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A Comparison of the Concurrent and Predictive Validity of Three Measures of Readiness to Change Alcohol Use in a Clinical Sample of Adolescents

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Abstract

We compared three measures of readiness to change alcohol use commonly used in clinical research and practice with adolescents: the Readiness Ruler, the SOCRATES (subscales of Recognition and Taking Steps), and a Staging Algorithm. The analysis sample consisted of 161 male and female adolescents presenting for intensive outpatient alcohol who reported current alcohol use at the initial assessment. Evidence for concurrent validity was assessed by computing simple correlations of each readiness measure with the other three, and of each readiness measure with drinking behavior (percentage of days abstinent (PDA) and drinks per drinking day (DDD), respectively, in the last 30 days) at the start of treatment and at the 6-month follow-up assessment. Evidence for predictive validity was based on percentage of independent variance accounted for by each of the readiness measures in predicting drinking behavior at six months from the start of treatment, and then in predicting drinking behavior at 12 months from the readiness assessment at 6 months. The results showed that all but Recognition had good concurrent validity, the Readiness Ruler score showed consistent evidence for predictive validity, and the Staging Algorithm showed good predictive validity for DDD at 6 and 12 months. For the 82 participants with an alcohol use disorder diagnosis, the findings for the Ruler and Recognition were similar, but the Staging Algorithm had poorer prediction of DDD at 12 months, and Taking Steps was a better predictor of 6- and 12-month PDA and DDD. Research and clinical implications of the findings are discussed.

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Keywords

Readiness to change; alcohol use; measurement validity; adolescents

The construct of motivation to change has been central to alcohol and other drug research and practice for many years (Miller, 1985). Systematic research on motivation to change accelerated with Prochaska's and DiClemente's (1982; Prochaska, DiClemente, & Norcross, 1992) work on the construct of "stages of change" of a given behavior, which was created as part of a "transtheoretical" model of psychotherapy (Prochaska, 1979). The construct has been especially influential in application to addictive behaviors, particularly tobacco smoking. Overall, these advances spurred the creation of a number of measures of "stages of change," and related variables, such as "readiness to change" and "motivation to change" for specific addictive behaviors in adult clinical and non-clinical samples. It is important to note that, although in some cases individuals presenting for treatment may express motivation to change their "drug use" in general, conceptually, readiness to change or stage of change is behavior-specific (Carey, Purnine, Maisto, & Carey, 1999; Sutton, 2001). Thus, we focus here on alcohol, a substance commonly used by youth in treatment.

Although there has been a substantial increase in addictions clinical research on adolescents in the last two decades, research with adolescents still lags behind that with adults in both breadth and volume. Nevertheless, the construct of motivation to change has been an important one for adolescent addictions clinical practitioners and researchers for some time, primarily because adolescents typically show little "intrinsic" motivation to change substance using behaviors. Youth present for formal treatment usually because of pressures exerted by family members or the judicial system (Breda & Heflinger, 2004). Accordingly, clinicians value an easy-to-administer, high utility measure of readiness to change to assist in planning the timing, structure, and content of interventions. Therefore, like the literature with adults, Prochaska's and colleagues' work on stages of and readiness to change addictive behavior has been influential in work with adolescents (Bukstein, 1995; Hawke & Kaminer, 2009; Monti, Colby, & O'Leary, 2001; Williams, Horton, Samet, & Saitz, 2007). However, research that has been done on these measures with adults cannot be assumed to apply to adolescents, both because of developmental differences in addiction severity (typically less severity and lower prevalence of dependence in adolescents; typically less severity and lower prevalence of dependence in adolescents; Deas, Riggs, Langenbucher, Goldman & Brown, 2000) and because many youth, some of whom are mandated to treatment, may not be "ready to change" their substance use.

Despite the influence of the construct of readiness to change on the alcohol and other drug treatment of adolescents, there remains relatively little research to support the use of specific measures of motivation or readiness to change alcohol use in adolescents. Maisto, Chung, Cornelius, and Martin (2003) noted this lack of empirical evidence as a basis of evaluating the Stages of Change and Treatment Eagerness Scale (SOCRATES), a measure of stages of change of alcohol use that was developed in a clinical sample of adults and administered to an adolescent clinical sample. Maisto et al. showed that the SOCRATES had a two-factor structure ("Problem Recognition" and "Taking Steps," respectively) in an adolescent clinical sample, and that both factors showed good internal consistency and construct validity. In this regard, Maisto et al. showed that both the Recognition and Taking Steps factors at baseline predicted 12-month alcohol use outcomes in a sample of treated adolescents. The SOCRATES is an example of a "multidimensional scaling" approach (Cohen, Glaser, Calhoun, Bradshaw, & Petrocelli, 2005) to measuring readiness to change alcohol use. Such measures typically are paper and pencil questionnaires that consist of a given number of items that load on one or more readiness "factors."

Another self-administered questionnaire measure is the Readiness Ruler (Miller, 1999; CASAA, 1995), which represents a 1–10 continuum of “readiness to change,” with the anchor points “not ready to change” to “unsure” to “ready to change” to “trying to change.” Research on alcohol readiness rulers in college students (LaBrie, Quinlan, Schiffman, & Earleywine, 2005) and general medicine clinic patients who are at risk for alcohol problems (Heather, Smailes, & Cassidy, 2008) support its use as a measure of readiness to change. To our knowledge, no published studies have examined the validity of the alcohol ruler in treated adolescents. However, the contemplation ladder (e.g., Slavet et al., 2006) is a measure that is conceptually similar to the ruler. The ladder is structured and administered in ways similar to the Readiness Ruler but is not identical to it, as the Ladder consists of a diagram of a ladder with 10 “rungs,” several of which are anchored by verbal labels of different degrees of readiness to change. Slavet et al. (2006) found concurrent and predictive evidence for the validity of Marijuana Ladder score in adjudicated adolescents in substance abuse treatment. Alcohol and other drug use ladders have received empirical support when used with adults (Hogue, Dauber, & Morgenstern, 2010; McGee, Williams, & Kypri, 2010). However, little is known about the performance of an alcohol Readiness Ruler in treated youth, many of whom do not seek treatment voluntarily.

Finally, another type of measure of readiness to change alcohol use that has been commonly used is the staging “algorithm,” which classifies an individual into one of five stages of change: precontemplation, contemplation, preparation, action, or maintenance (Prochaska et al., 1992; Carey et al., 1999). One study showed that youth in the precontemplation stage were more likely, compared to other stages, to drop out of residential substance abuse treatment (Callaghan et al., 2005). We are not aware, however, of any studies that examined stage of change as a predictor of treated adolescents’ substance use outcomes.

Because of their widespread use in clinical practice and clinical research, it is important to apply measures of readiness to change that have empirical support for use in a specific context (e.g., alcohol and drug treatment, juvenile justice settings) and for changing a specific behavior (e.g., alcohol use) (Carey et al., 1999; Sutton, 2001). The literature shows that the different types of measures commonly used may have pockets of empirical support, but the field lacks a solid empirical base for selecting a given measure for use in a given context (Slavet et al., 2006), and this is especially true for adolescent populations. The purpose of this study, therefore, was to provide data toward this end by comparing the concurrent and predictive evidence for the validity of three commonly used measures of readiness to change alcohol use: the Readiness Ruler, a Staging Algorithm, and the SOCRATES (subscales Recognition and Taking Steps, respectively) in a clinical sample of adolescents. The data were collected as part of a project concerned with relapse and remission among adolescents presenting for outpatient treatment of alcohol and other drug use disorders. In this longitudinal observational study, adolescents were assessed immediately before their first treatment session and provided follow-up data on alcohol, other drug use, and related functioning at multiple time points up to two years after treatment initiation. The data presented in this study were collected at the initial (prior to the first treatment session), baseline (usually within 2 weeks of starting treatment), 6-month, and 12-month assessments.

It was expected that each of the alcohol readiness measures would be moderately and positively correlated with each other, given the hypothesis that they are measuring the same construct. Similarly, we predicted a small correlation between each initial readiness measure and percentage of days abstinent (PDA) from alcohol (positive relationship) and number of drinks per drinking day (DDD) (negative relationship) at the initial assessment. In this regard, there is empirical evidence that measures of readiness to change tend to be inversely related to measures of quantity and frequency of alcohol consumption pretreatment (e.g.,

Maisto et al., 2003; Napper et al., 2008). However, for some patients, pretreatment readiness to change may be positively related to pretreatment severity of alcohol problem, resulting in a positive relationship between readiness and quantity and frequency of consumption measures. Overall, however, given empirical precedent as cited earlier, the hypothesis of an inverse relationship between pretreatment readiness and pretreatment alcohol consumption was proposed. For tests of predictive validity, the direction of the relationships expected were the same as that described for the counterpart concurrent validity analyses. Specifically, for the 12-month data, the direction of the correlations was expected to be the same as predicted for the initial to 6-month prediction, but the magnitude of variance accounted for was expected to be greater. In this regard, it was expected that readiness would more likely “drive” alcohol use than the reverse.

Method

Sample Characteristics

Adolescents, age 14–18, were recruited prior to attendance at the first treatment session from seven community-based treatment sites offering group-based intensive outpatient (IOP) treatment for adolescent substance users. All sites were located within the greater Pittsburgh, PA area. Six of the seven sites are run by a large, not-for-profit multi-site rehabilitation center. The seventh site was an adolescent Dual Diagnosis clinic (i.e., substance use disorder and co-occurring psychopathology), which is part of a university-based medical center. A total of 184 adolescents were recruited into the study; the analyses reported in this paper were restricted to the individuals who reported that they use alcohol ($N = 161$) at the initial assessment and for whom questions about readiness to reduce or stop alcohol use would be most relevant.

A majority ($n = 101$) of the 161 adolescents was male (62.7%); 88.8% of the participants were Caucasian, 6.2% were African-American, and 5.0% were of other ethnicity (e.g., bi-racial). The sample had a mean age of 16.71 ($SD = 1.19$) and represented a range in socioeconomic status (SES) (range 1–5, mean = 2.52, $SD = 1.09$) (Hollingshead, 1975). Slightly over one-third (36%) were recruited from the Dual Diagnosis Clinic, and 64% were recruited from the rehabilitation center. Participants reported at baseline that they were abstinent from alcohol 64.27% of the days in the last month ($SD = 37.89\%$) and that they consumed an average of 4.00 drinks per drinking day ($SD = 4.80$). Importantly, the sample's demographic characteristics (i.e., gender and mean age) are generally similar to those of youth admitted to publicly funded treatment (SAMHSA, 2007).

Adolescents most commonly reported alcohol and marijuana as the substances for which they were receiving treatment. A total of 13.3% of the participants reported that alcohol was their “primary” (most frequent) drug of use. Marijuana was the primary drug of use for 62.0% of the participants, 3.3% reported alcohol and marijuana, and of the remaining 21%, the largest proportion reported opiates as the primary drug (9.3%). At baseline, the majority met criteria for a current (past 6-months) DSM-IV marijuana diagnosis (92.2%: 58.4% marijuana abuse, 34.8% dependence). More than half (50.9%, $n = 82$) of the sample met criteria for a current alcohol diagnosis (42.2% abuse, 8.7% dependence) at baseline.

It is important to explain here why measures of readiness to change alcohol use were evaluated in a clinical sample whose members did not all have an alcohol diagnosis, even though the subgroup included in the analyses all did report recent alcohol use. In this regard, the treatment programs all had abstinence from all substances as a treatment goal. Indeed, at the initial assessment, participants reported a mean scale score of 6.55 ($SD = 2.97$) on the alcohol Readiness Ruler (see Table 1), just below the “ready to change” verbal anchor on the 1 – 10 scale. Moreover, although many of the participants who used alcohol also used

other drugs, especially marijuana, readiness to change measures theoretically should be behavior-specific, so that any assessment of readiness to change alcohol use should be limited to that drug alone (Carey et al., 1999).

The majority (85.7%) of the 161 participants ($n = 138$) completed the 6-month follow-up at least in part, and 85.1% ($n = 137$) completed the 12-month assessment. For both follow-ups, there were no statistical differences between completers and non-completers on race, sex, and SES, or on baseline PDA and DDD. Furthermore, there were no differences in these same variables between individuals who reported that they used alcohol and those who did not, except for the expected differences in PDA and DDD, respectively.

Study Recruitment and Assessment Procedures

Upon admission to IOP treatment, all adolescents were told about an on-going research project by a clinic staff person who handled the admissions process (rehabilitation center) or by their therapist (Dual Diagnosis Clinic). Adolescents who expressed interest in voluntary research participation were then introduced to research staff, who provided a description of study procedures. Among the adolescents approached for study participation, 67% provided informed assent (youth age 14 – 17) for study participation and consent from the minor adolescent's parent, or informed consent (youth age 18) for study participation. It is not possible to compare demographic characteristics of those who declined participation to those who provided consent. Among adolescents who provided consent for participation at the initial assessment, 74% ($n = 184$) completed the baseline assessment. Youth who did not complete the baseline assessment (26%) were not able to do so for reasons such as the time it took to complete the baseline (which would have been done in addition to, and separate from, attending 9 hours of treatment per week), changed their mind about research participation, and not able to schedule the baseline assessment after repeated attempts. Importantly, among youth who completed the initial assessment, there were no differences by sex, age, or race between those who did versus did not complete the baseline assessment.

The initial assessment (15 – 20 minutes long) occurred after consent procedures, and prior to the first IOP session attended. The initial assessment included several measures of readiness to change. The baseline assessment (2.0 – 2.5 hours) was usually completed within 2 weeks of starting IOP treatment (mean = 18.30 days, $SD = 14.80$) and covered the adolescent's lifetime history of substance involvement, psychiatric conditions, and readiness to change substance use. The 6- and 12-month follow-ups, which each took 1.5 hours to complete, collected data on the same domains covered at baseline. In addition, adolescents completed monthly phone follow-ups (about 15 – 20 minutes long) between baseline and 6-month follow-up, and between the 6-month and 12-month follow-ups. The monthly phone follow-ups collected data on substance use and treatment utilization in the past month. Participants were compensated for their time. The University's Institutional Review Board approved the study protocol.

Treatment Program Characteristics

Each IOP treatment program from which adolescents were recruited to the study adhered to a goal of abstinence from alcohol and other substances, and recommended participation in 6–8 weeks of IOP treatment. Each site ran one rolling admissions adolescent IOP treatment group, which met three times per week, for 3-hours per session.

Measures

The design of the parent study from which these data were taken involved an extensive assessment protocol. The readiness to change measures included in this study were

administered at the initial assessment, and at the 6- and 12-month follow-ups. This section describes only the measures relevant to the study reported in this paper.

DSM-IV substance use disorder (SUD) diagnoses and symptoms—An adapted version of the Structured Clinical Interview for DSM-IV SUDs (SCID[®]; First, Spitzer, Gibbon, & Williams, 2002; Martin, Kaczynski, Maisto, Bukstein, & Moss, 1995; Martin, Pollock, Bukstein, & Lynch, 1999) was used at baseline to determine the presence of SUD diagnoses and symptom counts. SCID adaptations accommodate developmental considerations in symptom assessment with adolescents (e.g., school grades dropping due to substance use). The adapted SCID has fair to high retest reliability for DSM-IV alcohol abuse ($\kappa = .64$) and dependence ($\kappa = .69$), cannabis abuse ($\kappa = .45$) and dependence ($\kappa = .87$), and nicotine dependence ($\kappa = .66$) (Chung, Martin, San Pedro, Shriberg, & Cornelius, 2004). Retest intraclass correlations (ICCs) for total symptom count were high (alcohol = .91, cannabis = .95, nicotine = .89) (Chung et al., 2004).

Readiness Ruler (Miller, 1999)—The question stem is: “Using the ruler below, indicate how ready you are to make a change (quit or cut down) in your drug use. If you are not at all ready to make a change, you would circle “1”. If you are already trying hard to make a change, you would circle “10”. If you don’t use a drug listed, please circle “don’t use” “. The stem was followed by separate responses to be provided for alcohol and 11 other substances. Other anchors on the 10-point scale included 4 = unsure, 6–7 = ready to change, and 10 = trying hard to change. If “did not use alcohol” was marked, the item was coded as missing data.

Staging Algorithm—This study’s staging algorithm (SA) was developed by Belding, Iguchi, and Lamb (1996) and consisted of four questions: “Have you used alcohol in the past 30 days?”, “Have you used alcohol in the past 6 months?”, “In the next 6 months, do you intend to cut down on your level of alcohol use or to stop?”, “In the next 30 days do you intend to cut down on your alcohol use, or to stop?”. Following Belding et al., youth were in “Precontemplation” if they reported use in the last 30 days, with no intention to reduce or to stop use in the next 6 months. Contemplation represented those who reported use in the last 30 days, and intention to reduce or stop use in the next 6 months, but not in the next 30 days. Preparation included youth who used in the last 30 days, but who intended to reduce or discontinue use in the next 30 days. Action represented those who reported no use in the last 30 days, but use in the last 6 months. Maintenance included those who reported no use in the last 6 months.

Scoring the staging algorithm posed some difficulty. Different approaches have been taken in the literature. One method was to distinguish precontemplators from the rest of the sample to create a dichotomous variable, on the premise that precontemplators are the only subgroup who have no belief or perception that alcohol is a problem and, thus, a change in consumption is not warranted, whereas individuals classified in any other stage perceive that change may be in order. The dichotomous approach follows Project MATCH, a clinical trial involving adult participants (e.g., DiClemente, Carbonari, Zweben, Morrel, & Lee, 2001). One problem in our data with the dichotomous approach is that our sample included a disproportionately low percentage of individuals classified in the precontemplation category (8.7%) at the initial assessment. Another approach was to create a scale representing increasing readiness (i.e., 1=precontemplation, 2=contemplation, 3=preparation, 4=action, 5=maintenance), classifying individuals into a stage according to the algorithm described above. This method turned out to be the more sensitive of the two and is the one reported here.

Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES)—

As noted earlier, this questionnaire consists of 19 5-point Likert items. Maisto et al.'s (2003) evaluation of the SOCRATES short form showed that 14 items loaded on two factors, "Amrec" (A merging of "Recognition" and "Ambivalence") and "Taking Steps," each of which showed good internal consistency and concurrent and predictive evidence for validity in a clinical sample of adolescents. Using data from the initial assessment, we ran a confirmatory factor analysis (CFA) of SOCRATES items. The CFA included the 14 items representing the Maisto et al. "Amrec" and "Taking Steps" factors, and an additional item (hypothesized to load on "Amrec") that was inadvertently omitted from the Maisto et al. study (i.e., number of items in the CFA for this study = 15). CFA results supported the two-factor structure in this sample (CFI = .91, TLI = .89, SRMR = .08, $N = 159$), providing additional evidence for the construct validity of the SOCRATES when used with treated adolescents. The factor loadings for the Amrec (name changed to "Recognition" for this study) factor ranged from .63 to .92, all statistically significant. Similarly, the factor loadings for the Taking Steps factor ranged from .51 to .90, all statistically significant. Cronbach's alpha for Recognition was .94, and for Taking Steps was .91. The two factors were correlated $r = .37$ ($p < .01$) in the CFA sample. The analyses reported here considered the Recognition and Taking Steps factors as separate measures of readiness to change. The average score for the items loading on each respective factor was used in analyses.

Timeline Follow-Back (TLFB; Sobell & Sobell, 1995)—The TLFB calendar method was used to collect data at baseline (past 30 days) and at subsequent assessments on the number of days of alcohol use, number of drinks per drinking day, and number of days attended inpatient treatment. To facilitate reliable and valid report of TLFB data, we first obtained information on life events that occurred since the last assessment (e.g., holidays, birthdays, "events" such as attendance at sporting events) to establish "anchors" for dates, and, in particular, dates when alcohol used, treatment, and 12-step meeting attendance occurred. To minimize missing TLFB data over follow-up, youth provided information "since the last assessment," if a monthly assessment was missed. TLFB data collected from adolescents has good reliability and validity (Donohue et al., 2004; Donohue, Hill, Azrin, Cross, & Strada, 2007; Lewis-Esquerre et al., 2005; Waldron, Slesnick, Brody, Turner, & Peterson, 2001).

Two drinking variables were analyzed: percentage of days abstinent (PDA) and drinks per drinking day (DDD). PDA is a measure of the frequency of alcohol use, and DDD is a measure of intensity of its use. PDA was computed by dividing the number of days abstinent from alcohol during the assessment interval by the total number of days and then multiplying by 100. The number of drinks per drinking day was computed by dividing the total number of drinks consumed during an assessment interval and then dividing that number by the total number of days in which alcohol was consumed. If the participant reported complete abstinence from alcohol during an interval, then DDD = 0. The drinking variable distributions were skewed; PDA had negative skew and DDD had positive skew. A square root transformation of each variable at all assessment points was found to provide the best approximation to normal distribution. Therefore, the transformed scores for each respective measure were used in all analyses, with the exception that the raw data are reported in Table 1, for descriptive purposes. To account for time in a controlled environment, in which access to alcohol would be limited, the number of days of residential and inpatient treatment was summed between the baseline and the 6-month follow-up assessment, and between month 7 to the 12-month follow-up assessment, respectively. The inpatient/residential summary variable was highly skewed, so a square root transformation was used to better approximate a normal distribution of scores for this variable.

Statistical Analyses

The analyses proceeded in several steps. First, concurrent evidence for the validity of each of the four readiness measures was tested by computing the simple Pearson correlations between scores on each of the readiness measures at the initial assessment. Correlations also were computed between each readiness measure completed at the initial assessment and the baseline TLFB PDA and DDD in the last 30 days. In the predictive validity analyses, for models predicting 6-month drinking outcomes, readiness score at the initial assessment was used to predict 6-month PDA and DDD at 6 months, with the critical test being the additional percentage of the variance accounted for after controlling for demographic variables, number of days of substance abuse residential and inpatient treatment participation in the last 30 days, the level of the criterion drinking variable at baseline, and the clinical site (dual diagnosis clinic vs. rehab center). A separate model was run for each readiness measure.¹

Because readiness to change is not a static variable (e.g., Breda & Heflinger, 2004), we repeated the concurrent validity analyses with the 6-month readiness and TLFB data. For the prediction of 12-month alcohol use from 6-month readiness, we tested the same hierarchical regression models, except that the criterion variables were 12-month PDA and DDD. The main readiness predictor was 6-month readiness, and the number of days in inpatient and residential treatment for the last 30 days before the 12-month interview and the 6-month level of the criterion variable were used as covariates. In predicting the 12-month outcomes, the direction of the correlations was expected to be the same as that for the initial to 6-month prediction, but the magnitude of variance accounted for was expected to be greater. In this regard, it was expected that the treatment experiences for each teen between the initial and 6-month assessments would tend to result in finer discriminations among their perceptions of readiness to change their alcohol use. It is important to note that these models are stringent tests for predictive evidence of validity of each of the readiness measures, as each is held up to the standard of explaining an additional, independent increment in the variance of a drinking outcome beyond what is explained by the measure of that same outcome at the earlier time point. As a further test, we also repeated the predictive validity analyses in the subsample with current AUD at baseline, because readiness to change alcohol use is particularly relevant for this group.

Results

Concurrent Evidence of Validity

Table 1 summarizes the descriptive data for each of the readiness and alcohol consumption measures at each of the assessment time points. One-way analyses of variance with repeated

¹Because participants were nested within treatment site using multiple regression analysis to test for predictive validity may have inflated the Type I error rate. We proceeded with several steps of analyses to investigate this possibility. The first step was to compute the intraclass correlation (ICC) for each model. In this regard, we computed 16 ICCs, as we could partition the data by either 2 or 7 sites (please see Method section), had 4 alcohol use outcomes (percentage of days abstinent (PDA) and drinks per drinking day at 6 and 12 months, respectively), and analyzed the data on both the full sample of individuals who reported current alcohol use at the initial assessment ($N = 161$) and the subsample of them who met criteria for an AUD at the initial assessment ($n = 82$). The second step was to use these ICCs to compute the design effect (DE) for each of these respective analytic settings. Among the 16 DEs that were computed, only one reached a level of >2.00 , which was $DE = 2.70$ for PDA at 6 months for the full sample, 2-site setting. The threshold of $DE = 2.00$ is the value cited most commonly in the literature (Clarke, 2008; Peugh, 2010) for determining whether multilevel modeling should be used to model nested data. If $DE \leq 2.00$, then it is likely that Type I error rate is inflated if OLS regression is used with nested data, but, if not, then use of the simpler, more accessible OLS regression modeling is satisfactory. Accordingly, the last step of the analyses was to run the models reported in Table 5 as a multilevel model (2 sites, or clusters) on the 6-month PDA data for the full sample. The results of these analyses did not differ from the findings of running the counterpart OLS regression models and reported in Table 5. In this regard, the only readiness measure that significantly predicted 6-month PDA was the initial alcohol Readiness Ruler. Based on this entire pattern of findings, we elected to present the predictive validity regression analyses.

measures (listwise deletion of cases with missing data at any of the three time points) conducted on the readiness measures showed only a significant effect ($p < .05$) of time on DDD. As Table 1 shows, DDD declined from the baseline to the 12-month assessment.

Table 2 shows the percentage of participants classified into each stage of change by use of the Staging Algorithm at each assessment point. McNemar's test for correlated proportions revealed a significant increase in the proportion of teens classified as precontemplators and in the maintenance stage, respectively, from the initial to the 6-month assessment ($p < .01$), but no significant change in the class proportions from the 6- to the 12-month assessment.

Table 3 presents the Pearson correlations among the four initial readiness measures, and the correlation between each readiness measure and baseline percentage of days abstinent and drinks per drinking day, respectively. As can be seen in Table 3, the correlations among the readiness measures all were positive, as expected, but they varied in magnitude. In particular, SOCRATES Recognition showed the smallest correlations, and there was virtually no relationship between Recognition and the Staging Algorithm.

Table 3 also shows the correlations between each of the readiness measures at the initial assessment and the baseline values of PDA from alcohol and DDD, respectively. Again, these correlations all were in the direction expected. However, Recognition showed no relationship to the drinking measures.

Table 4 replicates the summary in Table 3, except concurrent 6-month readiness and drinking measures are presented. As is evident in Table 4, the pattern of data strongly supports the concurrent evidence for validity hypotheses presented earlier for all of the measures except Recognition. With the exception of Recognition, correlations are in the expected direction and are of moderate-moderately high magnitude; Recognition again showed no relationship to the drinking measures.

Predictive Evidence of Validity

Table 5 summarizes results of testing the hierarchical multiple regression models to provide evidence (initial readiness to 6-months alcohol use) regarding the predictive validity of the readiness measure scores. Based on the criterion of increment in variance accounted for in the 6-month drinking data, the Readiness Ruler is the only one of the measures to show consistent evidence supporting the validity of the readiness to change score in relation to both percentage of days abstinent and drinks per drinking day. Table 5 shows that, among the remaining measures, only the Staging Algorithm score accounted for anything more than minimal independent variance (DDD) in the drinking outcomes at 6 months.

Table 6 summarizes the evidence for 6-month readiness scores as predictors of 12-month drinking outcomes. The findings for the 12-month drinking data are identical to that found for 6 months: the Readiness Ruler score was the only one, of the measures examined, that showed consistently good predictive evidence for validity. However, the Ruler score data for predicting 12-month DDD were stronger than for Staging Algorithm and Taking Steps scores.

Predictive Validity Analyses: Individuals Diagnosed with a Current AUD at baseline

Thus far this paper has focused on individuals who reported at the initial assessment that they use alcohol. However, almost half of these participants did not meet diagnostic criteria for an AUD and, therefore, may not have been in treatment primarily to modify their alcohol use. As a result, the predictive validity findings reported in this paper may not be directly applicable to clinical contexts in which the readiness measures investigated often are used, that is, when working with adolescents who present with an AUD diagnosis and for whom

one treatment goal is change in alcohol use patterns. Accordingly, the analyses summarized in Tables 5 and 6 were repeated with the subsample of individuals who were diagnosed at baseline with a current AUD ($n = 82$). The AUD and non-AUD subsamples showed differences on several variables listed in Table 1. Specifically, individuals with an AUD diagnosis had significantly ($p < .05$ or $< .01$) lower PDA at the 6- and 12-month assessments, had a higher number of DDD at the 12-month assessment, scored higher on the recognition factor at the initial, 6- and 12-month assessments, scored higher on Taking Steps at the initial and 12-month assessments, and scored lower on the staging algorithm at the initial and 6-month assessment.

Table 7 presents a summary of the AUD subsample change in R^2 findings when entering the readiness measure for each of the models reported in Tables 5 and 6. In these analyses, the same models whose results are summarized in Tables 5 and 6 were run for the AUD subsample. As can be seen in Table 7, the Ruler again emerged as the most consistent predictor of future alcohol use among the readiness measures tested. Findings for Recognition were consistent with the findings for the full sample. The Staging Algorithm showed poorer performance in predicting DDD at 12 months, and Taking Steps showed considerable improvement in predicting alcohol use at both 6 and 12 months.

Discussion

Based on the criterion of independent variance accounted for in the predictive validity analyses in the full sample, the data clearly support the use of the Readiness Ruler score as a measure of readiness to change alcohol use in adolescents presenting for intensive outpatient treatment of alcohol or other drug use disorders. In this regard, Readiness Ruler scores showed the most consistent pattern of evidence for both concurrent and predictive validity; the Staging Algorithm showed good concurrent validity and predictive validity for the DDD outcome at both 6 and 12 months, and Taking Steps scores showed good concurrent validity but poor predictive validity. Recognition score did not show good concurrent or predictive validity. To add to the advantages of using the Readiness Ruler, it is the briefest and easiest to complete of the three readiness measures, as it consists of one 10-point Likert Scale that the respondent self-administers. It is notable that the pattern of findings regarding the Ruler observed in this sample is consistent with the findings of studies of similar rulers used with college students in the U.S. (LaBrie, Quinlan, Schiffman, & Earleywine, 2005) and in patients presenting in general medicine clinics who have been identified as high-risk (for alcohol problems) drinkers in the UK (Heather, Smailes, & Cassidy, 2008).

When the predictive validity models run with the full sample were repeated with the AUD subsample, similarities and some differences in findings (ΔR^2) emerged. First, the Ruler again was the most consistent and best predictor of drinking outcomes, and Recognition consistently was the poorest. Second, findings for the Staging Algorithm were similar, except for a notable drop in the prediction of 12-months DDD. Third, Taking Steps showed improved predictive power for all drinking outcomes. This finding is significant, in that it replicates Maisto et al.'s findings with an adolescents presenting for AUD treatment and suggests that Taking Steps is a useful measure of motivation or readiness to change alcohol use for use with adolescents presenting for AUD treatment. On the other hand, the findings with the full sample suggest that Taking Steps has limitations in predicting changes in alcohol consumption in adolescents presenting for treatment who drink, but who do not have an AUD, and thus may not view change in alcohol use patterns as a primary treatment goal.

Taken together, this study's results make salient the question of whether these three (and other) measures of "readiness to change" of a given behavior should be used interchangeably, which, as described earlier in this paper, is common practice. The

discrepant findings across measures in this study may simply reflect, in part, that the operationalization of readiness or motivation to change differs considerably among the measures. For example, the SOCRATES is a multiple-item, multi-dimensional measure that requires individuals to report their perceptions about their alcohol use and related behaviors and consequences, as well as behaviors that respondents are engaging in to initiate or sustain change in alcohol use. The Readiness Ruler simply asks individuals to rate on a 1–10 scale how ready they currently are to make a change in their alcohol use. The Staging Algorithm, on the other hand, involves asking respondents four questions pertaining to recent past behaviors and future intentions regarding alcohol use and changing it; in fact, it would seem that this content, which overlapped with the criterion measure of recent alcohol consumption, would have inflated the correlations between the stage classification and consumption. Another feature of the Staging Algorithm is its use of relatively arbitrary time frames (i.e., “past 30 days”, “past 6 months”) to help classify individuals into stages. Each of the four measures has face validity as a measure of motivation or readiness to change, but, at the same time, the content of each measure differs considerably. This would suggest that there might be important differences in what is being measured, as well as similarities.

Overall, this study’s results point to the need for systematic research on the construct validity of these and other putative measures of readiness to change (Carey, Purnine, Maisto, & Carey, 1999; Sutton, 2001). For example, it would seem important to be precise about what construct a measure is designed to reflect and to design its content to be as consistent as possible with that construct’s meaning. Such increased precision would allow finer tests of convergent and discriminant validity, and thus of construct validity. Stronger evidence for construct validity among these different measures would advance the field by, for example, allowing clinicians and researchers to choose a measure that is best suited for use in a particular clinical or research context. Similarly, it would facilitate the use of “readiness” measures in more sensitive tests of mediation and moderation of treatment effects than are now possible, which would result in a better understanding of how treatments work, and increased effectiveness in their application with specific individuals in specific contexts.

Our conclusions regarding the evidence for the validity of the scores for the three readiness measures should be viewed in the context that our predictive validity tests were stringent. For each of the two drinking outcomes, predictive evidence for validity was determined by whether the score on the readiness measure accounted for significant, independent variance in the outcome after variance accounted for by several covariates, including the outcome itself measured at an earlier time and concurrent with the measurement of the readiness predictor. This is a stringent test, because the concurrent measures of readiness and alcohol use were expected to be correlated, and indeed were correlated at the initial and 6-month assessments.

The factor structure of the 19-item version of the SOCRATES replicated Maisto et al.’s (2003) findings without exception, which lends confidence in its use with a clinical sample of adolescents. However, the Recognition score consistently had the worst concurrent and predictive validity performance among the measures, and this finding is consistent with Maisto et al. This is an interesting finding because of the moderately large correlation between Taking Steps and Recognition found in the full sample in this study (and in Maisto et al.). Along these lines, Maisto et al. suggested that the Recognition subscale is more a measure of self-perception of the severity of an individual’s alcohol problems rather than of readiness to change behaviors leading to such problems. The perception of alcohol problem severity may be evident among people who are taking action to change a problem behavior, and likely accounts for the correlation between Taking Steps and Recognition. On the other hand, a person’s self-perception of the severity of his or her problem behavior does not necessarily reflect taking any action to change it, so that the correlations between a severity

measure and any measures of readiness to change and related behavior measures are likely to be small or zero in magnitude.

The Staging Algorithm data revealed the important finding of a significant increase in the percentage of participants classified as Precontemplators from the initial to the 6-month assessment, and this change was maintained at 12 months. Of course, one possible explanation for this trend is that the three time points do not include the same individuals, because of sample attrition patterns. However, a more likely possibility lies in the characteristics of this sample and the effect of active treatment. In this regard, this was a sample whose members tended to perceive that alcohol was not the primary drug causing them problems, and that, combined with the end of the index treatment episode, could account for the increase in the proportion of Precontemplators. However, at the same time, it is important to note that Table 2 also shows a substantial increase in the proportion of individuals classified in the Maintenance stage between the initial and 6-month assessments, and that proportion increased again between 6 and 12 months. Such a trend is what would be hoped for in following a group of individuals who had completed an episode of outpatient alcohol and drug treatment.

There are several limitations to this study that could affect the generalizability of its findings. All data consisted of the participants' self-reports. In addition, sample attrition could have biased the findings. However, overall, it appears that there were no significant differences between individuals who completed the 6-month and 12-month assessments and those who did not. Sample attrition over the course of the study's 12 months was not high and was in the upper end of the range reported by other major follow-up studies of clinical samples of adolescents (Dennis et al., 2004; Hser et al. 2001). Another limitation was that some measures (e.g., alcohol use) were collected at baseline and not at the initial assessment (due to time constraints at the initial assessment), such that the associations reported between measures collected as the initial and baseline assessments may have underestimated the strength of the relationships for these early time points. Finally, the main analyses were run on a sample of participants whose most common diagnosis was marijuana use disorder and almost half of whom did not have an AUD diagnosis. However, the potential difficulties in interpreting the findings on the validity of alcohol readiness to change measures were addressed largely by rerunning the predictive validity models on the subsample of individuals who had an AUD diagnosis. It also is important to note that the validity of measures of readiness to change marijuana use in this study's full sample is addressed in another manuscript (Maisto, Krennek, Chung, Martin, Cornelius, & Clark, 2011).

In conclusion, study results suggest that two of the three readiness measures investigated in this study have good concurrent validity. Furthermore, among the Readiness Ruler, Staging Algorithm, and the SOCRATES measures, the Readiness Ruler score has the strongest and most consistent support for predictive validity and thus for potential clinical utility, and that predictive utility of Taking Steps is good with adolescents who have an AUD. The results also suggest that the scores on the measures should not be used interchangeably. In general, the data show that the field would be advanced by additional systematic research on the construct validity of measures of readiness to change, given the importance of the construct in clinical practice with adolescents presenting for treatment of alcohol and other drug use disorders.

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Table 1

Descriptive Statistics for Alcohol Consumption and Readiness Measures across Assessment Points

Measure	N	Mean	Standard Deviation
Initial Readiness Ruler (RR)	161	6.55	2.97
6-Month RR	121	5.76	3.36
12-Month RR	121	6.10	3.46
Initial SOCRATES Taking Steps (STS)	159	3.04	1.28
6-Month STS	120	3.15	1.32
12-Month STS	119	3.00	1.35
Initial SOCRATES Recognition (SR)	159	2.09	1.07
6-Month SR	135	2.13	1.18
12-Month SR	133	1.98	1.13
Initial Staging Algorithm (ISA)	160	3.21	0.91
6-Month ISA	136	3.22	1.53
12-Month ISA	135	3.23	1.64
Baseline Percentage Days Abstinent (PDA)	161	52.24	43.68
6-Month PDA	121	59.98	43.83
12-Month PDA	120	65.80	41.79
Baseline Drinks Per Drinking Day (DDD)	161	4.00	4.80
6-Month DDD	121	4.04	4.65
12-Month DDD	120	3.64	4.27

Note: STS and SR data are item scores, range 1–5, higher score = “more ready” to change. Alcohol consumption raw scores are reported here.

Table 2

Classification of Adolescents' Readiness According to the Staging Algorithm at the Initial, 6-Month, and 12-Month Assessments

Initial (N=160)		6-Mo. (N=136)		12-Mo. (N=135)	
Stage	Percent	Stage	Percent	Stage	Percent
Pre	8.8	Pre	25.0	Pre	28.9
C	1.9	C	5.1	C	3.7
Prep	54.4	Prep	19.9	Prep	17.8
A	30.0	A	22.8	A	14.8
M	5.0	M	27.2	M	34.8

Note: Pre=Pre-contemplation, C=Contemplation, Prep=Preparation, A=Action, M=Maintenance. Ns vary due to missing data or loss to follow-up (for 6- and 12-mo. assessments).

Table 3
Inter-correlations among Initial Readiness Measures, and Correlations between Initial Readiness and Baseline Alcohol Consumption

	IRR	ISA	ISR	ISTS	Baseline PDA	Baseline DDD
Initial Readiness Ruler (IRR)	X	.46**	.16*	.64**	.35**	-.34**
Initial Staging Algorithm (ISA)		X	.02	.42**	.39**	-.40**
Initial SOCRATES Recognition (ISR)			X	.37**	-.12	-.15
Initial SOCRATES Taking Steps (ISTS)				X	.22**	-.22**

Note: PDA = Percentage of Days Abstained from Alcohol, last 30 days, as measured by the Timeline Followback (TLFB) interview, DDD = Drinks per Drinking Day, last 30 days, as measured by the TLFB, Ns for the analyses ranged from 158–161. A square root transformation was applied to the alcohol consumption measures before analyses.

**
p .01

*
p .05, 2-tailed tests

Table 4
Inter-correlations among 6-Month Readiness Measures, and Correlations between 6-Month Readiness and 6-Month Alcohol Consumption

	6RR	6SA	6SR	6STS	6PDA	6DDD
6-Mo. Readiness Ruler (6RR)	X	.69**	.23**	.76**	.59**	-.54**
6-Mo. Staging Algorithm (6SA)		X	.10	.63**	.78**	-.61**
6-Mo. SOCRATES Recognition (6SR)			X	.42**	-.02	.07
6-Mo. SOCRATES Taking Steps (6STS)				X	.56**	-.57**

Note: PDA = Percentage of Days Abstinent from alcohol, last 30 days, as measured by the Timeline Followback (TLFB) interview, DDD = Drinks per drinking day, last 30 days, as measured by the TLFB. Ns for the analyses ranged from 118–121. A square root transformation was applied to the alcohol consumption measures before analyses.

** $p < .01$
* $p < .05$, 2-tailed tests

Table 5

Evidence for Predictive Validity: Prediction of Alcohol Use at Six Months from Initial Readiness

Percentage of Days Abstinent (PDA) 6 Mos.									
IRR			ISA			ISR			ISTS
N = 148			N = 147			N = 146			N = 146
	beta	ΔR^2	beta	ΔR^2	beta	beta	ΔR^2	beta	ΔR^2
Step 1		.06*		.06*			.06*		.06*
Sex (1=female, 2=male)	-.09		-.08		-.09		-.09		-.09
Age	-.21*		-.22**		-.21*		-.21*		-.21*
Race (1=White, 2=Other)	-.05		-.05		-.05		-.05		-.05
Step 2 (SAT: # in-patient + # residential days, last 30 days)		.01		.01			.01		.01
Sex	-.09		-.09		-.09		-.09		-.09
Age	-.21*		-.21*		-.21*		-.21*		-.21*
Race	-.04		-.04		-.04		-.04		-.04
SAT	.11		.11		.11		.11		.11
Step 3 (Baseline PDA)		.16**		.15**			.16**		.16**
Sex	-.12		-.12		-.12		-.12		-.12
Age	-.17*		-.17*		-.17*		-.17*		-.17*
Race	-.04		-.04		-.04		-.04		-.04
SAT	.08		.08		.08		.08		.08
BL PDA	.40**		.40**		.40**		.40**		.40**
Step 4 (Clinical Setting: dual diagnosis=1, other =0)		.02*		.02*			.03*		.03*
Sex	-.14		-.14		-.14		-.14		-.14
Age	-.17*		-.17*		-.17*		-.17*		-.17*
Race	-.05		-.05		-.05		-.05		-.05
SAT	.10		.10		.10		.10		.10
BL PDA	.36**		.36**		.36**		.36**		.36**
Clin. Setting	-.16*		-.16*		-.17*		-.17*		-.17*
Step 5 (Initial Readiness)		.07**		.02			.01		.01

<u>Percentage of Days Abstinent (PDA) 6 Mos.</u>										
IRR			ISA			ISR			ISTS	
N = 148			N = 147			N = 146			N = 146	
beta	ΔR^2	beta	beta	ΔR^2	beta	beta	ΔR^2	beta	beta	ΔR^2
Sex	-.15*	-.13	-.16*							
Age	-.18*	-.16*	-.15*							
Race	-.05	-.05	-.07							
SAT	.06	.10	.13							
BL PDA	.26**	.31**	.35**							
Clin. Setting	-.16*	-.17*	-.16*							
Init. Readiness	.28**	.14	-.09							
<u>Drinks per Drinking Day (DDD) 6 Mos.</u>										
IRR			ISA			ISR			ISTS	
N = 148			N = 147			N = 146			N = 146	
beta	ΔR^2	beta	beta	ΔR^2	beta	beta	ΔR^2	beta	beta	ΔR^2
Step 1										
Sex (1=female, 2=male)	.14	.13	.14							
Age	.18*	.19*	.18*							
Race (1=White, 2=Other)	-.03	-.02	-.03							
Step 2 (SAT: # in-patient + # residential days, last 30 days)										
Sex	.14	.13	.14							
Age	.18*	.18*	.18*							
Race	-.04	-.03	-.04							
SAT	-.12	-.12	-.12							
Step 3 (Baseline DDD)										
Sex	.13	.13	.14							
Age	.16*	.16*	.16*							

Percentage of Days Abstinent (PDA) 6 Mos.									
	IRR			ISA			ISR		
	beta	ΔR ²		beta	ΔR ²		beta	ΔR ²	
	N = 148			N = 147			N = 146		
	beta	ΔR ²		beta	ΔR ²		beta	ΔR ²	
Race	.01			.01			.01		
SAT	-.13			-.13			-.13		
BL DDD	.33**			.32**			.33**		
Step 4 (Clinical Setting: dual diagnosis=1, other=0)	.03*			.02*			.03*		
Sex	.15			.15			.16*		
Age	.16*			.16*			.16*		
Race	.02			.02			.02		
SAT	-.14			-.15			-.14		
BL DDD	.30**			.30**			.30**		
Clin. Setting	.16*			.16*			.17*		
Step 5 (Initial Readiness)	.07**			.03*			.02		
Sex	.17*			.15			.19*		
Age	.16*			.15			.13		
Race	.00			.01			.05		
SAT	-.09			-.14			-.18*		
BL DDD	.21**			.23**			.29**		
Clin. Setting	.15*			.16*			.16*		
Init. Readiness	-.28**			-.17*			.15		

Notes: SAT=Substance Abuse Treatment. PDA and DDD both measured by use of the Timeline Follow-back Interview and reference the 30 days prior to their respective interview dates. As differ due to missing data. A square root transformation was applied to the alcohol consumption and number of substance abuse treatment days data before analyses. IRR = Initial Readiness Ruler, ISA=Initial Staging Algorithms, ISR=Initial SOCRAATES-Recognition, ISTS = Initial SOCRAATES Taking Steps. All betas are standardized.

**
p .01

*
p .05, 2-tailed tests

Table 6

Evidence for Predictive Validity: Prediction of Alcohol Use at Twelve Months from Readiness at Six Months

Percentage of Days Abstinent (PDA) 12 Mos.									
6RR			6SA			6SR			6STS
N = 104			N = 126			N = 125			N = 125
	beta	ΔR^2	beta	ΔR^2	beta	beta	ΔR^2	beta	ΔR^2
Step 1		.10*		.08*			.08*		.08*
Sex (1=female, 2=male)	-.17		-.14		-.13		-.13		-.13
Age	-.22*		-.20*		-.20*		-.20*		-.20*
Race (1=White, 2=Other)	-.08		-.12		-.13		-.13		-.13
Step 2 (SAT: # in-patient + # residential days, last 30 days)		.03		.03			.03		.03
Sex	-.19		-.16		-.15		-.15		-.15
Age	-.19		-.17		-.17		-.17		-.17
Race	-.15		-.16		-.16		-.16		-.16
SAT	.19		.17		.17		.17		.17
Step 3 (6-Month PDA)		.22**		.28**			.28**		.28**
Sex	-.10		-.07		-.07		-.07		-.07
Age	-.11		-.10		-.10		-.10		-.10
Race	-.17		-.15*		-.15		-.15		-.15
SAT	.12		.08		.08		.08		.08
6-Mo. PDA	.49**		.55**		.55**		.55**		.55**
Step 4 (Clinical Setting: dual diagnosis=1, other=0)		.00		.00			.00		.00
Sex	-.10		-.08		-.08		-.08		-.08
Age	-.12		-.10		-.10		-.10		-.10
Race	-.17		-.15*		-.15*		-.15*		-.15*
SAT	.11		.08		.08		.08		.08
6-Mo. PDA	.47**		.54**		.54**		.54**		.54**
Clin. Setting	-.06		-.04		-.05		-.05		-.05
Step 5 (6-Month Readiness)		.04*		.01			.00		.00

<u>Percentage of Days Abstinent (PDA) 12 Mos.</u>									
6RR			6SA			6SR			6STS
N = 104			N = 126			N = 125			N = 125
beta	ΔR ²	beta	ΔR ²	beta	ΔR ²	beta	ΔR ²	beta	ΔR ²
Sex	-.05		-.08			-.08		-.06	
Age	-.15		-.12			-.10		-.12	
Race	-.20*		-.16*			-.16*		-.16*	
SAT	.14		.08			.08		.08	
6-Mo. PDA	.30**		.41**			.54**		.49**	
Clin. Setting	-.09		-.04			-.05		-.06	
6-Mo. Readiness	.27*		.16			-.04		-.08	
<u>Drinks per Drinking Day (DDD) 12 Mos.</u>									
6RR			6SA			6SR			6STS
N = 104			N = 126			N = 125			N = 125
beta	ΔR ²	beta	ΔR ²	beta	ΔR ²	beta	ΔR ²	beta	ΔR ²
Step 1	.07		.05			.05			.05
Sex (1=female, 2=male)	.19		.14			.15		.15	
Age	.16		.15			.15		.15	
Race (1=White, 2=Other)	-.04		.02			-.00		-.00	
Step 2 (SAT: # in-patient + # residential days, last 30 days)	.02		.02			.02			.02
Sex	.20*		.16			.16		.16	
Age	.14		.13			.13		.13	
Race	.01		.06			.03		.03	
SAT	-.15		-.16			-.15		-.15	
Step 3 (6-Month DDD)	.19**		.21**			.25**		.25**	
Sex	.08		.05			.06		.06	
Age	.07		.08			.06		.06	
Race	.05		.05			.02		.01	

<u>Percentage of Days Abstinent (PDA) 12 Mos.</u>									
6RR				6SA				6SR	
N = 104				N = 126				N = 125	
	beta	ΔR ²		beta	ΔR ²	beta	ΔR ²	beta	ΔR ²
SAT	-.10			-.09		-.08		-.08	
6-Mo. DDD	.47**			.48**		.53**		.53**	
Step 4 (Clinical Setting: dual diagnosis=1, other=0)									
Sex	.08	.03		.07	.02	.07	.01	.07	.01
Age	.08			.08		.07		.07	
Race	.06			.06		.03		.03	
SAT	-.09			-.08		-.07		-.07	
6-Mo. DDD	.45**			.46**		.51**		.51**	
Clin. Setting	.16			.14		.12		.12	
Step 5 (6-Month Readiness)									
Sex	.02	.12**		.07	.07**	.05	.00	.05	.02*
Age	.11			.10		.10		.10	
Race	.09			.07		.03		.04	
SAT	-.12			-.06		-.08		-.07	
6-Mo. DDD	.21*			.26**		.51**		.38**	
Clin. Setting	.17*			.10		.12		.13	
6-Mo. Readiness	-.43**			-.34**		-.03		-.20*	

Notes: SAT=Substance Abuse Treatment. PDA and DDD both measured by the Timeline Follow-back Interview and reference the 30 days prior to their respective interview dates. Ns differ due to missing data. A square root transformation was applied to the alcohol use and number of substance abuse treatment days data before analyses. 6RR=Readiness Ruler at 6-months assessment, 6SA = Staging Algorithm at 6-mos., 6SR=SOCRATES Recognition at 6 mos., and 6STS = SOCRATES Taking Steps at 6 months. All betas are standardized.

**
p .01

*
p .05, 2-tailed tests

Table 7

Predictive Validity Change in R² Results for Subsample Diagnosed with a Current AUD at the Initial Assessment (N=82)

Outcome (N)	Readiness Ruler	Staging Algorithm	Recognition	Taking Steps
PDA-6 (75)	$\Delta R^2 = .06^*$	.01	.01	.04 ^{**}
DDD-6 (75)	.08 ^{**}	.04	.04	.06 [*]
PDA-12 (56)	.06 [*]	.01	.00	.02
DDD-12 (56)	.11 ^{**}	.02	.01	.04

Notes. PDA-6, -12 = Percentage of Days Abstinent at 6 and 12 months, respectively. DDD-6, -12 = Drinks per Drinking Day at 6 and 12 months, respectively. The same models whose results are summarized in Tables 5 and 6 were run in yielding the findings summarized in Table 7. Baseline readiness was used to predict 6-month outcomes, and 6-month readiness was used to predict 12-month outcomes.

^{**}
p .01

^{*}
p .05