-parameter item response theory models, and assumptions about data structure. However, it is more restrictive than other models in terms of the fit of items and can result in narrowing of the trait being measured to attain model fit. We used Winsteps software (Linacre, 2006) to complete the rating scale analyses.

### Overview of Data Analysis Strategy

We reduced the size of the 69-item initial version of the SAVR-S by completing several rating scale analyses and discriminant function analysis with data from the primary sample of VR customers. Next, we evaluated concordance between a 43-item SAVR-S and the DIS by splitting the sample into development and validation subsamples, and we evaluated test–retest reliability in a 14% randomly selected subsample. Then, we applied the scoring rules to a previously collected clinical sample of VR customers.

## Results

### SUDs

Using DIS scoring rules, we found an overall SUD prevalence rate of 22.1%. Analyses also indicated that 5.4% of the sample had

alcohol-related diagnoses only, 8.8% had drug-related diagnoses only, and 7.9% had diagnoses related to both alcohol and illicit drugs.

### *Discriminant and Rating Scale Analyses*

We completed a rating scale analysis as well as a discriminant function analysis of the 69-item initial version of the SAVR-S to evaluate its internal consistency and to reduce the number of items in the set. The discriminant analysis showed that all items except two true–false items (6, 44) significantly discriminated SUD from non-SUD cases.

Table 1 summarizes psychometric characteristics for five rating scale analyses: (a) all 69 items, (b) alcohol items, (c) drug items, (d) true–false items, and (e) a reduced set of 43 items. The person reliability (equivalent to Cronbach's alpha) of these item sets ranged from .90 (all 69 items) to .72 (alcohol items). Consistent with the discriminant analysis, Table 1 also shows that only 3 of the 69 items showed noisy fit to the construct in the rating scale analysis; that is, the standardized mean square infit was greater than 1.3 (true–false items 4, 6, 44). For the remainder of the items, the objective of producing a screening instrument (40–50 items) was served by considering individual item correlations with the overall measure. To reduce respondent burden, we sequentially deleted items with mean square infit values greater than 1.3 and items that correlated weakly (<.40) with the total measure. Misfit is an indication that an item may be measuring a construct other than the one measured by the remaining items. In Rasch model terms (Bond & Fox, 2001), infit values greater than 1.3 usually reflect a problem with an item's coherence with the underlying construct.

A subset of 43 items (Table 1, row 5) had a person reliability of .87. Table 2 shows the item characteristics for the 43-item, five-rating-scale-category solution. By selection, no item had a mean square infit value greater than 1.34, and only six item–measure correlations were smaller than .40. Figure 2 is a map that plots the difficulty of items on the right and SAVR-S measures for persons on the left. Consistent with the observed SUD prevalence of 22% in the sample, many customers reported little substance use and few problems, as illustrated by the frequency of persons on the left that occur below the easiest-to-endorse items on the right side of the map. The item set was able to distinguish a full range of substance use problems very well. The Flesch–Kincaid Grade Level readability test score for the 43-item SAVR-S is 5.8 and the Flesch Reading Ease score is 74.6.

### *Test–Retest Reliability*

We explored test–retest reliability of the instrument by scheduling follow-up interviews with a randomly chosen 14% of the original sample 7 to 14 days after the original interview. At the conclusion of the DIS and SAVR-S administration, we invited 217 participants to complete the second interview to assure that our pool was large enough to be reached within the 14-day window within the constraints of our staffing. None of the 128 participants who initially agreed to a follow-up interview in exchange for a second $15 honorarium declined when called. For this subsample, Pearson correlations on the 43-item instrument indicated stability coefficients of .88 for the alcohol items, .85 for the drug items, and .91 for the true–false items. All coefficients were statistically significant ($p < .01$).

### *Correspondence of SAVR-S Identification With DIS Criterion*

Using the 43 items, we randomly divided the total sample into two subsamples: a development subsample used to formulate a scoring routine and a validation subsample used to cross-validate the scoring rules. We used an iterative process with the development sample to identify a scoring routine that yielded the highest overall accuracy rate while maintaining a balance between sensitivity and specificity. Table 3 shows the sensitivity, positive predictive value, specificity, and negative predictive value of the SAVR-S for each subsample. It compares the classification accuracy obtained when all items are combined in one scale versus the accuracy of the results when separate cutoffs were used for alcohol and drug frequency items and true–false items. The decision rule that uses individual cutoffs for the three-item sets (see the top half of Table 3) was

Table 1
*Summary of Substance Abuse in Vocational Rehabilitation Screener Rating Scale Analyses (N = 948)*

| Item groups | Rating scale categories[a] | Person reliability | Items with mean square infit ≥ 1.3 | Ceiling or floor effect | Item measure *r*s ≤ .4 |
|---|---|---|---|---|---|
| 1. 69 items (12 alcohol, 17 drug, 40 true–false) | 5 | .90 | s4, s6, s44 | None | a12, d9, s3, s4, s6, s8, s9, s10, s11, s12, s13, s14, s15, s17, s20, s21, s22, s23, s26, s30, s32, s35, s39, s43, s44 |
| 2. 12 alcohol items | 3 | .72 | a1, a12 | 64% at floor | a12 |
| 3. 17 drug items | 3 | .74 | d9 | 60% at floor | None |
| 4. 40 true–false items | 2 | .85 | s4, s6 | None | s4, s6, s9, s10, s11, s12, s13, s14, s15, s17, s20, s21, s23, s26, s30, s32, s35, s39, s43, s44 |
| 5. 43 items (9 alcohol, 15 drug, 19 true–false) | 5 | .87 | s13, s23, s43 | 1% at floor | s8, s13, s23, s43, d9, d16 |

[a] Rating scale categories were *true* or *false* for dichotomous items and *never, 1–4 times,* or *5 or more times* for alcohol and drug frequency items.

Table 2
*Substance Abuse in Vocational Rehabilitation Screener 43-Item Version Statistics in Measure Order*

| Item | Gp | Abbreviated item label | Measure | *SEM* | Infit | Corr |
|---|---|---|---|---|---|---|
| d16 | 2 | Physician denied request for medication | 2.22 | .14 | 1.12 | .32 |
| d7 | 2 | Got into legal trouble | 1.80 | .12 | 0.97 | .44 |
| d17 | 2 | Accepted into treatment | 1.80 | .12 | 0.93 | .46 |
| a6 | 2 | Job, school, home problems | 1.63 | .11 | 0.92 | .48 |
| a11 | 2 | Nervous, shakes after use | 1.52 | .10 | 0.92 | .47 |
| d9 | 2 | Requested drugs from doctor | 1.43 | .10 | 1.28 | .37 |
| d15 | 2 | Used other people's medications | 1.34 | .10 | 1.01 | .43 |
| a10 | 2 | Relationship problems | 1.27 | .10 | 0.82 | .54 |
| d8 | 2 | Got really stoned | 1.24 | .10 | 0.77 | .56 |
| a3 | 2 | Drank to boost energy | 1.14 | .09 | 1.07 | .48 |
| a8 | 2 | Argued with family, friends | 1.12 | .09 | 0.99 | .51 |
| d14 | 2 | Higher medication dose than prescription | 1.09 | .09 | 1.11 | .45 |
| a5 | 2 | Physical problems | 0.94 | .09 | 1.05 | .51 |
| a7 | 2 | Became depressed when sober | 0.91 | .09 | 0.90 | .56 |
| d6 | 2 | Misused to forget pressures | 0.85 | .08 | 0.74 | .61 |
| d12 | 2 | Used to avoid pain, withdraw | 0.84 | .08 | 1.06 | .53 |
| d1 | 2 | Misused to improve mood | 0.75 | .08 | 0.94 | .57 |
| d10 | 2 | Time in drug-related activity | 0.75 | .08 | 0.86 | .59 |
| d13 | 2 | Misuse limited goals | 0.69 | .08 | 0.80 | .61 |
| d11 | 2 | Polydrug abuse | 0.68 | .08 | 0.78 | .61 |
| s37 | 1 | Drank to steady nerves | 0.67 | .11 | 1.02 | .46 |
| a2 | 2 | Drank to express feelings | 0.62 | .08 | 1.03 | .53 |
| d5 | 2 | Misused to forget feelings | 0.62 | .08 | 0.84 | .61 |
| d2 | 2 | Misused to feel better | 0.61 | .08 | 0.77 | .63 |
| a4 | 2 | Drank more than intended | 0.27 | .07 | 0.95 | .59 |
| s43 | 1 | Physician has not prescribed enough | −0.03 | .10 | 1.34 | .34 |
| s40 | 1 | Use leads to trouble | −0.29 | .09 | 0.91 | .57 |
| s36 | 1 | Neglected obligations | −0.35 | .09 | 0.81 | .62 |
| s42 | 1 | Drinks away from home | −0.37 | .09 | 1.08 | .49 |
| s46 | 1 | Binge use | −0.50 | .09 | 0.78 | .64 |
| s41 | 1 | Use causes family problems | −0.61 | .09 | 0.75 | .66 |
| s27 | 1 | Used too much alcohol, pot | −0.80 | .09 | 0.85 | .62 |
| s23 | 1 | Have never broken a law | −1.01 | .08 | 1.33 | .37 |
| s38 | 1 | Began regular use as teen | −1.06 | .08 | 0.93 | .58 |
| s31 | 1 | Smoke cigarettes regularly | −1.48 | .08 | 1.17 | .45 |
| s13 | 1 | Tempted to leave home | −1.74 | .08 | 1.34 | .37 |
| s16 | 1 | Sometimes drink too much | −1.87 | .08 | 0.90 | .59 |
| s2 | 1 | Never been in police trouble | −2.21 | .08 | 1.08 | .49 |
| s34 | 1 | Sometimes sit when should be working | −2.72 | .08 | 1.16 | .43 |
| s18 | 1 | Wish for better self-control | −2.91 | .08 | 1.13 | .43 |
| s8 | 1 | Hard time sitting still | −2.93 | .08 | 1.19 | .37 |
| s5 | 1 | Not lived way I should | −2.95 | .08 | 1.16 | .41 |
| s28 | 1 | Know people with bad reputation | −2.99 | .08 | 1.13 | .42 |
| *M* | | | 0.00 | .09 | 0.99 | |
| *SD* | | | 1.47 | .01 | 0.17 | |

*Note.* Items are arranged in descending order of difficulty of endorsement (see the Measure column). Gp = item groups for which 1 = true–false response option and 2 = response rating scale with options *never, 1–4 times,* and *5 or more times*; Measure = item difficulty in logits (item difficulties are anchored at a mean of 0 and standard deviation of 1); Infit = mean square infit statistic with expectation of 1 (values greater than 1.3 indicate unexpected noise; values less than .7 indicate dependency in the data); Corr = correlation between items and measure.

selected because, when applied to the validation sample, it afforded a 28% improvement in sensitivity over a rule that combined all items in one scale. Improved sensitivity was consistent with the goal of optimizing identification of VR customers in need of further assessment for SUD. The consequence of this decision was somewhat lower specificity and positive predictive value. With this scoring rule, sensitivity was 87%, positive predictive value was 60%, specificity was 84%, and negative predictive value was 96% for the development sample; likelihood ratio (1, $N = 471$) = 180.3, $p < .001$. For the validation sample, overall accuracy was 84%, with sensitivity of 82%, positive predictive value of 61%, specificity of 85%, and negative predictive value of 94%; likelihood ratio (1, $N = 474$) = 165.3, $p < .001$.

Effect sizes observed in the correspondence between the SAVR-S decision rule and the DIS diagnostic classification of SUD, measured as $\Phi$, were .625 (Cohen's $d = 1.6$) for the development sample and .605 (Cohen's $d = 1.5$) for the cross-validation sample. These values represent large effect sizes (Cohen, 1988).

We compared persons who completed the SAVR-S independently ($n = 662$, 70%) with those who required minimal ($n = 54$, 6%), moderate ($n = 10$, 1%), or high ($n = 82$, 9%) levels of assistance because of low literacy or limited vision and with those who completed the instrument by telephone ($n = 134$, 14%). Minimal assistance was defined as clarifying only a few questions or words; moderate assistance involved considerable assistance explaining questions or how to record responses; high levels of assistance involved reading all questions because of poor vision or limited literacy. SAVR-S accuracy rates in identifying those with and without DIS SUD diagnoses in these groups ranged from 83% to 91% and did not differ significantly across groups, $\chi^2(4, N = 942) = 2.33$, $\Phi = .05$, $p = .675$.

To test how well the SAVR-S results generalized to an independent sample of VR consumers, we applied the SAVR-S scoring system to responses from a sample of 184 VR consumers who had completed the SASSI-3 in an earlier study (Lazowski et al., 1998). The sample was 53% men; 80% were Caucasian, 9% African American, 8% Hispanic, and 3% other races. Marital status was reported as 38% never married, 37% divorced, 20% married, 3% unmarried but part of a couple, and 2% widowed. The mean age was 36.2 years ($SD = 10.2$ years). Respondents in this sample had been referred by VR counselors for a substance abuse assessment. Clinical diagnoses indicated a SUD prevalence rate of 60% in the sample. When test classifications on the 43-item SAVR-S were compared with the diagnostic criterion, analyses indicated an overall accuracy rate of 86%, with sensitivity of 92%, positive predictive value of 86%, specificity of 78%, and negative predictive value of 87%. This corresponds to a large effect size in concordance between the SAVR-S decision rule and the diagnostic classification of SUD ($\Phi = .715$, Cohen's $d = 2.0$). It should be noted that the instrument that these VR customers completed did not contain the four new medication abuse items added to the SAVR-S or the minimal rephrasing of five items. These differences not withstanding, the findings provide evidence of the generalizability of the SAVR-S results to a VR sample with a much higher prevalence rate of SUD.

## Discussion

Our objectives in this study were to develop an SUD screening instrument that is suitable for VR customers and evaluate its psychometric properties. We hypothesized that the SAVR-S would

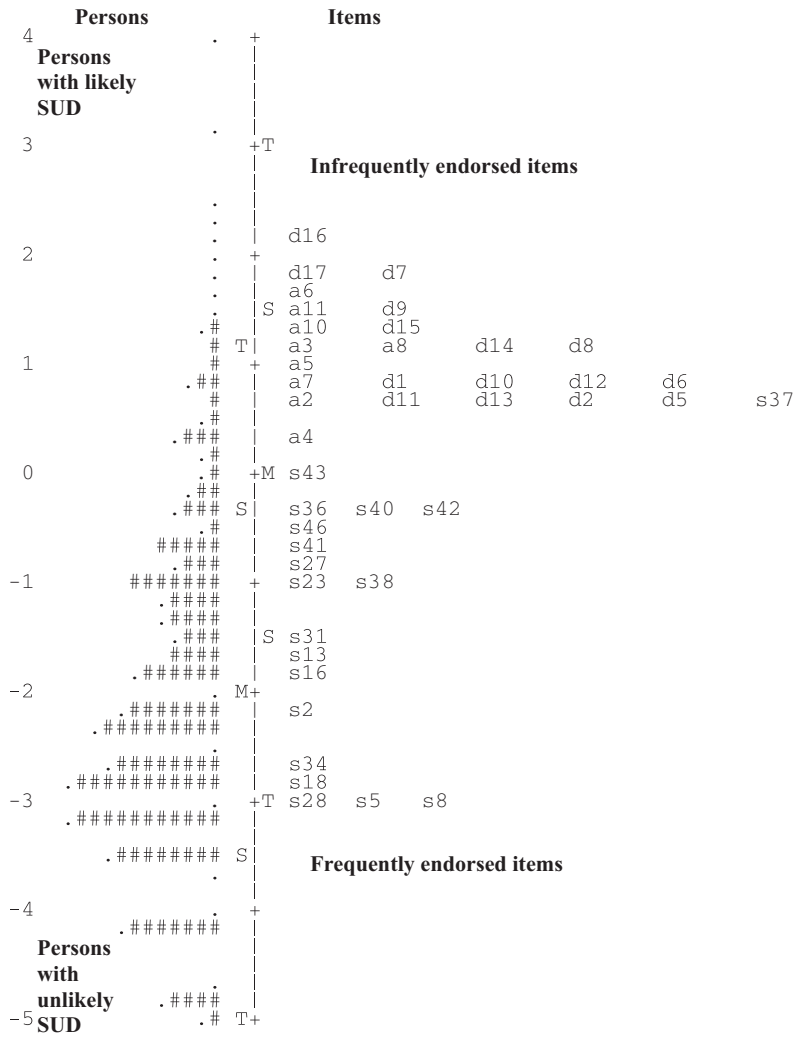


*Figure 2.* Map of items and persons on the 43-item Substance Abuse in Vocational Rehabilitation Screener. # = 7 customers; S = 1 standard deviation; T = 2 standard deviations; SUD = substance use disorder. The distribution of client measures (in log-odds units) is shown in the left histogram; the distribution of item difficulties is illustrated in the right histogram. Item labels correspond to items listed in Table 2.

demonstrate adequate psychometric properties with a heterogeneous sample of VR customers. Results support this hypothesis and indicate that the 43-item SAVR-S is promising for its intended purpose. The strengths of this instrument include its relative brevity; high specificity; good sensitivity given the nature of the VR screening process; readability; and consistency in results across levels of assistance, modes of administration, and independent samples of VR consumers. The inclusion of items related to medication misuse enhances the relevance of the instrument to a population with increased risk of misuse due to chronic pain and mental disorders. In field implementation, the SAVR-S requires minimal staff training.

The SAVR-S identified customers with a high probability of having a SUD that may jeopardize their chances of self-sufficiency. As part of our Rehabilitation Research and Training Center project to evaluate the effects of routine SUD screening on VR outcomes, we provide automated scoring of the SAVR-S and a report that encourages VR counselors to use the results to facilitate screening for referral services. The report includes a printout of key items and practical suggestions for helping customers recognize the impact of substance misuse in their lives. The SUD screening report addresses possible consequences of substance misuse: loss of control in usage, negative consequences, neglect of obligations due to use, substance use to manage emotions and cope with negative feelings, misuse of medications, physical tolerance and/or withdrawal, belief that substance use has had an adverse impact, and prior treatment for SUD.

The research reported here is being followed by a statewide implementation and efficacy study of the SAVR-S in state–federal VR programs in Illinois, Ohio, and West Virginia, where applicants are asked to complete the screening at intake. The SAVR-S is being shared without cost to these state VR agencies during the period of grant support. Addressing SUD

Table 3
*Correspondence of the 43-Item Substance Abuse in Vocational Rehabilitation Screener With Diagnostic Interview Schedule Diagnoses of Substance Use Disorders*

| Sample | Sensitivity | Positive predictive value | Specificity | Negative predictive value |
|---|---|---|---|---|
| Alcohol + drug + true–false subscores | | | | |
| Development sample ($n$ = 471) | | | | |
| Fraction | 90/104 | 90/150 | 307/367 | 307/321 |
| % | 87 | 60 | 84 | 96 |
| Validation sample ($n$ = 474) | | | | |
| Fraction | 86/105 | 86/142 | 313/369 | 313/332 |
| % | 82 | 61 | 85 | 94 |
| Clinical validation sample ($n$ = 184) | | | | |
| Fraction | 101/110 | 101/117 | 58/74 | 58/67 |
| % | 92 | 86 | 78 | 87 |
| Combined 43-item pool | | | | |
| Development sample | | | | |
| Fraction | 62/104 | 62/71 | 358/367 | 358/400 |
| % | 60 | 87 | 98 | 90 |
| Validation sample | | | | |
| Fraction | 57/105 | 57/65 | 361/369 | 361/409 |
| % | 54 | 88 | 98 | 88 |

*Note.* The prevalence of substance use disorders is 22% in the development and validation samples and 60% in the clinical validation sample.

within VR is a complex challenge. Although SUD is considered a qualified disability under the Americans with Disabilities Act of 1990 and the Rehabilitation Act of 1973, several potential barriers stand in the way of successful delivery of services. These barriers include the limited educational and field experience most VR counselors have with this condition, the likelihood that a percentage of active substance abusers attempt to conceal SUD from VR programs (as evidenced by the differences between official diagnoses and SUD prevalence in VR samples), and a lack of procedures and policies for detecting substance abuse among VR customers. Moreover, case service data from the national VR database indicate that only 13% of persons in these systems are diagnosed with SUD (Rehabilitation Services Administration, 2005). The distribution of SUD by state ranges from 0.2% to 28.0%, with fewer than 10 states approaching an SUD rate of 20% among their customers. The SAVR-S has promise for addressing these barriers because it is self-administered quickly, results are available rapidly, it demonstrates high specificity for SUD, and addictions expertise is not required of counselors. VR counselors face the challenge of allocating limited resources to help as many customers as possible, often with increasing caseloads and mandates to serve persons with the most severe disabilities first. This method of screening for SUD, therefore, allows counselors to identify an issue that has been shown repeatedly to have adverse effects on rehabilitation outcomes. Similar to identification procedures for other functional limitations in VR, a positive screening result based on the SAVR-S may indicate that further assessment by a qualified SUD professional may be warranted prior to completion of the rehabilitation plan.

The instrument's limitations should be noted. The SAVR-S is intended for screening purposes only—it does not provide a diagnosis. Despite the inclusion of items that have no apparent relation to substance misuse, some customers may minimize substance use so as to avoid identification. We valued brevity for routine agency use, although the instrument contains 43 items and is longer than some alternative screening instruments. Thus, several subtle items were removed, reducing the instrument's ability to detect customers with SUD who attempt to conceal their use. Finally, this sample differs from 2005 VR applicants nationwide (Rehabilitation Services Administration, 2005) by being somewhat older (40 years vs. 35 years old), being better educated (26% vs. 37% without a high school degree), and having larger proportions of women (52% vs. 45%) and persons from minority backgrounds (62% vs. 35%). The extent to which sampling bias may limit the generalizability of our findings awaits further investigation. Our alcohol and illicit drug use prevalence rates parallel national rates (Substance Abuse and Mental Health Services Administration, 2005), although our sample was not selected randomly. Finally, the base rate of SUDs (60%) in the clinical sample used to provide evidence of generalizability is probably two to three times the rate of a random vocational rehabilitation sample. Therefore, the sensitivity and specificity estimates reported for the clinical validation sample here may not apply to general screening settings in VR.

## Conclusions

We developed a 43-item SUD screening instrument for alcohol, illicit drugs, and prescription drugs that can be completed in approximately 15 min and demonstrates high specificity and good sensitivity; a low Flesch–Kincaid Grade Level readability score; and consistency in results across levels of assistance, modes of administration, and independent samples of VR consumers. Conceptualization, development, and validation of the SAVR-S represent the culmination of several years of work in investigating the needs of VR programs in serving persons with coexisting SUD. The research reported here is being followed by a statewide implementation and efficacy study of the SAVR-S in three state–federal VR programs. The SAVR-S can assist VR staff with decisions about functional impairments, the need for professional SUD assessment, content of individualized programs for employment, resource allocation, counseling, case management, and postemployment resources to enhance self-sufficiency.

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